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ERASMUS MUNDUS JOINT MASTER DEGREE

**MASTER DEGREE IN SUSTAINABLE DESIGN,
CONSTRUCTION AND MANAGEMENT OF THE BUILT**

MBUILD

FIT-OUT PROJECTS IN THE RETAIL INDUSTRY, TOWARDS A GREENER AGENDA.

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To my mother, wife, and children.

Less is More.

Ludwig Mies van der Rohe

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ABSTRACT

Keywords: Retail Design, Circular Design, Fit-out, LCA.

The retail industry, responsible for 40% of global greenhouse gas emissions, faces substantial pressure to adopt sustainable practices (Jesse et al., 2022). Retail spaces, which frequently undergo renovations, contribute significantly to embodied carbon emissions. The process of preparing interior spaces to meet client-specific retail atmosphere requirements—known as "fit-out"—is particularly resource-intensive, leading to frequent material replacement and significant waste generation at intervals ranging from 2 to 10 years (Fieldson & Rai, 2009), well before the exhaustion of their service life. This recurring embodied carbon is often overlooked, creating a gap in awareness among market participants, particularly retail designers, who possess considerable influence in transforming this reality. In the academic domain, there is a research gap concerning design strategies that could contribute to this transformation.

This research investigates how Sustainability and Circularity measures can be integrated into retail fit-out and renovation projects. The study examines the case of a fashion retail unit in Brazil developed under these principles. It documents the challenges of its design, quantifying the embodied energy and environmental impacts generated by its implementation, and evaluates the potential for integrating Life Cycle Assessment (LCA) methodology with Circular Design strategies specific to retail projects (Ayalp & Santoro, 2022). LCA is one of the most comprehensive methodologies for assessing the environmental impact of architectural production and operation. Circular Design is an approach to creating products, systems, and buildings that prioritize waste minimization and resource efficiency throughout their entire life cycle.

To this end, an LCA of the project with an emphasis on the systems typically involved in a "fit-out" was conducted: structures, finishes, lighting, furniture and equipment, and façades within the scope of interior architecture, which excludes the building envelope and structures, as well as all technical systems (electrical, HVAC, plumbing, and fire prevention systems). Based on the results, the most impactful materials in the Global Warming Potential (GWP) category were identified, and possibilities for their elimination, mitigation, and/or substitution were analyzed through the application of a Circular Design framework.

The results demonstrated that the attempt to integrate Life Cycle Assessment with Circular Design strategies to create more sustainable retail project pathways was partially effective. While LCA gains complexity and precision as the project advances in its Technical Development, Circular Design strategies lose opportunity and potential as the project moves away from the Conceptual phase. This antagonism confirms the greater adherence of this method in new retail design projects which offer greater openness to innovative solutions but are less frequent on the retail agenda. Otherwise, there is less adherence in projects aimed at improving existing retail designs, which are more recurrent and pressing, but offer less opportunity for altering existing design practices and specifications.

ABSTRACT IN PORTUGUESE

Palavras-chave: Desenho de Varejo, Desenho Circular, Implantação de Varejo, ACV.

A indústria de varejo, responsável por 40% das emissões globais de gases de efeito estufa, enfrenta uma pressão substancial para adotar práticas sustentáveis (Jesse et al., 2022). Os espaços de varejo, frequentemente passando por renovações, contribuem significativamente para as emissões de carbono incorporado. O processo de preparação de espaços interiores para atender a requisitos de atmosfera de varejo específicos do cliente – chamado de *"fit-out"* - é particularmente intensivo em consumo de recursos, levando à substituição frequente de materiais e à geração significativa de resíduos em intervalos que variam de 02 a 10 anos (Fieldson & Rai, 2009), muito antes do esgotamento da sua vida de serviço. Esse carbono incorporado recorrente é frequentemente negligenciado, criando uma lacuna de conscientização entre os participantes do mercado, particularmente os designers de varejo, que possuem uma influência considerável para transformar essa realidade. No âmbito acadêmico, existe um gap de investigação de estratégias de projeto que possam contribuir para a transformação desta realidade.

Essa pesquisa investiga como as medidas de Sustentabilidade e Circularidade podem ser integradas aos projetos de implantação e reformas de varejo. O estudo examina o caso de uma unidade de varejo de moda do Brasil desenvolvida sob esses princípios, documentando os desafios da sua concepção, quantificando a energia incorporada e os impactos ambientais gerados pela sua implementação, e avaliando o potencial de integração da metodologia de Avaliação do Ciclo de Vida (ACV) com estratégias de Design Circular específicas para projetos de varejo (Ayalp & Santoro, 2022), visando o aperfeiçoamento da performance ambiental do projeto. A ACV é uma das metodologias mais abrangentes para avaliar o impacto ambiental da produção e operação arquitetônica. O Design Circular é uma abordagem para criar produtos, sistemas e edifícios que priorizam a minimização de resíduos e a maximização da eficiência dos recursos ao longo de todo o seu ciclo de vida.

Para tanto, foi realizado um ACV do projeto com ênfase nos sistemas tipicamente componentes de um *"fit-out"*: estruturas, acabamentos, iluminação, mobiliários, equipamentos e fachadas no âmbito da arquitetura de interiores; ou seja, excluindo-se o envoltório e estruturas da edificação, e todos os sistemas técnicos (instalações de elétrica, ar-condicionado, hidrossanitário e prevenção de incêndio). Com base nos resultados foram identificadas as materialidades mais ofensoras na categoria Potencial de Aquecimento Global (GWP) e sobre elas foram analisadas possibilidades eliminação, mitigação, e/ou substituição através da aplicação de um framework para o Desenho Circular.

Os resultados evidenciaram que a tentativa de integrar a Avaliação do Ciclo de Vida com estratégias de Design Circular para construir rotas de projetos de varejo mais sustentável se mostrou parcialmente eficaz. Enquanto o ACV ganha complexidade e precisão à medida que o projeto avança em seu Desenvolvimento Técnico, as estratégias de Design Circular perdem oportunidade e potencial à medida que o projeto se afasta da fase Conceitual. Este antagonismo confirma a maior aderência desse método em projeto de novos designs de varejo, que apresentam uma maior abertura a soluções inovadoras, mas que em contrapartida são menos recorrentes na agenda do varejo; e uma menor aderência em projetos de melhoria de designs de varejo vigentes, cuja demanda é mais recorrente e latente, porém apresentam menor possibilidade de alteração das práticas de projeto e especificações vigentes.

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SYMBOLS, ACRONYMS AND ABBREVIATIONS

3D – three dimensional

Bq - becquerel

CO₂ – carbon dioxide

CFC - chlorofluorocarbon

CTU – comparative toxicity for human

eq – equivalent

kg - kilogram

MJ – megajoule

mol - molecule

N - nitrogen

NMVOC – non-methane volatile organic compound

PO₄ - phosphate

Sb – antimony element

sqm - square meter

ADP - Depletion of abiotic resources

AP - Acidification

ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers

BoQ - Bill of Quantities

BREEAM - Building Research Establishment Environmental Assessment Method

BTS – Build-to-suit

Cat - Category

CCA - Chromium, Cadmium, Arsenic

CE – Circular Economy

C&D – Construction and Demolition

CI – Construction Industry

CSR - Corporate Social Responsibility

DSM – Design Summit Meeting

EEC – End-of-life Carbon

EN – European Standard

EP - Eutrophication

EPD - Environmental Product Declaration

ESG – Environmental, Social, and Governance
ETP - Eco-toxicity potential
EU – European Union
Fig. – Figure
GB – Green Building
GDP – Gross Domestic Product
GHG – Greenhouse Gases
GWP – Global Warming Potencial
HS – hotspot
HTP - Human toxicity potential
HVAC – Heating, Ventilation, and Air Conditioning
ID+C – Interior Design + Construction
IEC – Initial Embodied Carbon
IEE – Initial Embodied Energy
ISO – International Organization for Standardization
JK – Juscelino Kubitschek
LCA – Life Cycle Assessment
LCCA – Life Cycle Cost Assessment
LCI – Life Cycle Inventory
LCIA - Life Cycle Inventory Assessment
LED – Light Emitting Diode
LEED – Leadership in Energy and Environmental Design
MEP - Mechanical, Electrical, and Plumbing
MERCO - Corporate Reputation Business Monitor
MDF – Medium Density Fibreboard
NYC – New York City
ODP - Ozone depletion
PCR – Product Category Rules
PM – Particle matter
POCP - Photochemical ozone formation
REC – Recurring Embodied Carbon
REE – Recurring Embodied Energy
RI – Retail Industry

RIBA – Royal Institute of British Architects

RPoF – RIBA Plan of Work

SAC - Sustainable Apparel Coalition

SBTi – Science Based Targets index

SQP - Soil Physical Quality

Tab - Table

UN – United Nations

VOC – Volatile organic compound

USGBC – United States Green Building Council

WDP – Water deprivation potential

WWF - World Wildlife Fund

1

INTRODUCTION

1.1. CONTEXT AND RELEVANCE

The impulse of the Retail Industry (RI) towards sustainability is no longer an option: the pandemic COVID-19 has revealed how interconnected the world is, both in business and social terms. Consumers have realized they need to support brands that do more and better with less. The Retail Sector is one of the topmost carbon-intensive industries, responsible for roughly 40% of global greenhouse gas (GHG) (Jesse et al., 2022). Moreover, it is estimated that retail and office spaces account for 28% of the total energy used in non-residential buildings, and 28% of non-residential floor space in Europe, according to the Building Performance Institute Europe et al. (2011).

The Retail Sector significantly contributes to climate issues related to the built environment due to the resource-intensive nature of maintenance and ongoing operational demands. Additionally, commercial, brand, and marketing pressures impose a significant impact on short-term store renovation or remodelling projects. A unique combination of construction process particularities, design ephemerality (architectural concept and visual merchandising), and operational stress (Petermans & Kent, 2016). While residential buildings are designed and constructed for a lifespan of 50 to 100 years, commercial buildings undergo renovation cycles in drastically shorter periods - 2 to 10 years intervals - , long before their service life has been reached. Such a condition leads to increased consumption of raw materials, energy, and water, as well as waste generation (Fieldson & Rai, 2009).

Typically, commercial spaces and offices are implemented in a fit-out process. Fit-out refers to the process of making an interior space ready for occupation and to meet specific requirements. Building fit-outs present a significant challenge for reducing resource consumption and waste generation in the built environment, as they represent the most frequent replacement of building materials and components (Casas-Arredondo et al., 2018). The fit-out process involves (removing and) installing interior building materials and components, including floor, wall, and window coverings, partitions, doors, furniture, equipment, and sometimes mechanical and electrical services. Before new building products are installed (re-fit), the interior space is typically stripped out (de-fit), with most removed products ending up as waste (Forsythe & Wilkinson, 2015).

According to Strudwick et al. (2020), retail and office fit-outs are responsible for 40% of embodied energy in a building, and 300 tons of fit out waste go to landfills daily only in the United Kingdom.

“Most people know that a lot of energy is used in operating buildings. More people are recognizing that construction also uses a huge amount of embodied

energy. But fewer realize that fit-outs are responsible for about a third of emissions over the life of a building. Why is this so high? Because a typical building lasts around 60 years, but offices are refitted every eight years on average and all the embodied energy that goes into producing, transporting, and installing the new furniture, carpets, lighting, and kitchens effectively goes in the bin.” (Jaffe, 2021)

The replacement of these components is more common in non-domestic buildings, occurring every 3-10 years (Forsythe, 2017). When an outgoing tenant removes the fit-out, the incoming tenant installs new fittings, fixtures, and finishes. As a result, fit-outs contribute significantly to embodied carbon emissions and waste generation throughout a building's life cycle due to the frequent replacement of products. Nevertheless, building fit-outs often go unnoticed and unmeasured in discussions about sustainable buildings (Forsythe, 2017).

From a global perspective, linear models consume more than they replenish. To establish long-term sustainability in the retail and wholesale sector and meet consumer demand for sustainable solutions, retailers and wholesalers will need to transition from linear business models ("use and discard") to circular business models ("reuse or recycle") and reduce waste throughout their value chain (Ellen MacArthur Foundation, 2022). Circularity can also reduce greenhouse gas emissions by decreasing the need for virgin material extraction and processing required to maintain products in use (Ellen MacArthur Foundation, 2022).

Such strategies are core when one looks at Scope 3 emissions (supply chain up and downwards), but also are fundamental when coping with Scope 1 emissions (direct emissions, controlled by a company, generated from facilities construction and operation, and vehicles) and Scope 2 emissions (caused by the local production of energy consumed for operation and heating) (World Business Council for Sustainable Development & World Resources Institute, 2004). According to the GHG Protocol, leased assets and franchises are accounted under Scope 3 as downstream activities (World Business Council for Sustainable Development & World Resources Institute, 2004).

However, it is assumed that even in the current context of legal and social pressures towards a greener agenda, many retail companies still struggle to include issues related to sustainability and the environmental impact of their operations at the business level. In such a dynamic business environment, decisions that impact the immediate future end up taking precedence over demands for the extended future when considering turnover generation (Jesse et al., 2022). This short-term agenda combined with the environmental burden of recurring fit-outs processes highlight the urgency for a new approach to decision-making by retailers, with the inclusion of the information and variables related to the sustainable dimension along with business factors. This new agenda can make room for extended service life and afterlife in retail fit-outs (Ayalp & Santoro, 2022).

1.2. PROBLEM DESCRIPTION

Retailers have been recognized as crucial agents in driving sustainable transformation, due to their essential function in bridging the gap between production and consumption. Consequently, sustainability is high on the agenda for many retailers (Dagilienė et al., 2021). However, research on sustainability in retail has mostly focused on the production sourcing side (Vadakkepatt et al., 2021), and very few in the retail-built environment.

Hence, even considering the growth of e-commerce in several formats, a huge part of retail operations still relies on physical spaces, such as warehouses, distribution centers, and stores. Data extracted from Statista Research Center (2024) accounts for the retail space per capita in some countries worldwide in 2018: the United States had the highest square footage of retail space per capita at 2,18 sqm; followed by Canada, 1,55 sqm, and Australia, 1,04 sqm. In the European Union context, Netherlands and France have the biggest retail surface per capita, accounting 0,38 and 0,35 sqm, respectively. Such numbers bring to light the relevance of the built environment dedicated to retail operations in terms of embodied energy and carbon footprint.

After analyzing the literature, it is possible to identify that there is room to study the effects of retail practices on the built environment and how to translate such related impacts – and opportunities – into the retailer decision-making process. Hence, the present work will put its best efforts into answering the following question: **how to include sustainability and circularity measures in retail fit-out projects from the learnings of a case study?**

Answering the above question will demand the exploration of the following hypothesis:

- i) A growing awareness of the environmental impacts of retail fit-outs can lead to a greener future.
- ii) In retail projects, the immediate future is more important than the extended future. This leads to a short-term vision that does not account the recurring nature of retail fit-outs and these impacts.

Complementary, based on the professional practice of the author in the field of retail design, a study case intends to verify the validity of the following assumptions:

- i) Recurring embodied energy and emissions are underestimated in retail fit-outs.
- ii) The service life of retail fit-outs is too short.
- iii) There is a gap of awareness in retail design teams about the sustainable impacts.

1.2.1. OBJECTIVES

The aim of this research is to demonstrate the importance of taking a lifetime emissions-based approach to understanding the impact of store design. This investigation essentially highlights the importance of the embodied impact of construction products in retail interiors, with the adoption of a Life Cycle Analysis (LCA) as a tool for inventory, quantification, and analysis of these impacts; mainly the GHG emissions.

To this end, the study will focus on the case study of the implementation of a fashion retail unit with the adoption of pro-sustainability and circularity strategies. This project was implemented in Brazil between 2019 and 2021 (considering from the beginning of the project to the completion of the work and opening of the store) and its qualities were recognized with the rating "excellent" by the British certification of the Building Research Establishment Environmental Assessment Method (BREEAM). BREEAM is a globally recognized environmental assessment method and rating system for buildings that aim to improve their sustainability and environmental performance by evaluating them against a set of performance criteria (Building Research Establishment, 2024).

The exploration of a case study (Eisenhardt, 1989) has proven to be highly effective in achieving the objectives of this research. Firstly, it allows for a more in-depth look at a particular context, but at the same time it serves as a sample of phenomena that have extensive recurrence. Secondly, it allows for a certain methodological flexibility that proved necessary given the exploratory nature of the

experimental plan. The combination of these factors, in addition to justifying the adoption of the case study as an essential part of the methodology of this research, also confirms its commitment to the reality of professional practice in retail design, by exposing some challenges and limitations (Azevedo & Ensslin, 2020).

The general objectives of this research are:

- i) Document a case study in green retail design, pointing out the challenges and presenting the development path taken.
- ii) Quantify and better understand the magnitude of Total Embodied Carbon (Initial Embodied Carbon, IEC + Recurring Embodied Carbon, REC) in a retail fit-out.
- iii) Explore the integration between Circular Design and Life Cycle Assessment to enhance the sustainable performance of a retail fit-out.
- iv) Increase awareness in retail design teams and contribute to making better decisions regarding sustainability goals.

Reaching such general objectives will demand the accomplishment of some specific ones in the exploration of the case study, as listed below:

- i) Review the processes and achievements of the case study object implementation in comparison to the previous standards.
- ii) Quantify the carbon footprint and environmental impacts of a retail fit-out process developed with the adoption of sustainable and circular design strategies.
- iii) Deploy and assess the adoption of a Circular Design framework (Ayalp & Santoro, 2022) as a tool to enhance the environmental performance of the project.

1.3. RESEARCH METHODOLOGY

The methodological framework for this research the Double Diamond technique, which is a design process model adapted from the divergence-convergence model proposed by Jenlink & Banathy (2008). It proposes an exploring process with subsequent steps of divergent thinking and convergent thinking as presented in Fig. 1 below.

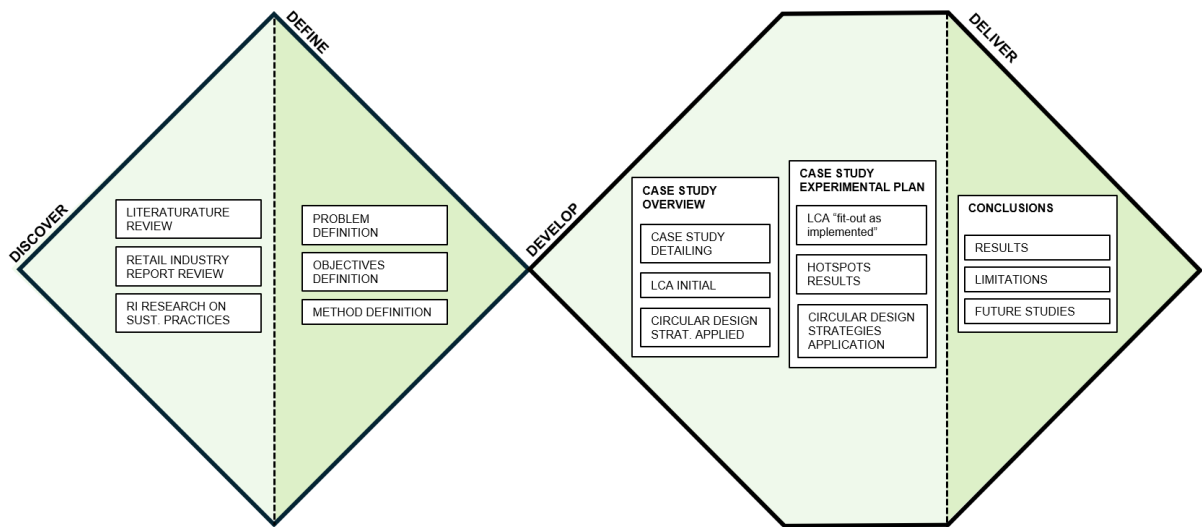


Fig. 1 - Methodological framework.
Source: Author, adapted from Jenlink & Banathy (2008)

According to the British Design Council, which has worked to popularize the model since 2005, four phases are suggested:

- **Discover:** step to gather knowledge and a deeper understanding of the problem, avoiding assuming bias or previous concepts.
- **Define:** step to redefine the problem, objectives, and methodology to be applied.
- **Develop:** after clarifying the problem in the first diamond, the second diamond starts the problem-solving phase by exploring tools and solutions.
- **Delivery:** since the problem was properly explored, this step consolidates possible solutions, knowledge produced, and further explorations and possibilities.

Once adapted to the objectives of this research, each of the 04 Double Diamond phases was filled with jobs to be done, building an integrated and tailor-made approach to the accomplishment of the research objectives.

The **Discovery-phase** covers three explorative initiatives to harvest knowledge about the current state of development of retail sustainable design practices:

- i. literature exploration (N. Moore, 2018), searching for the principles and drivers of sustainability in the built environment, the Circular Design principles and tool, the LCA principles and tools, and the current practices in Retail Design.
- ii. desk-research (N. Moore, 2018) on sustainable retail design projects.
- iii. review on the Corporate Sustainable Report of the 10 major physical retailers in Europe to identify current achievements and goals in this field with effect in the retail built-environment, providing background for this study.

The **Definition-phase** is dedicated to building the research problem, objectives, and methodology. Based on the reflexions triggered by the previous investigation, the research opportunity is delimited and shaped.

In the third phase, the **Development-phase**, a case study is properly presented and developed. The adoption of a case study (Eisenhardt, 1989) accomplish with several goals within the context of this research, and followed the roadmap presented in Fig. 2:

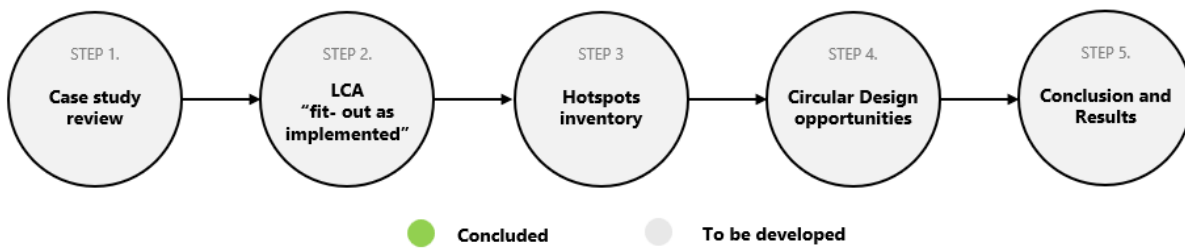


Fig. 2 - Case study roadmap.
Source: Author

- **Step 01:** A review of the objectives, expectations, and limitations of the case study at the time of its development. Also, the documentation in academic environment the development context of this retail fit-out project that was a precursor to the adoption of circular design strategies in Brazilian retail.
- **Step 02:** Performance of a Life Cycle Assessment to evaluate the effectiveness of the strategies adopted in the new concept design in comparison with the store standard in force until then.
- **Step 03:** Identification of the most environmentally harmful materials in the case study to be reconsidered using a Circular Design approach.
- **Step 04:** Deployment of a Circular Retail Design framework for improving and enhancing the Green Retail performance, over the hotspots.
- **Step 05:** Measurement and reflection on the effectiveness of the proposed method for accomplishing the research objectives.

The methodology applied to the case study is developed in section 3.1. Opportunely, it is worth mentioning that the Research methodology and the Case Study methodology were developed simultaneously in a non-linear manner, in which one influenced the other.

Concluding, the findings and knowledge produced are summarized in the **Deliver-phase**, and future research opportunities are suggested. As a legacy, this work intends to contribute to a field of knowledge that is still little explored, the sustainable and circular retail design.

1.3.1. DOCUMENT STRUCTURE

This document is structured in 04 main sections which partially mirrors the Research methodology. The **First Section** is the Introduction, where the context and relevance of this work and its objectives are presented. The document organization and methodology are also part of it, as well as the description of the expected results of the work.

The **Second Section** covers the non-systematic literature review, performed by desk-research (Kraus et al., 2022; N. Moore, 2018) to build the Theoretical Background. The recent knowledge produced on two main topics - Sustainability in the Construction Industry, and Retail Design – was reviewed through content research in known scientific research reference managers. Regarding Sustainability in the Construction Industry, this review starts from a general approach to the main principles and drivers, passes through the frameworks, explores the concepts and applications of Circular Design in the Retail Industry, and finishes exploring the main concepts and procedures related to the Life Cycle Assessment as a tool to quantify embodied carbon and impacts in construction projects.

The Retail Design practice is reviewed from a historical perspective bringing context to pose the retail designer as the best-placed actor to trigger innovation in the way of sustainability. This sub-section also presents the retail design working and project-delivery context, trying to weave an overview of this professional practice and its challenges in implementing a green design agenda.

The **Third Section** develops the case study from two perspectives: a retrospective of the case, exploring it as it was implemented; and a prospective (or experimental) one, applying circular design strategies to predict future scenarios. The object of study is a Brazilian fast-fashion store, designed under principles of circularity and sustainability, whose architectural design was led by this author as part of a team of architects and engineers in charge of the project.

The **Fourth Section** is dedicated to consolidating the results, findings, and learnings gathered across the research journey, as well as to propose possible future developments to researchers in the same field. The last section, the Fifth, is dedicated to **Annexes** and **Bibliographic References**.

THEORETICAL BACKGROUND

2.1. INTRODUCTION AND BIBLIOMETRIC ANALYSIS

This research is included in the context of sustainable renovations. Inside this broad field of research, the present work explores the recurring nature of retail fit-outs, their environmental impacts, and the opportunities for a greener agenda through the adoption of Circular Design strategies.

This section presents the literature review carried out for this work which is posed in the intersection between the Retail Design (sub-section 2.2.1), Sustainability and Circularity (sub-section 2.2.2), and Environmental Assessment (sub-section 2.2.3). This literature exploration adopted a funnel strategy, starting from a review of the general principles and drivers of each domain to a deeper investigation on specific topics that hold the potential of directly contributing to this research (Alahmadi, 2020).

A bibliometric study was conducted to better address this review from the perspective of the recent scientific production. This study was fed by data generated from the research in Scopus database. Scopus was chosen as the main source of information due to its solid coverage in the subject areas of Engineering (Building and Construction, Architecture) and Environmental Science.

The initial selection of contents had the following premises:

- The search included the following source types: journals, conference papers, and books.
- The data range adopted was 2004-2024, covering production in the last 20 years.
- The term “fit-out” was assumed as the omnipresent and selective term.
- To this term, few others were added by using the Boolean expressions “AND” and “OR” alternately:
 - First attempt: fit-out AND sustainab* OR circular* OR design OR retail OR office.
 - Second attempt: fit-out AND sustainab* AND circular* OR design OR retail OR office.

The term “fit-out” that has a very rare appearance before 2004, has clearly increased its presence in scientific research since the year 2005. This list of contents was manipulated with the assistance of VOSviewer, a free-license software tool for constructing and visualizing bibliometric networks.

As a result, the first attempt presented 144 documents found. The research landscape presented very a disperse result, with no identified protagonism of any researcher. When analyzing the production of these authors by the keywords presented, it is possible to perceive the research context around the term fit-out, with prominent presence of the terms: office building, architectural design, design, sustainable development, and buildings. The results are presented in Fig. 3 and Fig. 4.

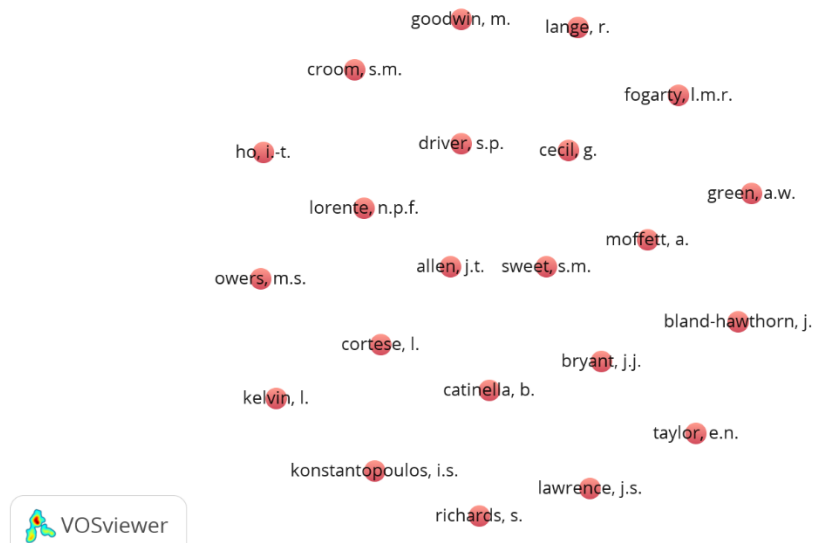


Fig. 3 - Bibliometric study first attempt – filter by authors.
Source: author, from VOSviewer

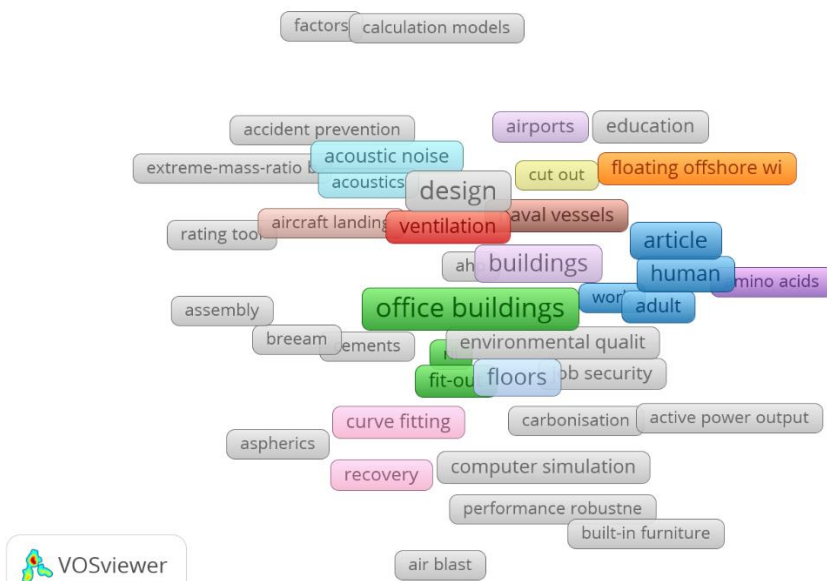


Fig. 4 - Bibliometric study first attempt – filter by keywords presence.
Source: author, from VOSviewer

In a second attempt, the research was restricted by imposing the correlation between the terms “fit-out” and “sustainab*”. The resulted list was shorted (22 occurrences), which suggest the novelty of the sustainable approach to this topic. This led this research to the most contributing titles.

Regarding the terms with more presence as keywords in such research, highlight is due to the following expressions: sustainability, sustainable development, office building, construction, and circular economy. The authors’ and keywords’ map that represents this research landscape are showed below in **Erro! Fonte de referência não encontrada.**Fig. 5 and Fig. 6.

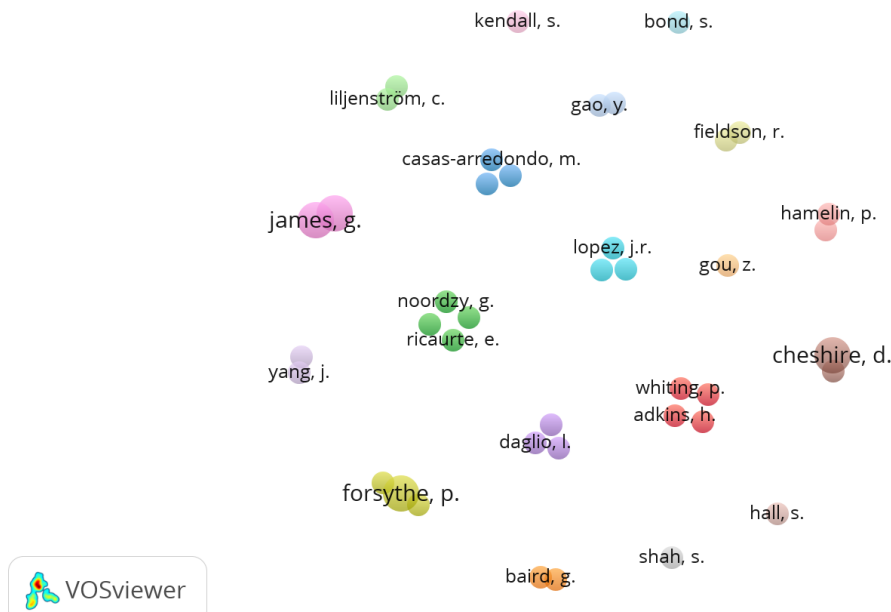


Fig. 5 - Bibliometric study second attempt – filter by authors.
Source: author, from VOSviewer

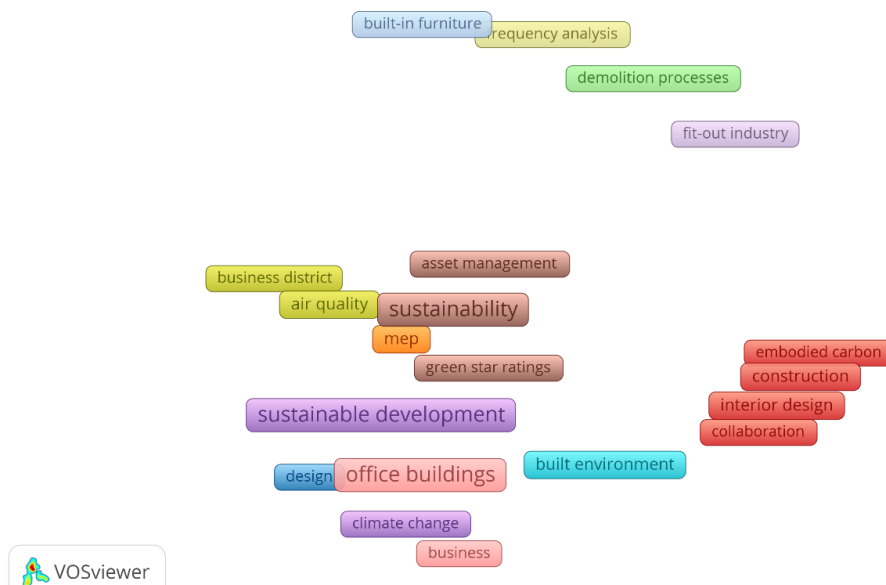


Fig. 6 - Bibliometric study second attempt – filter by keywords presence.
Source: author, from VOSviewer

Beyond the selection and capture performed through the bibliometric study, other articles used in this research were identified by direct search in Scopus, Web of Science, and Google Scholar databases for the following terms, alone and in combination: Retail, Construction, LCA, Fit-out, Sustainability, Circularity, Interior Design, and Refurbishment.

The research questions presented in the introduction are partly addressed here. No studies were found regarding sustainable or circular approaches in retail fit-out projects and few works were found in the inter-relation between fit-out and retail. Hence, the sustainable approach to this kind of project seems to be quite innovative and worthy of exploration.

2.2. THE RETAIL INDUSTRY

This Section begins by offering an overview of the retail industry, highlighting its economic relevance and environmental impact. Secondly, it briefly reviews how retail constructions have evolved in form and positioning over time, leading to the current standards. Subsequently, it introduces Retail Design as a field of knowledge and professional practice capable of translating concepts into built spaces, emphasizing its privileged position as a driver of the green agenda. The discussion then shifts to the importance of environmental visual identity for retail chains, observing that this factor can either support or hinder the implementation of sustainable solutions in retail space projects. Finally, it details the potential scopes of fit-out projects and presents the project management model proposed by RIBA (Royal Institute of British Architects) - RIBA Plan of Work - correlating it with its application in retail projects (RIBA, 2020).

The decision to begin this review with the theme of Retail aims to present the context in which this project is inserted, and what particularities make it unique within the practice of interior design and architecture. Enhancing this design process towards a greener agenda is the main motivation to the realization of this research.

2.2.1. CONTEXT AND RELEVANCE

The Retail and Wholesale industry is one of the economic pillars of the European Union and an essential part of consumers' lives. Approximately 20% of all registered companies in the EU - which amounts to about 5 million enterprises - belong to this sector. This industry is also responsible for the largest job creation compared to any other private sector, representing around 26 million workers, or 13% of the continent's entire workforce (Jesse et al., 2022).

Typically, retail spending accounts for between 30% and 50% of private consumption and generates annual revenues of approximately 7 trillion euros. The largest European retail market is Germany, whose business volume produced in 2019 was around 640 billion euros. Following Germany, the largest revenues were generated in France, the United Kingdom, and Italy, respectively (Statista, 2024).

This important industry is undergoing rapid transformations that threaten existing business models but also provide opportunities for growth and differentiation. Constant changes in consumer demands, e-commerce growth, and pressure for decarbonization of the economy are some of the main pressure factors (Jesse et al., 2022). More recently, other challenges have contributed to the reduction of profitability of operations and, consequently, investments. These include the COVID-19 pandemic, which disrupted supply chains at both the global and local levels and is still seeking to recover. Also the war in Ukraine which, in addition to all social and humanitarian issues, in the European economic context contributes to a sharp rise in energy costs, with a direct effect on inflation levels and consumption patterns. This environment of instability and pressure destabilizes short—and long-term investment

horizons, leading initiatives to lean towards the former, aiming to ensure businesses' solvency (Jesse et al., 2022).

There is, therefore, a certain tension between economic and sustainability priorities, due to the perception that sustainable decisions (with long-term objectives) will generally require the organization to forego immediate profits (with short-term objectives) (Marín-García et al., 2020). In this context, investments in the built environment - and its performance - are highly affected.

This consequence runs counter to a sector that needs to deliver its contribution to the decarbonization of the economy following the objectives agreed upon in the Paris Agreement and accelerated through continental programs such as the European Green Deal (Marín-García et al., 2020). The retail industry contributes approximately 40% of total greenhouse gas emissions (GHG) globally (Jesse et al., 2022), of which 5% come from its direct operations (where buildings and fit-outs are included), and the remaining 95% from upstream and downstream activities in the value chain (such as agriculture, manufacturing, and transportation) (Jesse et al., 2022).

Due to its distinctive role as a link between manufacturers and consumers, the retail industry holds considerable influence in driving the transition to more environmentally and socially sustainable production and consumption, aligning with the goals of the United Nations Sustainable Development Goals (Vadakkapatt et al., 2021). As a result, sustainability currently occupies a prominent position on the priority list of many retailers (Dagilienė et al., 2021).

Despite this evident movement, scientific research on sustainability in the retail sector predominantly focuses on either production of goods or on the barriers and enablers of changes in consumer behaviour, with little emphasis on strategies for integrating sustainability within organizations (Blom et al., 2023). Ideally, retail research should guide all actors in the retail ecosystem toward strategies that are commercially efficient, consumer-effective, and socially beneficial. However, many significant phenomena in retail remain under-researched, including sustainability in retail ecosystems (Bolton, 2019).

2.2.2. RETAIL MODELS EVOLUTION

In the late 18th century, shops were mainly simple places where traders met with their customers to converse or sell. Generally, merchandise was stored at the back of the shop, as owners expected it to be the customer's responsibility to drive the sale. Subsequently, arcades emerged, resembling covered streets made mainly of iron and glass, reminiscent of ancient Byzantine markets and the bazaars of European empires (Fieldson, 2007).

The early 19th century presented the Great Exhibitions, vast thematic exhibitions that marked the first occasion when retailers considered attracting customers with visual spectacles. These exhibitions showcased diverse cultural elements, creating a multisensory experience that foreshadowed the emergence of interaction design in retail (Fieldson, 2007). Later, Department Stores were born as an evolution of the Great Exhibitions, offering permanence and more intense sensory experiences. Opulent environments with chandeliers, silk walls, and golden staircases aimed to captivate customers and stimulate their desires. This strategic design, brimming with products, sought to satisfy customers' intrinsic desires and ensure repeat visits, incorporating elements of interaction design unknowingly (Fieldson, 2007).

The 20th century witnessed the rise of modern retail, with Department Stores flourishing after World War II and the emergence of shopping-centers in America. Technological advances, especially television, transformed advertising, drawing customers to stores from their living rooms. Discount stores

like Target and Walmart, emerged in the 1960s, shifted the focus to affordability and efficiency at the expense of luxury, reshaping the retail landscape (Fieldson, 2007).

In the last two decades, rapid technological advancements have influenced both retail spaces and consumer behaviour (Danielle Castano, 2013). While attracting customers to stores remains a primary goal, retailers now prioritize delivering memorable experiences. The convenience of online shopping skyrocketed with the expansion of the internet, leading physical stores to focus on creating environments rich in sensory appeal (Danielle Castano, 2013).

After this brief overview, Fieldson (2007) presents a synthesis of current physical retail formats, based on the UK market as a recurring picture in much of European Union:

- **City Center or Main Street Stores:**

These operations involve retail chains and independent retailers, with a predominance of the former in large urban centers and a greater presence of the latter in smaller cities. In terms of the built environment, constructions from the early last century predominate, with varying levels of adaptation to current legal requirements and consumer demands.

- **Department Stores:**

Department Stores are a phenomenon of the 19th century that has persisted in popularity, although their methods and, therefore, their designs have evolved greatly since then. In the 20th century, this form of retail evolved to offer better variety and quality of products and a higher-class environment and image.

The same phenomenon can be identified in many other countries, such as France, Spain, Australia, and the United States. And, once consolidated, many of these companies began the expansion process by opening other units within their countries, a fact recorded as early as the early 21st century.

- **Covered Arcade Stores:**

This model also flourished in the 19th century, in the form of streets covered by arcades sheltered from the weather in major cities like Milan, Paris, and London. This model was employed again after World War II when much of the urban fabric of major cities needed to be redesigned and rebuilt.

- **Shopping Centers:**

The evolution of the previous concept of "covered street" emerged in the United States as the concept of the "covered city". These spaces attempt to emulate the urbanity of public spaces by combining commercial operations with entertainment, leisure, and dining options. This model is characterized by the delivery and management of common spaces by the project manager, with the retailer, as the tenant of the commercial space, being responsible for all the characterization and construction of its operation.

- **Suburban Mall:**

As a direct product of Modernist influences on urban development and the growth of the automotive industry, the second half of the 20th century also witnessed the decentralization of cities, to which the retail response came through a model derived from shopping centers, the Suburban Shopping Center. In these locations, operations with large commercial surfaces predominated, such as supermarkets, home goods stores, and family clothing stores. Currently, we see this formula being used by large retailers whose product mix can attract

enough audience to become a destination, as is the case with IKEA and various supermarket chains.

- **Outlets:**

This model gained popularity in the late 20th century, in the 1990s, when retailers began to demand an outlet channel for unsold stocks in commercial seasons. This format typically features a collection of standardized units with strictly regulated facades, shared management, public facilities, and parking. Eventually, these centers may reuse historic buildings. While some retailers maintain dedicated store designs for outlets, completed to the same standard as their main stores, others may have only one outlet in a selected center with a minimalist design. As of the early 21st century, this model has shown strong evidence of saturation, and little to no expansion has been observed.

2.2.3. WHAT IS RETAIL DESIGN

Although it may be considered a subcategory of interior design, the recognition of retail architecture (or design) as an independent field of academic research is relatively recent in the literature (Petermans & Van Cleempoel, 2010). The emergence of retail design as a focus within interior architecture coincides with the socio-cultural, demographic, and technological changes experienced by our society in recent decades. Retail design is a complex and multidisciplinary practice that integrates different disciplines and fields of research, such as psychology and sociology (Petermans & Van Cleempoel, 2010). Additionally, due to its involvement in financial activities, retail design is also considered a field of work in marketing-related disciplines (Ceylan, 2020).

This discipline seeks to address the rigorous demands placed on retail spaces. Since the primary goal of commercial space is to store and sell products to consumers, spaces must be designed to promote a pleasant and frictionless shopping experience for the consumer. However, the complexity involved is growing as the role of retail spaces evolves beyond their transactional activity into places of socialization, entertainment, and learning (Petermans & Kent, 2016). Currently, the relationship between the customer and the brand is composed of emotional and sensitive values more than quantitative characteristics. Retail architecture effectively contributes to building this relationship through the design of physical space. Despite the increasing involvement of online shopping channels, retailers are finding new ways to offer customers something unique or special to encourage the use of physical stores (Sachdeva & Goel, 2015).

Petermans and Van Cloempoel (2010) establish the components of retail design as a combination of aesthetics, functionality, commercial viability, financial aspects, and regulatory considerations. The response to these components, translated into interior architectural design, will ultimately build the retail brand's environmental identity, whose replication and repetition will ensure its uniqueness and distinction in the market.

Although retail companies, in general, still exhibit some passivity and lethargy in adopting sustainable practices, they tend to act quickly in response to market changes (Naidoo & Gasparatos, 2018). This condition suggests a particular approach for retail companies in their transition to more sustainable business models and built environments (Fieldson, 2007). In this context, retail architecture plays a central role as a mediator in the introduction and expansion of the sustainability agenda in projects occupied by this industry.

2.2.4. DECISION-MAKING FACTORS

The theme of sustainability applied to retail and wholesale commercial units has its precedent and justification at the strategic level of the business, materialized in the commitment to Corporate Sustainability (Hahn et al., 2015). Although there is no universal definition for the theme, Hahn et al. (2015) conceptualize Corporate Sustainability as *"a set of economic, environmental, and social concerns, systematically interconnected and interdependent at different levels, which companies are expected to address simultaneously"*. This integrative perspective implies that companies must recognize tensions in corporate sustainability and simultaneously address different aspects of sustainability, even if they appear to be contradictory (Hahn et al., 2015). Sustainability requires the effective integration of social and environmental issues into the vision, values, culture, and operations of the organization (Ahern, 2015).

For retailers, sustainability represents a competitive necessity that goes beyond simply presenting themselves as responsible corporate entities (Dagilienė et al., 2021). First, sustainability helps differentiate the brand from its competitors, increase brand value, retain customers, and attract younger consumers (Dagilienė et al., 2021). Second, retailers face increasing regulatory pressures related to environmental practices and other sustainability-related issues. Compliance with these regulations not only mitigates business risks but also reduces liability, strengthening the sustainability of the supply chain (Dagilienė et al., 2021). Third, sustainability initiatives enable retailers to attract investment capital by meeting the criteria of institutional investors with specific environmental, social, and governance (ESG) requirements (Dagilienė et al., 2021).

Moreover, adopting sustainability helps companies improve profit margins by reducing fixed and variable costs through waste reduction, energy conservation, decreased packaging and transportation expenses, inventory and storage cost reduction, employee turnover reduction, and mitigation of health costs (Dagilienė et al., 2021). Among retailers, 51% cite cost savings as their primary motivation for adopting sustainability goals (Dagilienė et al., 2021).

Such depth and strategic cross-cutting tend to foster paradoxes and contradictions in the face of the expectations and demands of different stakeholders, who, in turn, tend to apply different decision-making logic (Dagilienė et al., 2021). Fieldson (2007) pointed out the main theories documented in the literature that focus on decision-making processes of retailers when considering the opening of a new store unit. From this list, this research focuses only on those that hold strong correlation with the retail design practice and affect considerably the sustainability performance of the project:

- **Urban Morphology Theory** (Fieldson, 2007):

According to this theory, location is the primary decision factor for a retailer. When seeking to develop a store in existing facilities in a mall or busy street, retailers dedicate significant effort to selecting the right property.

Such condition explains the reason why the building conditions is a secondary decision factor in many cases, which often lead to huge retrofit of buildings that are outdated or not prepared to support the retail operations. As a result, increasing in construction demolition waste generation and consumption of raw materials.

- **Financial Theory** (Fieldson, 2007):

Financial Theory investigates location attributes, geometry, and building operating conditions from the perspective of acquisition, adaptation, recovery, and/or operating costs.

In this context, the effect of sustainable decisions in the design phase can affect strongly the construction and operation costs.

- **Aesthetic Theory** (Fieldson, 2007):

The aesthetics and design of a store are associated with the product mix and the intended sales volume, as well as customer segmentation. Interior design tends to focus on two main descriptors: appearance and atmosphere. The store's appearance describes which cultural or stylistic references are being employed, while the atmosphere describes the quality and image that the concept intends to convey.

Considering that sustainability is an issue in the shopper's agenda, the adoption of an aesthetic of sustainability can contribute to the brand's image.

- **Environmental Theory** (Fieldson, 2007):

The environmental factor usually does not have a significant influence on decision-making in retail unless legislation or action groups intervene on its behalf. Although these factors ideally serve the interests of all, they often conflict with short-term economic concerns, such as ensuring a consistent supply of goods and managing capital and operational costs per square meter.

All these factors operate simultaneously and asymmetrically throughout the decision-making process regarding the implementation of a retail unit.

2.2.5. RETAIL ENVIRONMENTAL IDENTITY

Brand recognition is considered the first step in building brand equity (Aaker, 1992) due to its evocation of the brand's strength and presence in the consumer's mind. The brand image is the result of the sum of associations, stimulus, beliefs, attitudes, positions, and experiences generated by the interaction between the brand and the public (Petermans & Kent, 2016). The corporate identity of a brand encompasses the coordinated set of initiatives to build its singularity. Through it, the brand's vision, values, purpose, the essence of its value proposition, and reason for existence are expressed. Corporate identity is the material manifestation of corporate culture and is evidenced through physical and visual representations (graphics, symbols, colours, logos, finishes, coatings, lighting, buildings) and sensory (sounds, scents) (Petermans & Kent, 2016),

In the context of the retail industry, it is mainly in the store environment that this corporate identity translates into experience. For many retailers, the competitive advantage in the market is based on the development of strong store and corporate images while seeking to establish themselves as brands (Petermans & Kent, 2016). For those operating physical channels, the store atmosphere is a powerful activator of perceived quality. Thus, retailers continuously invest resources in the development and updating of their store models, facing commercial, corporate, and operational pressures. Therefore, retail companies need to fully understand the importance of image in competitive positioning and the components of store image before attempting to replicate that image and position abroad (Burt & Carralero-Encinas, 2000).

Simultaneously, retail companies compete for market shares with their competitors, which translates into a permanent search for presence and territorial occupation. From the combination of these pressures (permanent evolution of the model and accelerated capillarity), emerges a model of expansion and its respective typologies:

- **Flagship Units or Concept Stores:**

The term "flagship" was borrowed from naval vocabulary due to the tactical relevance that such ships carried compared to others in a fleet. Typically, this vessel used to be the largest, best-equipped, and, so to speak, the most important (C. Moore et al., 2010). This figure is very well suited for the representation of so-called Concept Stores. Retail chains distribute their store network according to the potential and tactical/strategic role of each consumer market. Concept Units (or Flagships) are usually implemented in the most representative markets and feature the best and latest architectural, display, and product solutions, seeking visibility for the Brand and the maximization of positive associations and consumer engagement (C. Moore et al., 2010).

Due to their pioneering nature, such units also serve as test pilots for new architectural and operational concepts that either still need to be validated by the market before being replicated or still have some scalability restrictions.

Fig. 7 to 9 present some examples of globally recognized flagship stores.



Fig. 7 – Apple New York City (NYC) 5th Ave. façade and interiors
Source: Fakharany (2024)

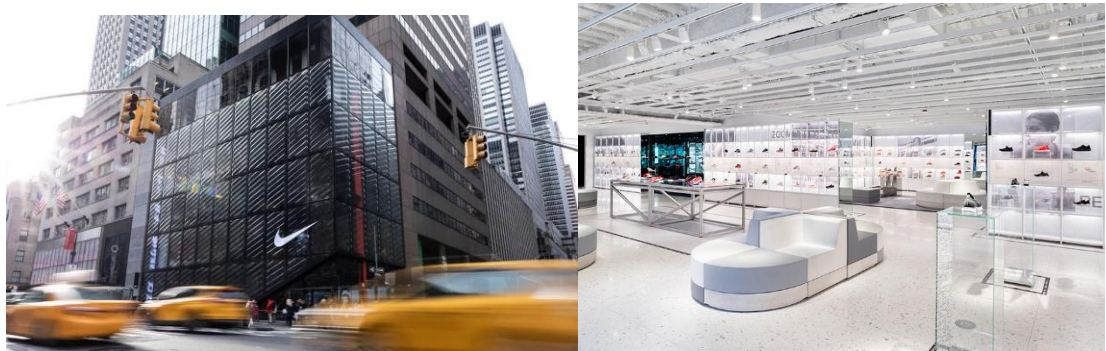


Fig. 8 - Nike NYC 5th Ave. façade and interiors
Source: Allen (2019)



Fig. 9 - Primark Madrid façade and interiors
Source: Retail Design Blog (2015)

- **Standard Units:**

While Concept Units work as broadcasters of the brand's value proposition and, therefore, are less limited in cost and budget, Standard Units will face the challenge of territorial occupation in volume and speed, both in the domestic and international markets (Fieldson, 2007). This network expansion process, commonly called roll-out, relies on standardization concepts to ensure replicability and identity with speed and optimization of investments (Casas-Arredondo et al., 2018). Fig. 10 to 12 present examples Standard units of the same retailers presented before.

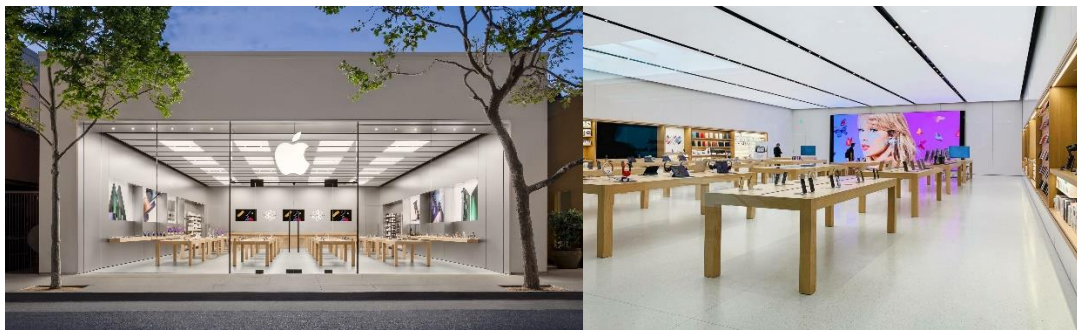


Fig. 10 - Apple Berkeley façade and interiors
Source: Apple (2024)



Fig. 11 - Nike Porto Alegre façade and interiors
Source: Mercado e Consumo (2022)

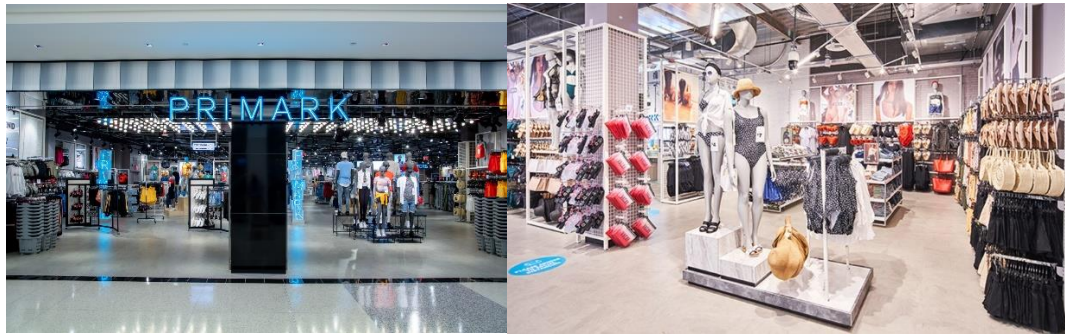


Fig. 12 - Primark Brooklyn façade and interiors
Source: Retail Design Blog (2015)

From the examples presented above, three inferences with a strong correlation to the sustainability of the built environment can be made:

- First, the design line adopted to create the unique atmosphere of each store, expressed in architectural and material solutions, can contribute to or hinder the achievement of environmental objectives, if these are not connected within the scope of the business.
- Second, the greatest opportunities for incorporating and expanding sustainability and circularity approaches reside in the context of designing Concept Stores since this project's successes and mistakes will be widely replicated in standard units throughout the network expansion process.
- Third, this "exportation" of a store model tends to stress supply chains and disregard the benefits of production and extraction of local resources together with project sites, a fact that is known to contribute to the increasing of the environmental footprint.

2.2.6. RETAIL CHAINS - EXPANSION MODELS

The implementation and expansion of retail units can have a speculative nature or be driven by the retailer's need for more distribution. In the first case, developers of various sizes, based on their knowledge of the value of certain locations (areas, land, buildings), identify the commercial potential of site or building, and invest in making them available as retail spaces (Fieldson, 2007). This type of project usually involves three stakeholders:

- **The Developer** (Fieldson, 2007):

Developers conceive products and invest in the construction and/or renovation of buildings, aiming to operate this future asset through lease contracts. Developers typically handle tasks such as site selection, project execution (with in-house or outsourced teams), approvals, construction planning, and construction process management. This model applies from constructing a building for a single user (retail company) to a complex with numerous commercial and mixed-use operations.

- **The Contractor** (Fieldson, 2007):

The contractor or construction company specialized in such construction is responsible for the construction process. Positioned in the value chain, they aim to carry out construction at the lowest possible cost to maximize profit.

- **Tenant** (Fieldson, 2007):

The tenant—in this case, the retail company— that receives the property under various occupancy conditions: in some cases, newly constructed buildings with the shell perfectly defined and prepared for fit-out reception; in others, buildings recently vacated by the previous tenant and still with the physical structure and equipment legacies; and in many cases, variations of the situations mentioned above.

The retailer adapts and characterizes the space according to its construction and environmental requirements and may receive some allowance (manifested in forgoing the rental amount) from the landlord as a means of solidarity in the investments for property adaptation.

In the second case, where demand is driven by the retail company, two expansion models are identified:

- **Owner-Occupier** (Fieldson, 2007):

The retailer constructs the building for its own occupation and commercial exploitation. Given the constant liquidity requirements of retailers, this model is less common due to its need for high investment in capital assets. However, this model is still prevalent in operations requiring large commercial areas. Hypermarkets and large speciality stores, such as furniture and decoration stores, are examples. Often, these operations become anchors of the development and use this consumer attraction force to offer leased commercial spaces to small retailers.

- **Tenant Fit-out** (Fieldson, 2007):

Tenant retailers usually have little control over the building envelope and are often limited by the owners' conditions. Legal permissions are generally not required as projects mostly concern interior architecture. However, permission is usually required for any external changes to store facades and signage.

Understanding these relationships and recognizing stakeholder motivations is crucial to making the adoption of impactful sustainable strategies more feasible, which depend on specific construction conditions. Depending on the implementation model adopted, the conditions for the adoption of circular design strategies by the retail designer will be better or worse. This research focuses on the Tenant Fit-out model (Fieldson, 2007), which in turn represents most retail occupancy occurrences.

2.2.7. RETAIL FIT-OUT

There are several terms currently used to describe the activity of modifying a building or space (Casas-Arredondo, 2021). Many of these terms often being used interchangeably and becoming indistinguishable (Mansfield, 2009). Renovation or refurbishment encompasses any building works that alter a building or space, with the aims of increasing its economic value or social desirability, updating it to current standards, improving its performance, or adapting it for a different use (Casas-Arredondo, 2021). Building fit-outs and retrofits are specific types of renovation or refurbishment. A fit-out refers to a refurbishment focused primarily on the interior of a building (infill), whereas a retrofit involves renovations that enhance the thermal, hygric, acoustic, or energy performance of the building (Casas-Arredondo, 2021).

In a more comprehensive definition, building fit-out refers to the process of removing and installing predominantly interior building components and materials. These elements may include partitions, doors, flooring, ceilings, finishes, fittings, furniture, equipment, and mechanical, electrical, and plumbing (MEP) services (Casas-Arredondo, 2021).

Buildings can be analyzed in different layers, each with distinct functions and replacement rates. Brand (1994) proposes six distinct layers: Site (geographical setting), Structure (load-bearing elements), Skin (building envelope), Services (wiring, plumbing, HVAC), Space Plan (walls, partitions, ceiling, floor), and Stuff (furniture and equipment). Fig. 13 presents the Brand's shearing layers' model with expected service-life of each.

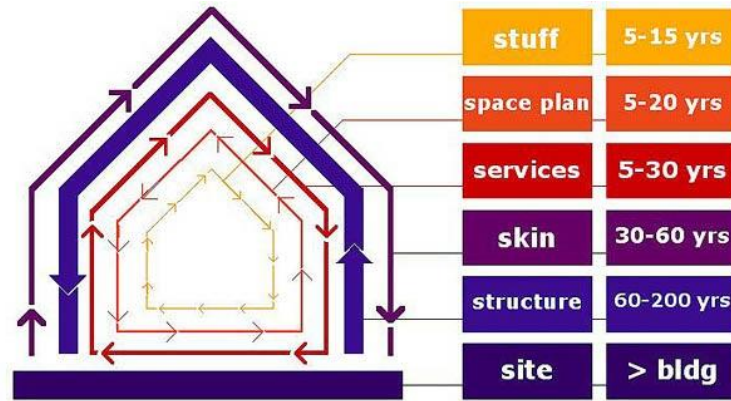


Fig. 13 - Shearing layers of a building.
Source: Brand (1994)

Fit-outs are executed more frequently in non-residential buildings, which comprise 28% of the total floor area in the European Union building stock (Building Performance Institute Europe et al., 2011). Non-residential buildings are categorized as follows: retail (7%), offices (6%), education (4%), industrial and sport facilities (4%), hotels and restaurants (3%), and healthcare (2%) (Building Performance Institute Europe et al., 2011).

Building fit-outs can be split into three stages:

- **Core and Shell** (O'leary, 2014):

In buildings intended for commercial use, especially offices, it refers to the main physical elements of the development, which are permanent. In addition to the construction itself, it includes electrical, plumbing, mechanical, and protection systems in the case of offices.

In the case of retail spaces, only the building envelope is offered. This is the initial recurring stage for any new adaptation process. Even in the case of a non-primary occupation, it is common to recover the Core and Shell state before starting a new occupation (Fit-out Category A + Category B).

- **Fit-out Category A** (O'leary, 2014; RICS, 2023):

A Category A (Cat A) fit-out refers to the basic finishing of an interior space, including the installation of a building's mechanical and electrical services. A Cat A project typically encompasses finished internal walls, reception areas, and lift lobbies. It features raised metal flooring, painted perimeter walls, and a grid ceiling with fitted lights. Cat A spaces are often described as a "blank canvas," as they are prepared to be further developed into Category B (Cat B) spaces.

A fit-out Cat A usually includes Lighting, Air Conditioning, Grid ceilings, Toilets, Raise flooring (in the case of offices), and basic fire detection systems. In the case of retail space, fit-out Cat A is very rare.

- **Fit-out Category B** (O’leary, 2014; RICS, 2023):

A Category B (Cat B) fit-out refers to a fully operational workplace tailored to a client's specific requirements. This type of fit-out includes everything from constructing various rooms to selecting decoration. Typically, Cat B fit-outs are undertaken by a company before moving into a new office or retail space.

The Fig. 14 **Erro! Fonte de referência não encontrada.** presents a schematic vision of the common elements covered in a retail fit-out Cat B.

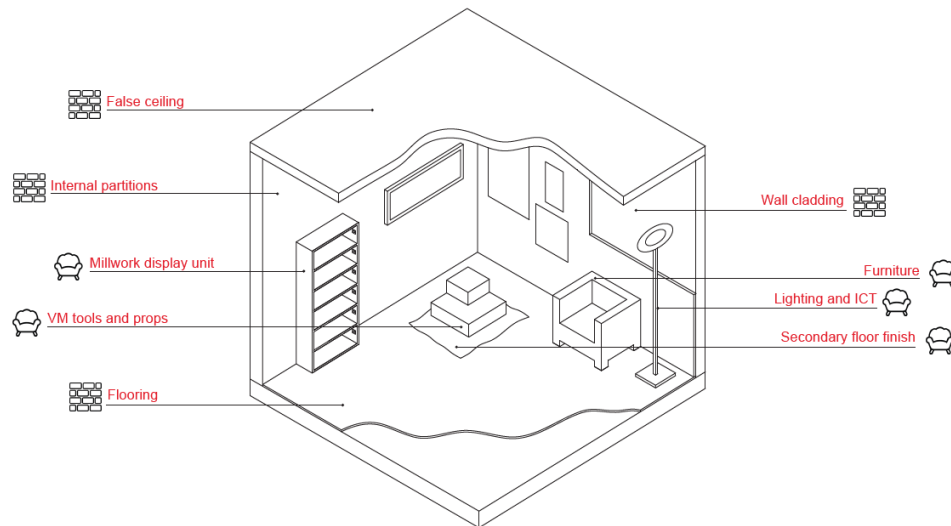


Fig. 14 - Common elements of retail fit-out Cat B.
Source: Ayalp & Santoro (2022)

Typically, a Cat B retail fit-out encompasses façades, internal structures (usually metallic), partitions and doors, special flooring and ceiling finishes, lighting and facilities, fixtures and furniture, and branded materials and décor.

2.2.8. PROJECT DEVELOPMENT IN RETAIL DESIGN PRACTICE

Retail Design as a profession is a quite recent fact. Over time, the design practice has evolved, following changes in society. Most retail designers start from a background in architecture, interior design, or fine arts, and then a common route is a complementary qualification in retail design and closely related disciplines (Petermans & Kent, 2016). However, including sustainability goals in retail fit-outs requires a technical approach with the necessary knowledge in building construction and physics, which determines the prevalence of architects and engineers in the best position to conduct such challenges (Petermans & Kent, 2016).

As a construction process, all retail fit-outs follow a design process. There are several design process maps, or plans of work, used throughout the world to guide clients through briefing, design and construction, handover, and beyond. In most countries, the process maps are set by professional institutes or by sector bodies (RIBA, 2020).

For this work, in the absence of a specific framework for retail fit-out project, the RIBA Plan of Work (RPOW) 2020 (RIBA, 2020) is assumed as the reference for the following developments. The RPOW

organises the process of briefing, designing, delivering, maintaining, operating and using a building into eight stages. It is a framework for all disciplines on construction projects and should be used solely as guidance for the preparation of detailed professional services and building contracts (RIBA, 2020).

A general structure of the RPoW is presented in Fig. 15 **Erro! Fonte de referência não encontrada.** and a brief detailing of each stage is provided next. Opportunely, some particularities of retail design practice are highlighted, bringing context to the future analysis.

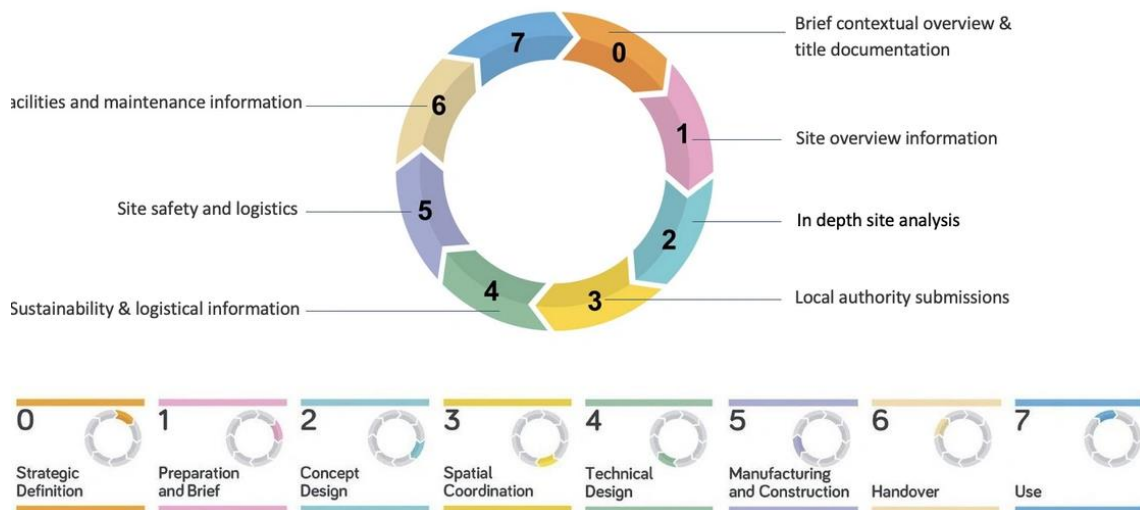


Fig. 15 - RIBA Plan of Work stages
Source: RIBA (2020)

RIBA Plan of Work 2020 (RIBA, 2020):

- **STAGE 0 - Strategic Definition:**

The primary goal of Stage 0 is strategic – to ratify that a construction project, or otherwise, is the best means of achieving the Client Requirements. It is a step conducted by the client team, still without the presence of the design team (RIBA, 2020).

The following tasks are usually performed (RIBA, 2020):

- Prepare Client Requirements.
- Develop Business Case with review of Project Risks and Budget and the ratify option that best delivers Client Requirements.
- Review Feedback from previous projects.
- Undertake Site Appraisals

In the context of retail fit-outs, this is the stage in which the role of the physical retail space is considered as a tool to facilitate the achievement of the business goals, confirming its very strategic nature.

- **STAGE 1 – Preparation and Briefing:**

This stage is about developing the information that the design team will need to commence the design process, the Project Brief. It is a step conducted by the client team, still without the presence of the design team (RIBA, 2020).

The following tasks are usually performed (RIBA, 2020):

- Prepare Project Brief including Project Outcomes and Sustainability Outcomes, Quality Aspirations and Spatial Requirements.
- Undertake Feasibility Studies.
- Agree Project Budget
- Source Site Information including Site Surveys.
- Prepare Project Programme.
- Prepare Project Execution Plan

Different from that recommended by RIBA, usually in retail fit-outs the design team (in-house team or external consultancy) is invited to contribute to shaping the project brief. This happens because construction processes are not core activities in retail business, and often is the retail designer who bring insights that amplify the possibilities and ambitions of projects.

- **STAGE 2 – Concept Design:**

Stage 2 sets the Architectural Concept for a project. Proposals that align with the Site Information and the Project Brief, including the Spatial Requirements, are prepared (RIBA, 2020).

The following tasks are usually performed (RIBA, 2020):

- Prepare Architectural Concept incorporating Strategic Engineering requirements and aligned to Cost Plan, Project Strategies and Outline Specification.
- Agree Project Brief Derogations.
- Undertake Design Reviews with client and Project Stakeholders.
- Prepare stage Design Programme.

This stage holds the biggest opportunities for the implantation of a greener agenda in retail fit-outs. During the Concept Design, the project strategies are discussed, and an Integrated Project Delivery (IPD) approach can enhance the design conception. Additionally, adopting early estimation tools for environmental impact at this stage can bring visibility to the effectiveness of the solution by bringing a quantitative dimension (in environmental impact and/or cost) and improving the decision-making process. However, this is not a recurring practice.

- **STAGE 3 – Spatial Coordination:**

Stage 3 is fundamentally about testing and validating the Architectural Concept, to make sure that the architectural and engineering information prepared at Stage 2 is Spatially Coordinated before the detailed information required to manufacture and construct the building is produced at Stage 4 (RIBA, 2020).

The following tasks are usually performed (RIBA, 2020):

- Undertake Design Studies, Engineering Analysis and Cost Exercises to test Architectural Concept resulting in Spatially Coordinated design aligned to updated Cost Plan, Project Strategies and Outline Specification.
- Initiate Change Control Procedures.

As an evolution of the previous stage, in retail fit-outs, this step is invested on checking the viability of design strategies with the contribution of technical specialists. There is a growing recurrence of the application of Environmental Assessment tools (early estimations) at this stage to assist the choosing of design options.

- **STAGE 4 – Technical Design:**

Stage 4 involves the preparation of all information required to manufacture and construct a building (RIBA, 2020).

The following tasks are usually performed (RIBA, 2020):

- Develop architectural and engineering technical design.
- Prepare and coordinate design team Building Systems information.
- Prepare and integrate specialist subcontractor Building Systems information.
- Prepare stage Design Programme.

At this stage, considering the technical project is completed, detailed, and ready for procurement and construction, this is the ideal moment to perform a complete Environmental Assessment, due to the quantitative nature of this kind of work. However, this condition presents some contradiction, because, on the one hand, the best data can be produced; on the other hand, such information feeds the design process when usually there is no more time or budget to implement changes.

- **STAGE 5 – Manufacturing and Construction:**

Stage 5 comprises the manufacturing and construction of the Building Systems in accordance with the Construction Programme agreed in the Building Contract (RIBA, 2020).

The following tasks are usually performed (RIBA, 2020):

- Finalise Site Logistics.
- Manufacture Building Systems and construct building.
- Monitor progress against Construction Programme.
- Inspect Construction Quality and resolve Site Queries.
- Undertake Commissioning of building.
- Prepare Building Manual.

- **STAGE 6 – Handover:**

Stage 6 starts with the building being handed over to the client, with Aftercare initiated and the Building Contract concluded (RIBA, 2020).

The following tasks are usually performed (RIBA, 2020):

- Handover building in line with Plan for Use Strategy.
- Undertake review of Project Performance.
- Undertake seasonal Commissioning.
- Rectify defects.
- Complete initial Aftercare tasks including light touch Post Occupancy Evaluation.

- **STAGE 7 – Use:**

At this stage, the building is operated by the client, and the design and construction teams are probably out of the project. At the end of a building's life, Stage 0 commences again. In line with circular economy principles, a refurbishment might prolong the life of the building or facilitate a new use (RIBA, 2020).

The following tasks are usually performed (RIBA, 2020):

- Implement Facilities Management and Asset Management.
- Undertake Post Occupancy Evaluation of building performance in use.
- Verify Project Outcomes including Sustainability Outcomes.

The presentation and adoption of the RIBA Plan of Work in the context of this research will serve the purpose of positioning design initiatives and decisions that influence sustainability and circularity objectives in the design stages defined by this framework. By doing so, it is expected to contribute with a possible reference for future developments (academic or professional) that have the realization of a

green retail design project as a relevant part. The term “green retail” is adopted to represent those retail design initiatives that carry specific objectives on sustainability and/or circularity.

2.2.9. SUBSECTION SUMMARY

This subsection presented an overview of the retail industry and retail design practices. It delves into the retail industry, emphasizing its economic significance and environmental impact. Also, tracing the evolution of retail construction and highlighting the role of Retail Design in promoting sustainability.

The industry faces significant challenges, including evolving consumer demands, e-commerce growth, and pressures for economic decarbonization. Despite these challenges, sustainability remains a key topic due to the retail sector's substantial greenhouse gas emissions. Sustainability in retail is influenced by corporate sustainability commitments, balancing economic, environmental, and social concerns. Sustainability enhances brand differentiation, regulatory compliance, and cost savings, attracting both consumers and investors. However, implementing sustainable practices often involves navigating tensions between short-term profitability and long-term goals.

Retail design has emerged as a distinct field within interior architecture, shaped by societal and technological changes. It integrates various disciplines to create spaces that enhance consumer experiences, going beyond mere transactions to provide social and sensory engagement. The evolution of retail spaces from simple shops to complex environments like department stores and shopping centers reflects this shift. Designers face the challenge of creating appealing retail environments while demonstrating environmental responsibility. This tension presents an opportunity for embracing Circular Economy (CE) principles and to redesign processes to be more sustainable. However, as presented by Münster et al. (2022), Cultural, Market, Regulatory, and Technological barriers hinder the adoption of CE principles.

Decision-making in retail design considers factors such as location (Urban Morphology Theory), financial implications (Financial Theory), aesthetics (Aesthetic Theory), and environmental impact (Environmental Theory). On the other hand, brand recognition and corporate identity are crucial in the retail industry, particularly through the physical store environment, because the way a store is designed influences perceived quality and competitive positioning. The design of concept stores presents opportunities for incorporating sustainability and circularity. Successful concepts can be replicated across standard units, promoting sustainable practices throughout the store network.

Retail deployment involves many actors and stakeholders – developers, architects, contractors, and tenants. Retailer-led demand often leads to a fit-out occupancy strategy. In a retail fit-out, the tenant (the retailer) is responsible for adapting the space – mainly interiors – to its specific needs. This can happen at many levels, depending on the building's delivery conditions and the level of customization required by the tenant.

Finally, this subsection also discusses the retail design process under the RIBA Plan of Work's (RPoW) framework. Adopting the RPoW helps position design initiatives and decisions that influence sustainability and circularity objectives within the defined stages. This integration contributes to the realization of green retail design projects. The next section provides an overview of sustainable and circular initiatives in the built environment of the retail industry.

2.3. SUSTAINABILITY IN THE CONSTRUCTION INDUSTRY

This section presents the theme of sustainability in the construction industry as a main topic for the discussion proposed in this work, which focuses on the adoption of sustainable practices in retail fit-out projects. It begins with a brief overview of the essential principles and pillars of sustainable development and how these have been interpreted and implemented by the construction industry. Subsequently, the potential contribution of Circular Economy approaches, particularly Circular Design strategies, is explored as accelerators for adopting the green agenda in corporations. Following this, several globally recognized retail projects that have presented advances in implementing the green agenda through Circular Design solutions are analysed. Finally, to complement this "snapshot" of the maturity and penetration of sustainability in the retail-built environment, a detailed analysis of the Corporate Sustainability Reports (CSR) of some of the largest European retailers is conducted. A CSR is an annual report that shows a company's operations, commitments and initiatives towards sustainability in the preceding 12 months.

2.3.1. ISSUES AND DRIVERS

Researchers have clearly articulated the urgent global climate challenge: a minimum 50% reduction in global carbon emissions by 2030 is imperative to mitigate the most severe effects of global warming (USGBC, 2024). As climate change becomes more obvious on a global scale, it's prompting that both governments and corporations commit to reducing emissions.

The Construction Industry is a pillar of any economy but its impact on the environment is undeniable. Buildings and infrastructure collectively contribute to about 40% of global carbon emissions annually (World Economic Forum, 2023). A significant portion of these emissions occurs even before a structure is put into operation. The manufacturing of building materials is responsible for roughly 15-20% of building emissions and a substantial 50-60% of infrastructure emissions (World Economic Forum, 2023). Globally, the construction industry consumes 40% of total energy production, 12-16% of all water available, 32% of non-renewable and renewable resources, 25% of all timber, 40% of all raw materials, produces 30-40% of all solid wastes, and emits 35-40% of CO₂ (Berardi, 2013).

The adoption of sustainable building practices is viewed as a pathway for the construction sector to progress towards achieving sustainable development by addressing environmental, social, and economic considerations. Akadiri et al. (2012) mapped out the sustainable building issues in each of the sustainability pillars, as presented in the Tab. 1:

Tab. 1 - Sustainable building issues.
Source: Akadiri et al. (2012)

Title	Key Theme	Principal Issues
Economic sustainability	1.0 Maintenance of high and stable levels of local economic growth and employment	Improved productivity; Consistent profit growth; Employee satisfaction; Supplier satisfaction; Client satisfaction
	1.1 Improved project delivery	Minimizing defects; Shorter and more predictable completion time; Lower cost projects with increased cost predictability; Delivering services that provide best value to clients
	1.2 Increased profitability & productivity	and focus on developing client business
Environmental sustainability	2.0 Effective protection of the environment	Minimizing polluting emissions; Preventing nuisance from noise and dust by good site and depot management; Waste minimization and elimination; Preventing pollution incidents and breaches of environmental requirements; Habitat creation and environmental improvement;
	2.1 Avoiding pollution	Protection of sensitive ecosystems through good construction practices and supervision; Green transport plan for sites and business activities
	2.2 Protecting and enhancing biodiversity	
	2.3 Transport planning	
	3.0 Prudent use of natural resources	Energy efficient at depots and sites; Reduced energy consumption in business activities; Design for whole-life costs; Use of local supplies and materials with low embodied energy; Lean design and construction avoiding waste; Use of recycled/sustainability sourced products
	3.1 Improved energy efficiency	Water and Waste minimization and management
Social sustainability	3.2 Efficient use of resources	
	4.0 Social progress which recognizes the needs of everyone	Provision of effective training and appraisals; Equitable terms and conditions; Provision of equal opportunities; Health, safety and conducive working environment;
	4.1 Respect for staff	Maintaining morale and employee satisfaction;
	4.2 Working with local communities and road users	Participation in decision-making; Minimizing local nuisance and disruption; Minimizing traffic disruptions and delays; Building effective channels of communication; Contributing to the local economy through local employment and procurement; Delivering services that enhance the local environment; Building long-term relationships with clients; Building long-term relationships with local suppliers; Corporate citizenship; Delivering services that provide best value to clients and focus on developing client business
	4.3 Partnership working	

In the **Economic pillar**, the authors highlight the importance of the integrated project, construction and quality management as instruments for preserving financial results for stakeholders. Being this an essential input for preserving jobs and economic growth. In the **Environmental pillar**, the authors advocate for an extended look at the entire life cycle of materials (and their costs) from the extraction of resources to their disposal in the life cycle. Finally, in the **Social pillar**, Akadiri et al. (2012) call for the guarantee of decent working conditions and opportunities creation for all those involved in the construction processes.

Sustainable solutions in the construction industry offer several benefits, including prevention of warming and climate change, minimizing GHG emissions, sparing of resources, and promotion of health and well-being (Darko et al., 2017). In the context of the construction industry, many drivers play to promote such practices, but they tend to be very dissimilar according to place, stakeholders, and decision-making context. Besides fulfilling regulatory obligations and enticing incentive offerings, numerous stakeholders and organizations actively pursue Green Building (GB) practices for various reasons (Darko et al., 2017). These include conserving energy, enhancing their corporate culture and

image, boosting market appeal, meeting customer expectations, and reducing operational and maintenance expenditures (Darko et al., 2017).

Darko et al. (2017) performed an extensive review of the existing knowledge and driving forces behind the adoption of GB, as shown in Fig. 16:

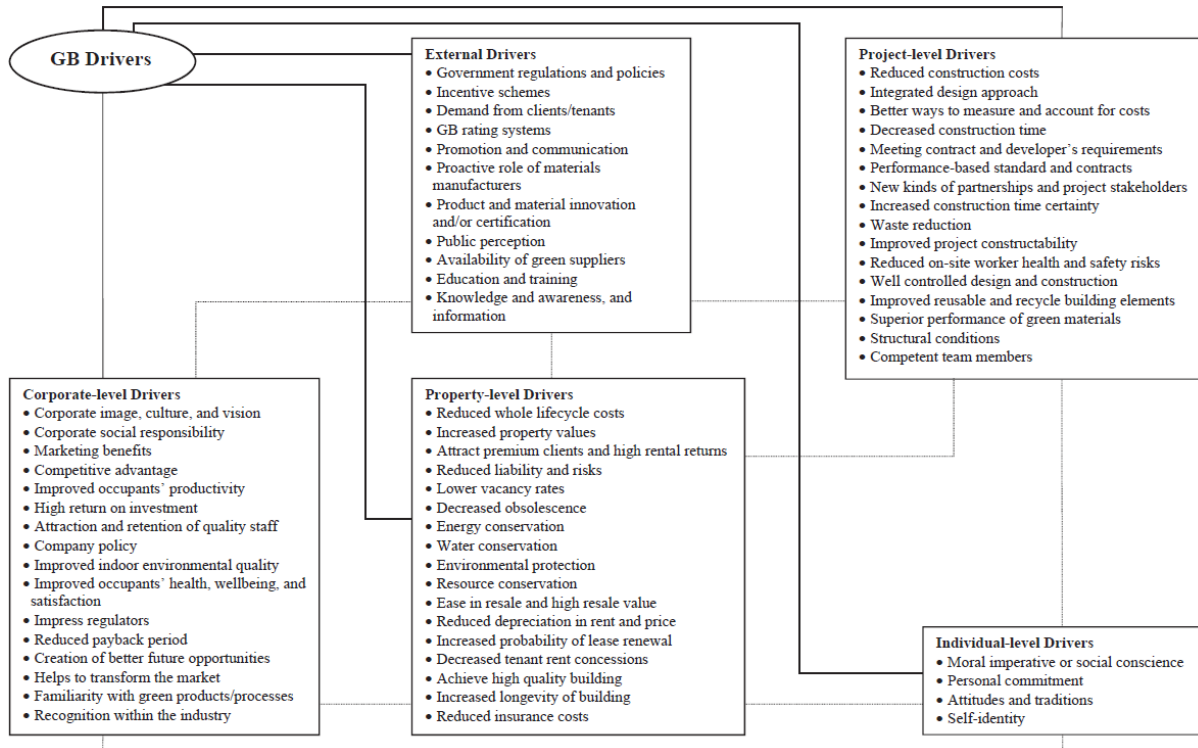


Fig. 16 - Conceptual framework for GB drivers.

Source: Darko et al. (2017)

After analysing published papers, the authors found five main categories in which these drivers can be classified:

- **External drivers** (Darko et al., 2017):

External drivers are essentially influences originating from external sources, including governmental bodies, international organizations like the United Nations and the European Union, trade unions, and clients/customers, which prompt companies or organizations to prioritize green initiatives. In essence, external drivers encompass occurrences beyond the control of the company developing green initiatives.

This type of requirement, top-down drivers, is growing and is expected to continue to increase in the future.

- **Corporate-level drivers** (Darko et al., 2017):

Refers to those internal drivers that move the business into sustainability. This research pointed out that corporate image, culture, and vision are some of the biggest drivers of green corporate practices. The contemporary business landscape, marked by fierce competition and intricate dynamics, has reshaped the operational strategies of companies. In today's highly technologically advanced era, incidents of misconduct and irresponsible

behaviour can easily proliferate, posing significant challenges for companies regarding their reputation. Consequently, cultivating a positive image and solid reputation has become indispensable for organizations striving to thrive within their respective industries.

- **Property-level drivers** (Darko et al., 2017):

According to the findings of this study, property-level drivers include increasing property value, rental income, and reduction of risks. Studies have shown that the operation and maintenance costs of buildings can be reduced by adopting sustainable design and building solutions.

Moreover, the market value of a property is intricately tied to its occupancy and rental rates. Consequently, the notable effects of sustainability issues on rents, occupancy rates, and operational costs directly influence property values.

- **Project-level drivers** (Darko et al., 2017):

Decisions made at the project level carry substantial weight in determining the overall or final cost of a building. It is imperative to make the right design decisions to ensure that costs remain within acceptable limits.

Bond, (2010) showed that the optimal outcomes are achieved through employing an integrated approach, wherein all stakeholders participate during the initial design phase, fostering collaborative innovation within the design team to develop solutions together.

In a study conducted in the Chinese construction industry context, Zhai et al., (2014) ranked the top drivers playing at the project level: reduced construction waste, decreased construction time, reduced materials waste, increased construction time certainty, reduced labour demand and construction cost, improved project constructability, ensure project cost certainty, reduced on-site worker health and safety risks, and achieve high building quality.

- **Individual-level drivers** (Darko et al., 2017):

Intrinsic motivations are inherently self-driven, independent of external influence, voluntary, and adaptable, enabling individuals to act according to their own values. At the individual level, intrinsic drivers play a significant role, representing the internal forces compelling people to embrace sustainability objectives or adopt green building practices in their own endeavours.

The authors found 04 main individual drivers: moral imperative or social conscience, personal commitment, attitudes and traditions, and self-identity.

The issues and drivers presented above weave the background acting in every sustainable construction or renovation process. The awareness of their simultaneous occurrence offers the justification for a systemic approach, where all the parts iterate each other.

2.3.2. IMPLEMENTATION FRAMEWORK

Several approaches are proposed to control and enhance the current state of building activity, reducing its environmental impact without diminishing its overall utility. To gain a competitive edge through environmental-friendly construction practices, it's imperative to consider the entire life cycle of buildings as the framework within which these practices are implemented.

A framework like the one presented in Fig. 17, proposed by Akadiri et al. (2012), holds significant promise for accelerating the application of sustainability in building construction. Offering a concise overview of sustainability objectives and strategies, it underscores the importance of adopting an integrated and comprehensive approach to incorporate sustainability into building projects. It delineates and elucidates the basic factors to consider in the various stages of building projects, including design, construction, operation, refurbishment, and deconstruction.

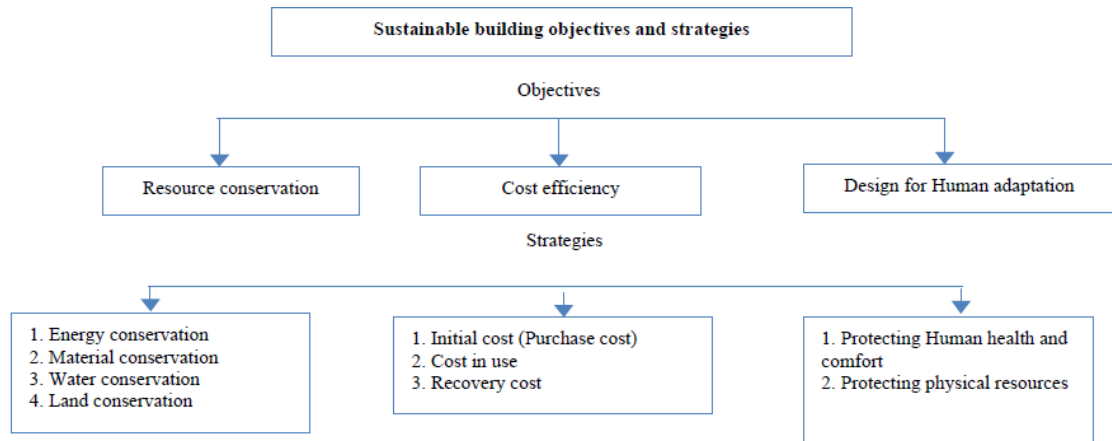


Fig. 17 - Framework for implementing sustainability in the building sector.

Source: Akadiri et al. (2012)

Bearing in mind the principles of sustainable issues (socio, environmental, and economic), the authors stated three main objectives: **resource conservation, cost efficiency, and design for human adaptation.**

- **Resource conservation** (Akadiri et al., 2012):

Resource management involves overseeing the human utilization of natural resources to optimize benefits for present generations while ensuring the ability to meet the needs of future ones. The push for resource efficiency arises from growing concerns about the escalating depletion of non-renewable natural resources. Given that energy, water, materials, and land are pivotal non-renewable resources in construction projects, conserving them holds paramount significance for ensuring a sustainable future.

- **Cost efficiency** (Akadiri et al., 2012):

Construction clients are demanding assurance regarding the long-term economic performance and expenses of their buildings. Furthermore, the construction project supply chain, comprising developers, suppliers, manufacturers, design, and construction teams, faces increasing pressure from clients to minimize total project costs and consider the building's lifecycle expenses and its ability to consistently meet occupiers' needs. However, wide evidence suggesting that many organizations, both public and private, base building-related investment decisions solely on initial construction costs, without consideration of operational and maintenance costs over the building's lifespan (Woodward, 1997).

To ensure the attainment of these objectives, the concept of Life Cycle Costing Analysis (LCCA) can play a crucial role in the economic aspect of building projects. LCCA serves as an economic evaluation approach capable of forecasting a building's costs from operation, maintenance, and replacement throughout its entire lifespan.

- **Design for human adaptation** (Akadiri et al., 2012):

A primary objective of sustainable construction is to create environments to provide healthy and comfortable human activities. A building should effectively accommodate its intended purposes, providing adequate floor space, room volume, shelter, lighting, and amenities for various activities such as work, residence, education, healthcare, and processing. While fulfilling these fundamental needs, the building must prioritize the well-being of its inhabitants and the environment, ensuring structural stability, fire safety, and minimal environmental impact, particularly in terms of energy consumption, to align with sustainable development goals.

Such complexity is beyond the limitations of this academic work. Thus, this research emphasizes the opportunities to promote sustainability in retail fit-outs by enhancing resource efficiency through design. Employing methods to reduce material wastage before and during construction, extending the service life of buildings and interiors, and creating avenues for recycling and reusing building materials are essential requirements to reach this goal. Design strategies are pivotal, as they significantly impact resource consumption efficiency. The following topics explore the concepts of Circular Economy and Circular Design as tools for improving the materials selection.

2.3.3. CIRCULAR ECONOMY

The circular economy can be seen as a prerequisite for sustainability (Geissdoerfer et al., 2017), which is an older concept defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”(Keeble, 1988). Both concepts, sustainability and the circular economy, emphasize intra- and inter-generational commitments driven by environmental hazards. They share a global perspective that promotes joint responsibilities and coordination among multiple agents. Both rely on regulation and increasingly focus on designing incentive structures and fostering business innovation (Casas-Arredondo et al., 2018).

The notion of circularity has roots in both history and philosophy. Although not explicitly labelled as such, sustainable sourcing practices aligned with circularity have been employed for many years, particularly in forestry and agriculture (Zylka et al., 2021). However, the landscape has shifted significantly with contemporary production and consumption heavily influenced by a linear economic model. Products are created, used, and discarded – the take-make-use-dispose paradigm - without consideration for environmental impact or resource limits (Zylka et al., 2021). Transitioning to a circular economy (CE) holds immense promise for reshaping economic systems and significantly advancing sustainable development goals (Zylka et al., 2021).

The premise of the Circular Economy (CE) is the argument of continuously utilizing resources by maximizing their value through extraction, followed by the recovery and regeneration of products and materials at the conclusion of their service life (Sleiman, 2022). The Circular Economy proposes a system that is restorative and regenerative by design, which aims to keep products, components, and materials at their highest utility and value always, distinguishing between technical and biological cycles (Ellen MacArthur Foundation, 2016). Within this system, products and resources are continuously reused, repaired, refurbished, remanufactured, recycled, and composted. By decoupling economic growth from the depletion of finite resources, the circular economy addresses issues such as climate change, biodiversity decline, waste, and pollution on a global scale (Ellen MacArthur Foundation, 2016). Therefore, Circular Economy is as “a continuous positive development cycle that preserves and enhances natural capital, optimizes resource yields and minimizes system risks by managing finite stocks and renewable flows” (Ellen MacArthur Foundation, 2016).

The Circular Economy is based on three principles, driven by design (Ellen MacArthur Foundation, 2016):

- **Design out waste and pollution** (Ellen MacArthur Foundation, 2016):

Waste and pollution are largely a consequence of decisions made at the design stage. In the context of the construction industry (CI), answering this principle demands the following strategies (Ellen MacArthur Foundation, 2016):

- Design for longevity, adaptability or flexibility, and reusability or recoverability.
- Design out construction, demolition, and excavation.

- **Keep products and materials in use at the highest value** (Ellen MacArthur Foundation, 2016):

Maintaining materials in active use, whether as finished products or, if no longer viable in their current form, as components or raw materials. Through this approach, waste is minimized, and the inherent value of products and materials is preserved. It is helpful to think about two fundamental cycles – the technical cycle and the biological cycle, as the Ellen MacArthur Foundation illustrates by the “butterfly” diagram (Ellen MacArthur Foundation, 2019) shown in Fig. 18. In the technical cycle, products are reused, repaired, remanufactured, and recycled. In the biological cycle, biodegradable materials are returned to the earth through processes like composting and anaerobic digestion.

Some strategies to reach these goals are listed (Ellen MacArthur Foundation, 2016):

- Extending products and materials lifespan.
- Keeping them in use by reusing, repairing, and remanufacturing.
- Ensuring that fast-consuming goods can be reclaimed, and materials recycled.
- In the Construction Industry context also refers to the management of excavation, construction, and demolition waste.

- **Regenerate natural systems** (Ellen MacArthur Foundation, 2016):

Proposes a shift from an extractive to a regenerative model that tries to emulate natural systems by avoiding waste.

This principle encourages the following strategies (Ellen MacArthur Foundation, 2016):

- Adoption and use of renewable energy instead of fossil fuels.
- Preservation and enhancement of natural resources.
- Returning nutrients to the soil.

The point here is to move from the idea of doing less harm to the environment to an attitude of improving it.

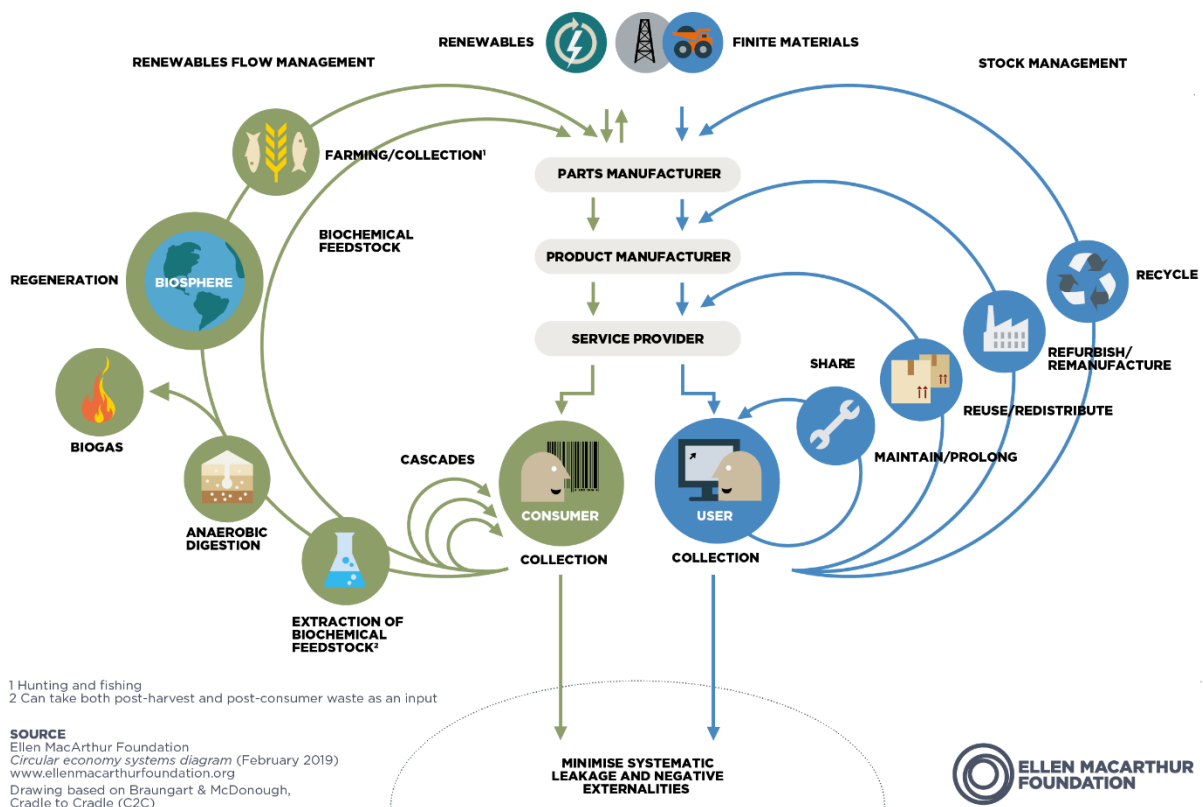


Fig. 18 - The Butterfly diagram.
 Source: Ellen MacArthur Foundation (2019)

Circular Economy (CE) demands a cohesive strategy. Circular Business must walk hand-by-hand with Circular Design and Materials. Embracing Circular Economy principles can bring about transformative change across both public and private spheres through systematic integration and complementary strategies encompassing planning, business operations, design, and material utilization (Ayalp & Santoro, 2022). Policies play a crucial role in facilitating the transition towards circularity by establishing guidelines and mandates. Implementing circular economy principles at the corporate level not only influences governance but also shapes value creation throughout the business (Ayalp & Santoro, 2022).

According to Ghisellini et al., (2016), CE implies implementing cleaner production practices at the company level, enhancing both producers' and consumers' responsibility and awareness, employing renewable technologies and materials whenever feasible, and adopting appropriate, transparent, and consistent policies and tools. The key takeaway from successful endeavours is that the shift towards a Circular Economy comes from engaging all members of society and their ability to establish effective collaboration and exchange networks (Ghisellini et al., 2016). Additionally, success stories emphasize the importance of achieving an economic return on investment to offer adequate incentives to companies and investors (Ghisellini et al., 2016).

The Commission (2015) launched the Circular Economy Action Plan to aid Europe's shift toward a circular economy and promote sustainable economic growth while creating new jobs. The plan outlines various measures to "close the loop" of product life-cycles, covering production, consumption, and waste management. It identifies five priority sectors for boosting the transition: plastics, food waste, critical raw materials, biomass and bio-based materials, and construction and demolition (C&D). The

Circular Economy Action Plan aims to enhance the repairability, durability, and recyclability of products, establish quality standards for secondary raw materials, ensure improved recovery of valuable resources and effective waste sorting and management in the C&D sector, and facilitate environmental performance assessments of buildings (European Commission, 2015).

The concept of circularity can be applied to many industries. Some experts predict that the Circular Economy will drive the fourth economic revolution (World Economic Forum, 2019). As largely discussed, the building construction and renovation works are hugely raw material consumers and waste generators. Adopting circular strategies by applying closed-loop systems can effectively divert materials from landfills. This means designing products for a longer life cycle and ensuring that materials can be recovered and reused (Ellen MacArthur Foundation, 2024).

Two distinct approaches to implementing the Circular Economy in the built environment exist: one focuses on existing buildings, while the other approaches to new constructions (Sleiman, 2022). The principles for **existing buildings** prioritize prolonging the building's life cycle, reducing resource consumption, waste, emissions, water, and energy leakage, while also optimizing energy and material flows (Sleiman, 2022). This approach aims to minimize disposal and preserve both economic and ecological value. Conversely, the principles for **new buildings** underscore resilient and adaptable design strategies, along with protocols for disassembly, potential reuse, repair, and systems for material remanufacturing or recycling (Sleiman, 2022). There is some agreement in the literature that implementing strategies to diminish waste generation, prolong building lifespan, and streamline resource recovery are facilitators for transitioning towards a circular economy within the built environment.

2.3.4. SUSTAINABILITY AND CIRCULAR ECONOMY IN THE RETAIL DESIGN PRACTICE

Within a broader retail and hospitality marketing strategy, store design serves as a vital tool for attracting and captivating consumers (Petermans & Kent, 2016). However, this reliance on design necessitates a continuous renewal of stores to sustain their appeal to consumers. Consequently, there's an ongoing demand for energy and raw materials to create the next wave of stores. Typically, store interiors have life cycles ranging from 2 to 10 years, contingent upon the store type and the pace of trend changes (Fieldson & Rai, 2009; Petermans & Kent, 2016). The linear economic model, characterized by a take-make-use-dispose approach, exacerbates the issue as discarding old interiors generates significant waste, demands a large consumption of raw materials (Fieldson & Rai, 2009).

In the field of retail design, designers must navigate between two competing imperatives: the requirement for innovative and appealing retail environments on one side, and the growing pressure for companies to demonstrate environmental responsibility on the other (Tucker, 2015). The tension arising from the need for rapid renewal and its resultant environmental repercussions presents an opportunity for retail design to take proactive steps towards embracing the Circular Economy (CE) principles, thereby motivating a redesign of the process (Tucker, 2015). Stakeholders in the retail industry can no longer ignore the emerging green market trends; to remain relevant and sustainable, they must view the design process as an integral component of a green marketing strategy, rather than merely focusing on visual appeal (Münster et al., 2022). However, there is some gap in theory and practice, as pointed out by Münster et al. (2022).

Kirchherr et al. (2018) identified the main barriers to the adoption of Circular Economy in the European Union context, as presented in Fig. 19. After interviewing 47 experts and surveying 208 stakeholders from businesses and governments, they found 04 driving categories influencing the CE transformation: **Cultural**, **Market**, **Regulatory**, and **Technology** (Kirchherr et al., 2018).

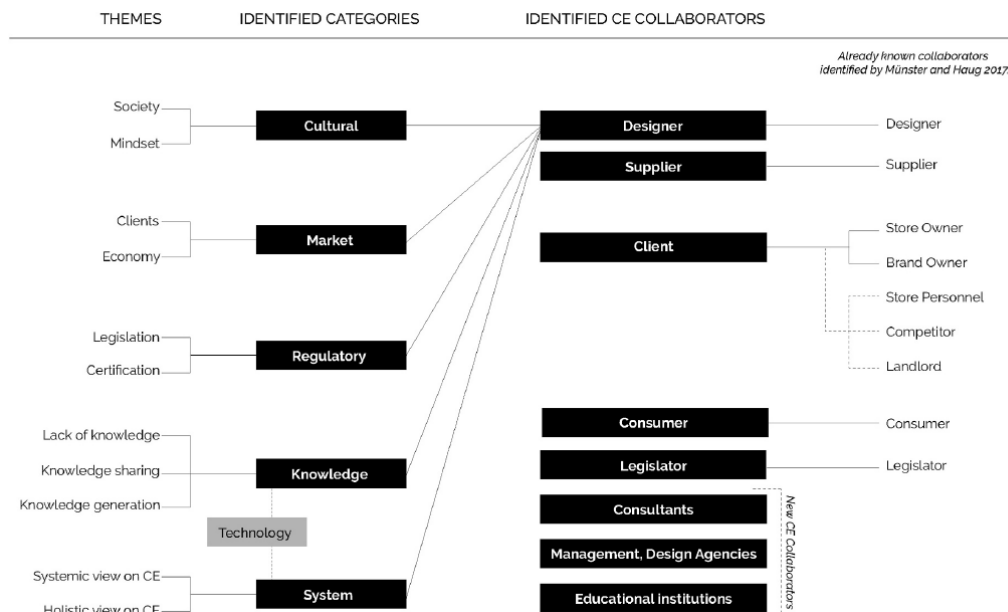


Fig. 19 - Barriers/Drivers and Collaborators to CE transition.

Source: Kirchherr et al. (2018)

Following this work, Münster et al. (2022) performed a customized study with the goal of identifying the barrier to the adoption of CE concepts by retail designers. The findings are listed below:

- **Cultural barriers and drivers** (Münster et al., 2022):

According to the authors, retail designers are generally enthusiastic about learning CE and its principles and are open to integrating such concepts into their practice since the early stages. None of the participants raised worries about the potential adverse effects on their creativity or professional growth from applying CE principles. Instead, they saw these constraints as catalysts for their creativity.

The concerning aspects came from the market acceptance and a self-perception of weakness to act as a market changer.

- **Market barriers and drivers** (Münster et al., 2022):

Retail companies struggle for market share. Retail designers exist to create experiences for customers, and their relevance depends on the ability to create and maintain market share for their clients. This context exposes some limitations in the practice of retail design because the strategic decision lies in other hands.

This correlation between strategy and results reinforces the economic factor as a driver and barrier to CE. Sustainability and money depend on each other, and the last is used both as motivation (revenue generation) and excuse (cost effect), according to the situation and point of view.

- **Regulatory barriers and drivers** (Münster et al., 2022):

There is a consensus that legislation is key to accelerating the transition to CE. Regulatory changes also level the playing field and market competition.

- **Knowledge barriers and drivers** (Münster et al., 2022):

The research also exposed some lack of knowledge about CE principles and, mainly, about practical application. Many designers recognized such conditions as one of the most important barriers.

Respondents also revealed their inability to evaluate materials and products marketed as sustainable. Because they are not able to verify these claims, they avoid incorporating these materials in their projects.

Retail designers interviewed also indicated their lack of conviction about where to find reliable information about materials, citing the internet or suppliers as potential sources. However, the absence of hands-on, practical experience-related knowledge leads to uncertainty, which can also be perceived as a barrier.

- **System barriers and drivers** (Münster et al., 2022):

The studies evidenced that collaboration is at the very heart of CE transformation. A systemic approach is mandatory and suppliers play an important role regarding what happens with the products before and after their use in the projects.

By explaining different barriers and motivators to the implementation of circular economy principles in retail design practice, this study also contributed to and motivated the realization of this research that seeks, among other objectives, to facilitate the adoption of circular design strategies in retail projects.

2.3.5. CIRCULAR DESIGN

In October 2017, international representatives of professional designers, architects, urban planners, landscape architects, and other design-related disciplines, joined in the first international Design Summit Meeting (DSM), undersigned the Montreal Design Declaration ("Montréal Design Declaration: Issued at the 2017 Montréal World Design Summit," 2018). The Declaration proclaims the potential of design to achieve global economic, social, environmental, and cultural objectives, and includes a call to action to professionals, educators and governments. It defines design as "*the application of intent: the process through which we create the material, spatial, visual and experiential environments in a world made ever more malleable by advances in technology and materials, and increasingly vulnerable to the effects of unleashed global development.*" ("Montréal Design Declaration: Issued at the 2017 Montréal World Design Summit," 2018)

The idea of intention is core. The Circular Design concept follows this statement under the light of the three principles of the Circular Economy. In opposition to the traditional design practice that focuses on considering and meeting the needs of the end user, the Circular Design purposes "*understanding the impact of design decisions on stakeholders and building in feedback loops to help identify and address the unintended consequences of our design decisions*" (Ellen MacArthur Foundation, 2022). At every stage of the design process is needed to both zoom in on the user needs and zoom out to consider the systemic implications, oscillating continuously between these two equally critical perspectives (Ellen MacArthur Foundation, 2022). Hence, designing is an iterative process that never finishes.

According to Guerra & Leite (2021), two stages of the building life cycle – design and end-of-life – are critical and closely interconnected in the CE model. The authors performed an extensive review

of the strategies related to the CE in the built environment context at these stages. The findings are summarized in a list of twelve initiatives described below:

Design phase (Guerra & Leite, 2021):

- i. **Specify recyclable and reusable materials**
Encourages the adoption of recycled and reused materials in the design specification. Additionally, specification of materials that can be recycled in the end-of-life phase.
- ii. **Design out waste**
Covers the strategies applicable to avoid waste generation, such as off-site construction, and materials optimization.
- iii. **Design for modularity**
Recommends the use of components that are dimensionally and functionally compatible within and with other systems.
- iv. **Design for adaptability and flexibility**
Calls for design strategies that enable the building to be modified and adapted during its life.
- v. **Design for standardization**
Proposes the standardization of building materials, components, and connectors with the purpose of simplifying the disassembly and sorting processes at the end-of-life.
- vi. **Design in layers**
Prescribes the design of building systems in layers to ease the separation of components in case of renovation.
- vii. **Design for disassembly**
Stimulates the adoption of design strategies that facilitate the building's components recovery and reuse.
- viii. **Design for prefabrication**
Suggests the fabrication of components outside the construction site to enhance its performance and minimizes waste.

End-of-Life (EoL) phase (Guerra & Leite, 2021):

- ix. **Selective demolition**
This strategy is composed of two parts starting with the identification and removal of hazardous waste, components and materials that can be reused; followed by conventional demolition.
- x. **Deconstruction or Disassembly**
Refers to the process of disassembling buildings to recover components and materials, avoiding demolition.
- xi. **Closed-loop recycling or up-cycling**
This recycling process intends to recover or enhance the material state and value.

xii. **Open-loop recycling or down-cycling**

In this recycling process, material mass is remanufactured into different products usually of lower value.

Implementing circularity presents a multifaceted and intricate challenge to address sustainability issues (Tan et al., 2024). Circular Design methodologies play a pivotal role in shaping both current and future resource utilization patterns (Ayalp & Santoro, 2022). The Ellen MacArthur foundation in collaboration with the global design agency IDEO, released a Circular Design Guide (Ellen MacArthur Foundation, 2024). The guide contains a large collection of tools, methods, resources, and mindsets to help designers through all stages of the circular design approach.

The guide proposes the Circular Design process comprising four stages (Ellen MacArthur Foundation, 2024), as presented in Fig. 20:

- **Understanding:** Get to know the user and the system surrounding the problem.
- **Defining:** Translate into words and images the design challenge and the designer's intention.
- **Making** - Ideate, design, and prototype as many iterations and versions as possible.
- **Releasing** – Present the design solution in an engaging storytelling.

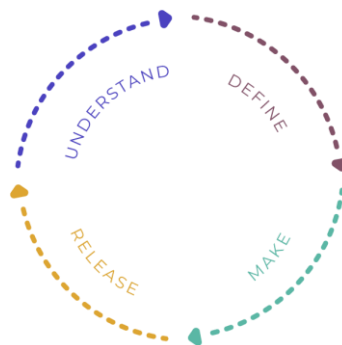


Fig. 20 - Circular Design stages.
Source: Ellen MacArthur Foundation (2024)

Each of these stages holds significant opportunities for releasing the potential of Circular Design into the projects. The Circular Design Guide offers several insights and activities to help designers to understand, define, make, and release circular innovation. Those ideas that offer some inspiration or guidance to this work were highlighted below:

Understanding Stage (Ellen MacArthur Foundation, 2024):

- Circular flows: Purposes a deep dive on technical (reuse, refurbishment, remanufacturing, and recycling), and biological (material cascade, feedstock extraction, and returning nutrients) cycles to identify and address the potential of the loop.
- Service Flip: Explores opportunities to shift from a product selling/buyer position to a service provider/user.
- Inside outs: Ignites the potential of design for disassembly and recovery of components.
- Learn from nature: Searches for inspiring and similar contexts in nature that can be replicated in the design challenges.

Definition Stage (Ellen MacArthur Foundation, 2024):

- Challenge definition: Articulates and frames what circularity challenge is possible to solve by building a skilled team and aligning goals and approach.
- Find circular opportunities: Identifies small, measurable opportunities to design for circularity.
- Circular buy-in: Maps the stakeholders and understands their perspectives.
- Circular business model: Develops or redefines the business model from a Circular Design perspective.

Making Stage (Ellen MacArthur Foundation, 2024):

- User-centred research: Understands the needs of everyone involved in the use cycle of your circular proposition(s) – the end users or beneficiaries, but also suppliers, manufacturers, retailers and others who may reuse your materials.
- Smart material choices: Makes smart material choices by asking the right questions.
- Rapid prototyping: Create roughs and rapid prototypes to test your concept before going to market.

Releasing Stage (Ellen MacArthur Foundation, 2024):

- Product journey mapping: Enlarges the perspective about the use possibilities of product or service, and their parts.
- Imagine new partnerships: Explores partnerships that strengthen your value chain, increase system effectiveness or make a more robust business case.
- Align your organization: Applies the principles of design thinking to ensure your organization to support the change to circularity.

Despite of its inspiring approach to promote Circular Design, these recommendations have a generalist profile and lack an instrumental and operational dimension. The British consultancy ARUP worked to fill this gap in the context of retail stores, releasing its Circular Fit-out in Retail Stores Guide (Ayalp & Santoro, 2022). This framework reinforces the role of the Design phase as a key stage to increase Circularity, considering that the carbon reduction potential reduces dramatically as the design-construction cycle progresses, as presented in the Fig. 21.

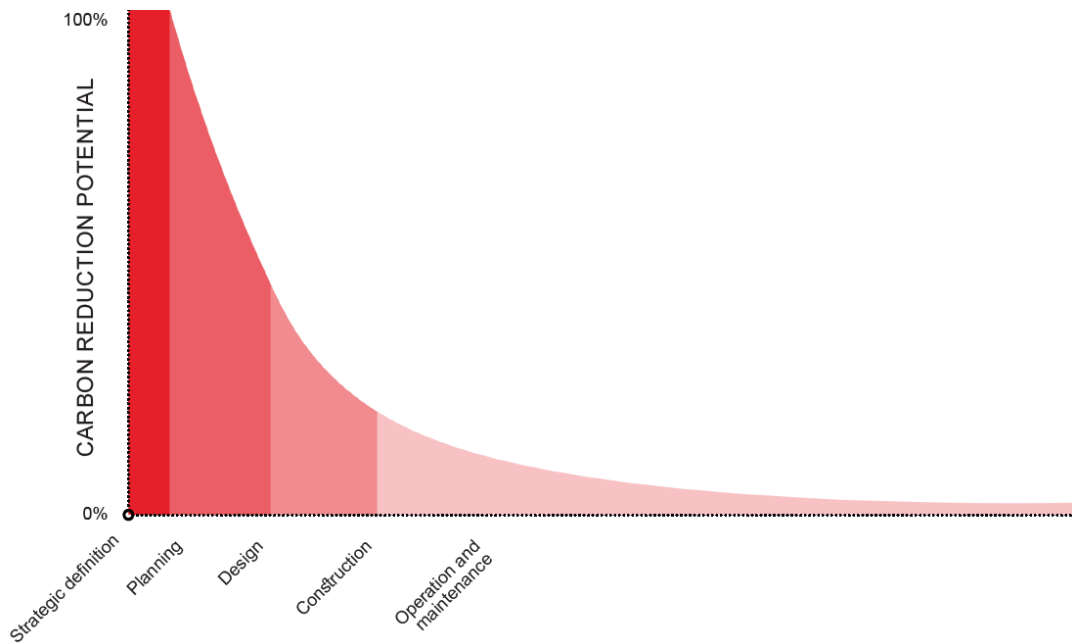


Fig. 21 - Carbon Reduction Potential.
Source: Ayalp & Santoro (2022)

Opportunities for a Circular Fit-out go beyond decarbonization, material reduction, and extending the lifespan of elements (Ayalp & Santoro, 2022). At the beginning of a project, there should be a commitment to rescuing and reusing materials across multiple lifecycles rather than just one. Circular Design demands a transformation in how fit-out elements are manufactured, by rethinking the system they belong to (Ayalp & Santoro, 2022). To implement this systemic approach, it is essential to consider the entire life cycle of stores to feed the design process and facilitate the application of circular economy principles (Ayalp & Santoro, 2022).

According to Ayalp & Santoro (2022), the circular store must incorporate adaptable, flexible, and responsive elements to minimize premature obsolescence and replacement. It must be constructed using refurbished, reclaimed, or recycled materials to reduce the use of virgin resources and eliminate hazardous or pollutant materials. Products ought to be redesigned to perform the same functions with fewer resources and materials (Ellen MacArthur Foundation, 2022). Their design must be optimized to be lightweight, compact, easily transportable, and simple to assemble and disassemble on-site, enhancing their reusability and recyclability. If products are damaged, they can be easily repaired or have parts replaced due to their accessible design. When replacement is necessary, the residual value is preserved by extending the life of the entire product or its parts and components through sharing models or remanufacturing (Ayalp & Santoro, 2022).

In the case of retail chains, a circular store network enables the exchange of material and fit-out components according to on-demand needs, generating a symbiotic ecosystem in which the waste of one is the resource for another (Ayalp & Santoro, 2022). Moreover, a Circular Design considers the end-of-life stage from the early stage of design and processes by partnering with waste management companies, or by adopting procurement contracts that enable supplies to be fully responsible for the products – product-as-service models (Ayalp & Santoro, 2022). Digital technologies also contribute to reach circularity goals, by providing information and database management to keep track of material flows and to allow the implementation of predictive maintenance procedures (Ayalp & Santoro, 2022).

Arup's proposal to Circular Design deployment in retail fit-outs is summarized in the "9R" strategy presented in Fig. 22.

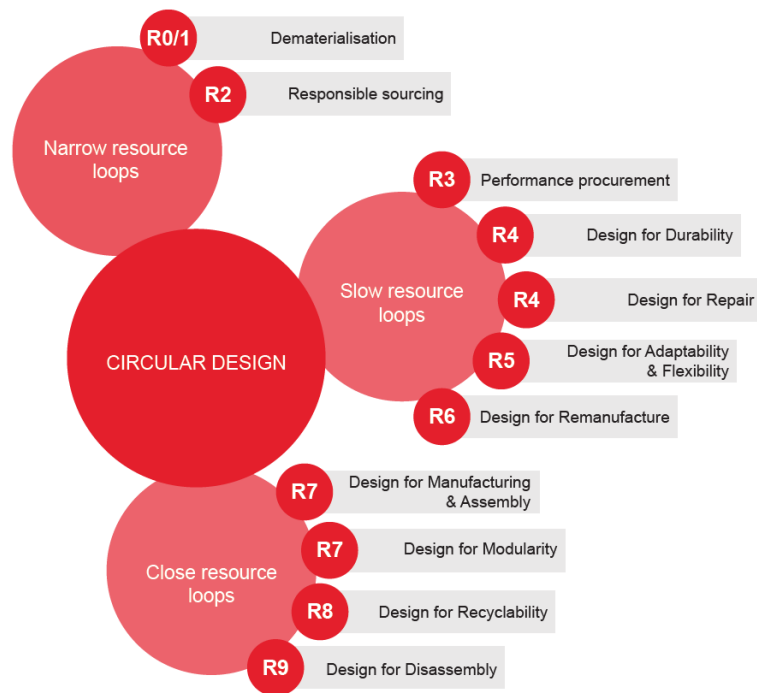


Fig. 22 - 9R Strategy to CirAyalp & Santoro (2022) fit-outs.
Source: Ayalp & Santoro (2022)

This framework partially confirms the findings presented by Guerra & Leite (2021), but innovates by bringing an applicable and retail design driven toolbox (Circular Design Cards) for Circular Design deployment. The strategies are organized around three approaches to the "loops":

Narrow resource loops (Ayalp & Santoro, 2022):

Proposes design for smarter product use and manufacture by using fewer materials and resources. The recommended "R" strategies are:

- i. **Rethink and Refuse (R0/1) - Dematerialization:** Design and deliver the same product or service with none or less material and resources required.
- ii. **Reduce (R2) - Responsible sourcing:** Specify and source materials and other resources regeneratively and sustainably.

Slow resource loops (Ayalp & Santoro, 2022):

Design for prolonging inner loops through sharing models, maintenance and repair. Refurbish and remanufacture are enhanced against replacement. The recommended "R" strategies are:

- iii. **Reuse (R3) - Performance procurement:** Maximize products utilization by procuring sharing/service models rather than relying on individual ownership.
- iv. **Repair (R4) - Design for durability:** Design products that last and have a long lifespan, extended through fixing and repair.

- v. **Repair (R4) - Design for repair:** Products can be designed so that parts are physically accessible for repair to prolong their life cycle.
- vi. **Refurbish (R5) - Design for adaptability and flexibility:** Prevent premature obsolescence by developing a new design culture focused on adaptation to different use scenarios in the future.
- vii. **Remanufacture (R6) - Design for remanufacture:** Exploit residual value of products by designing for facilitating reuse of parts of a discarded product in a new product with the same/different function.

Close resource loops (Ayalp & Santoro, 2022):

Circular treatment at end-of-life shall always be considered. Design for recycling allows to close the loop between post-use and production, resulting in a circular flow of materials and resources. This approach recommends the following “R” strategies:

- viii. **Repurpose (R7) - Design for manufacturing and assembly:** Ensure that a product is designed to be easily and efficiently manufactured and assembled with minimum effort, time, and cost.
- ix. **Repurpose (R7) - Design for modularity:** Establish uniformity across manufacturing materials and processes.
- x. **Recycle (R8) - Design for recyclability:** Prioritize easy recover and recycle of end-of-life products so that they can be collected and recycled after use.
- xi. **Recover (R9) - Design for disassembly:** Products and components shall be designed to be deconstructed at end-of-life.

In the development of this research, the 9R Strategy framework is adopted to identify the Circular Design initiatives both in the sustainable retail cases presented in the next sub-section, and in the analysis of the case study scenarios.

2.3.6. CASES IN SUSTAINABLE RETAIL DESIGN

The retail industry’s major players have been growing awareness and moving towards a greener future (Jesse et al., 2022). Consumers are demanding an unprecedented level of commitment and enthusiasm from them to ensure that their businesses operate sustainably by reducing their carbon footprint and limiting their environmental impacts (Petermans & Kent, 2016). Despite all noticeable efforts applied to the supply chain involved in their products offer, there is much room for improvement in the retail design strategies (Mueller, 2018).

Many initiatives have arisen in the last years and some of them, due to their impact and visibility, are worth mentioning. Beyond bringing general information about the cases, this analysis highlights the sustainable and circular design initiatives applied.

- **Ikea Greenwich Sustainable Store** (Ikea, 2024):

The store (Fig. 23) opened in 2019 when the Swedish furniture giant presented the 32.000 square meters of space with the promise of being the most sustainable store ever made (Ikea, 2024). Such promise was grounded in two strategies: by offering a place for Londoners to meet, share, learn, and

shop more sustainable products; by designing the building to reach the highest sustainability BREEAM rating, being the first retail outlet in the United Kingdom (UK) to do so (Ikea, 2024).



Fig. 23 - Ikea Greenwich Store façade.
Source: (Ikea, 2024)

Regarding the sustainable design and construction initiatives, the building block presents some differences in comparison to a typical **Ikea store**. The superstructure is made of timber, big plans in glass in façades and ceiling allow the entrance of a huge amount of natural light (Fig. 24), and a roof covered with 12.000 square meters of solar panels and a seeded roof (4.000 sqm) offers a visitable terrace with London views. The store also incorporates many renewable construction materials and green technologies including solar panels, rainwater harvesting, geothermal heating, and 100% LED lighting (Ikea, 2024).



Fig. 24 - Ikea Greenwich Store interiors.
Source: (Ikea, 2024)

The store also includes a Learning Lab (Fig. 25) – the first for Ikea globally – where people can attend classes and workshops about prolonging the life of products, upcycling old furniture, and

adopting more sustainable lifestyle habits (Ikea, 2024). Beyond these, customers can return their old furniture to donate, resell, or order spare parts to repair broken items, allowing the products to have their life extended as purposed by circular economy principles. Regarding the community creation' and changing habits' intentions, the store is located in a highly accessible site, with many public options available, to encourage customers to travel by public transport rather than car (Ikea, 2024).



Fig. 25 - Ikea Greenwich Learning Lab.
Source: (Ikea, 2024)

Despite all this ambition and efforts, the Ikea Greenwich project didn't escape of strong criticism (Ravenscroft, 2019). The controversy comes from the fact that to build the new store on that site, Ikea demolished what was the UK's most sustainable supermarket. The old Sainsbury's Greenwich was a pioneering example of sustainable architecture, awarded with the rating excellent by BREEAM, and a Stirling Prize shortlisted project due to its green credentials, a completely unprecedented achievement for a supermarket project. The question is that Ikea should have faced the challenge of building on a brownfield land despite demolishing the construction and paving all green areas, taking advantage of structures from the previous building, and sparing lots of embodied energy and emissions (Ravenscroft, 2019).

- **Starbucks Greener Stores Program**(Starbucks, 2023):

The year was 2018 when the American coffee maker published its commitment to designing, building, and operating 10.000 unit of its **Starbucks Greener Stores** globally by 2025 (Starbucks, 2023). Since 2004, the company has been partnering with the U.S. Green Building Council (USGBC), when launched the program under an open-sourced framework that established performance criteria to ensure that the company's approach to designing, building, and operating its owned stores (encompassing existing stores, new buildings, and renovations) set a new standard for green retail (Starbucks, 2023). Fig. 26 presents the external appearance of one Greener Store's sample, whose location has not been identified.



Fig. 26 - Starbucks Greener Store façade sample.
Source: (Starbucks, 2023)

The program is committed to the 2030 preliminary targets of becoming resource-positive, storing more carbon than they emit, eliminating waste, and providing more clean fresh water than they use. In broad terms, it means achieving a 50% reduction in scopes 1, 2, and 3 greenhouse (GHG) emissions, a 50% reduction in water consumption, and a 50% reduction in waste sent to landfills. The LEED certification was established as the main indicator and comparison criteria between stores inside the chain. Up to 2024, the company accounted for 6.091 certified units, in 44 markets (Starbucks, 2023).

Being certified as a Greener Store means meeting standards across eight environmental impact areas developed in partnership with the World Wildlife Fund (WWF) and SCS Global Services: water stewardship, energy efficiency, waste diversion, renewable energy, responsible materials, engagement, sites, communities, health, and wellbeing (Starbucks, 2023). Each Greener Store has a combination of sustainable features that help it receive this third-party verification. Some stores have obvious elements like solar panels or water recycling tanks. Others have more subtle features behind the counter like high-efficiency appliances, low-emitting paint and sealants, and energy management systems as well as store practices like composting and food donation. Fig. 27 **Erro! Fonte de referência não encontrada.** presents the interior design of a Greener Store sample (Starbucks, 2023).



Fig. 27 - Starbucks' Greener Store interiors sample.
Source: (Starbucks, 2023)

- **Nike Store Paris - House of Innovation Paris** (Nike , 2024):

Nike has opened its first flagship store in Europe in the French capital in 2020 (Fig. 28). Covering 2.400 square meters, the space embodies the brand's commitment to innovation, sustainability, and the power of digital. This store concept is part of the Nike "move to zero" initiative, which has led the company towards a zero carbon and zero waste future (Nike , 2024).



Fig. 28 - Nike Store Paris' Façade.
Source: (Nike , 2024)

The store design takes advantage of more than 85,000 kilograms of sustainable material that were woven into the store design and display fixtures as shown in Fig. 29 and Fig. 30. Moreover, the megastore is completely fuelled by a clean energy wind complex thanks to a partnership with the world's leading wind power company in Spain (Allen, 2019).



Fig. 29 - Nike Store Paris' Interiors.
Source: (Nike , 2024)



Fig. 30 - Nike Store Paris' Interiors.

Source: (Nike , 2024)

In the same year, 2020, **Nike** introduced a new retail concept focused on local communities – the Nike Unite concept. The idea is to celebrate the people in each local community, and each store is designed to reflect them. Consumers are welcomed by an in-store community wall highlighting the store team and local partnerships, and design elements throughout the space also look to tell the story of the community (Neira, 2020).

- **Ecoalf Company** (Ecoalf, 2024):

The Spanish company was born in 2009 with the firm intention of transforming the fashion industry in a very sustainable way (Ecoalf, 2024). Since that, the brand has applied the principles of circularity to become the Spanish leader in environmental responsibility (according to the ranking *Monitor Empresarial de Reputación Corporativa* / MERCO, 2023). The core idea was, and still is, offering a new generation of recycled products with the same quality and design as the best non-recycled products (Ecoalf, 2024).

Such ambition demanded consistency in every decision, which includes the retail design and fit-out process. Since 2012, when the company opened its first store in Madrid, **Ecoalf** has expanded its physical stores chain with innovative interior design solutions to deliver a brand-new space made completely with recycled materials and/or natural materials with fast-growing, like bamboo (Ecoalf, 2024).

The more retail units demonstrate how the company has been committed to this purpose. Launched in 2022, the **Ecoalf Store Paris** (Fig. 31 **Erro! Fonte de referência não encontrada.** and Fig. 32) showcases the brand's DNA: design, sustainability, and innovation. Starting from a minimal resource allocation, the store presents an entire space covered with leftover recycled cotton in combination with fixtures made in reclaimed wood, reclaimed iron, low-consumption LED lighting, and other finishes made from textile waste (Ecoalf, 2024).



Fig. 31 - Ecoalf Store Paris' Façade.
Source: (Ecoalf, 2024)



Fig. 32 - Ecoalf Store Paris' Interiors.
Source: (Ecoalf, 2024)

Same year, **Ecoalf** presented its first net zero store in Madrid (Fig. 33 and Fig. 34~~Erro! Fonte de referência não encontrada.~~). As described in the Ecoalf's website: "Wood beams sourced from Spanish forests wave across the 149 sqm space, a material with a positive CO₂ impact, as trees actively absorb CO₂ from the atmosphere during their lifecycles. The wood is extended into the sleek footwear displays, benches, and tables fitted with ceramic tiles. Terracotta covers the walls to naturally regulate heat and humidity while ample natural light and LED bulbs further reduce energy consumption." The store also counts on solar panels to provide renewable energy (Ecoalf, 2024).



Fig. 33 - Ecoalf Store Madrid's Façade.
Source: (Ecoalf, 2024)



Fig. 34 - Ecoalf Store Madrid's Interiors.
Source: (*Ecoalf*, 2024)

The **Ecoalf Store Milan** (Fig. 35 and Fig. 36) opened in 2023 with a monochromatic space characterized by tones of off-white and contrasting organic textures. The 80 square meters space has been selected to reach the lowest impact possible without compromising on design (*Ecoalf*, 2024). The building itself is LEED certified relying on a geothermal energy installation used for its air conditioning, allowing the store to further lower energy consumption and reduce CO₂ emissions from the use of electricity in the space. The building is also WELL certified, which focuses on the development and maintenance of the well-being of the surrounding community. The store also adopted innovative solutions to fixtures, made with recycled plastic extracted from reclaimed fishing nets (*Ecoalf*, 2024).



Fig. 35 - Ecoalf Store Milan's Façade.
Source: (*Ecoalf*, 2024)



Fig. 36 - Ecoalf Store Milan's Interiors.
Source: (Ecoalf, 2024)

The most recent store, also in the Madrid metropolitan area, features 90 square meters and is made with 3,3 tons of recycled plastic through a 3D printing process as presented in Fig. 37 **Erro! Fonte de referência não encontrada.** and Fig. 38 (Ecoalf, 2024). The main idea of the resulting aesthetics is to create awareness about the melting of our poles and the consequences of that. The walls, shelves, display tables and even the hangers are made from recycled plastic giving a second life to this huge amount of plastic (Ecoalf, 2024).



Fig. 37 - Ecoalf Store Madrid's Interiors.
Source: (Ecoalf, 2024)

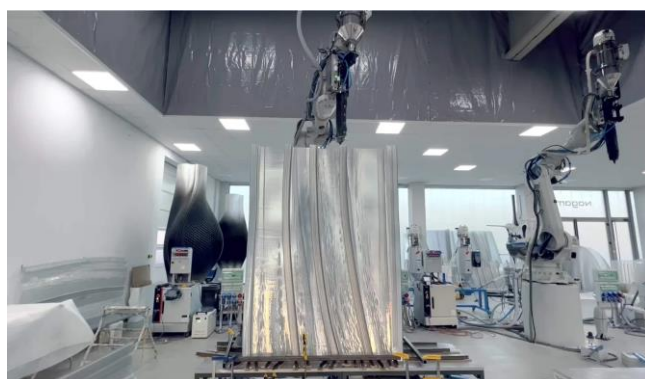


Fig. 38 - Ecoalf Store Madrid's 3D-printing process.
Source: (Ecoalf, 2024)

- **Other initiatives**

Sustainability has become one of the most important issues for retailers of all types. Such demand is not reserved for high-end retailers. It is expected by customers that all retailers respond to widespread calls for more sustainable business models by weaving environmentally friendly fixtures, materials, technologies, and processes.

The **Big Beauty Store** and the **Monc Eyewear Store**, both in London, have in common the London-based interior design studio Nina+Co as the author (Nina+Co, 2024). In both projects, the studio explored its circular thinking by offering refined design solutions made with both ancient and pioneering new materials. In the case of **Big Beauty Store London** (Fig. 39), the atmosphere bet on reclaimed gypsum, salvaged travertine marble, expanded cork blocks, mycelium, and seaweed bioplastics to create a quiet space with earthy tones. Raw stone edges, metal patination, and earthy tones are blended with soft, oversized, rounded forms for a calming effect. The main store was designed to be flexible and host events with seating arranged around a large travertine stone table – which was sourced 50 percent from salvage and 50 percent from offcuts (Nina+Co, 2024).



Fig. 39 - Big Store London's Interiors.
Source: (Nina+Co, 2024)

In the case of **Monc Store London** (Fig. 40), the studio created a very original space designed for disassembling and deconstruction, crafted from circular and biomaterials (Nina+Co, 2024). Display plinths fabricated from mycelium – the vegetative part of a fungus – are dotted across the area to showcase different eyewear models. Over them, thicker blocks made from cornstarch foam create the

shelves that, when showing signs of wear and tear, can be used as packaging, or simply dissolved in water (*Nina+Co*, 2024).



Fig. 40 - Monc London Store's Interiors.
Source: (*Nina+Co*, 2024)

The information on these cases was based on information published by their brand owners. Despite these limitations in accessing technical information and about the design process, it was possible to identify some of the Circular Design strategies adopted in each case by applying the 9R framework (Ayalp & Santoro, 2022). This first attempt of using the 9R framework can be considered a trial run of the tool, with a view to applying it when exploring the case study. The results are presented in the Tab. 2.

Tab. 2 - Assessment of the application of the 9R Strategy in selected retail cases
Source: Author, adapted from Ayalp & Santoro (2022)

9R STRATEGY FOR CIRCULAR RETAIL FIT-OUT, based on Circular Design Guide ARUP2022															
		Dematerialization	Responsible Sourcing	Performance Procurement	Design for Durability	Design for Repair	Design for Adapt. and Flex.	Design for Remanufacture	Design for Manuf. and Ass.	Design for Modularity	Design for Recyclability	Design for Disassembly			
		R0/1	R2	R3	R4	R4	R5	R6	R7	R7	R8	R9			
RETAIL CASE	SCOPE	STRATEGY											COUNT	SHARE	
Ikea Store Greenwich	Unit (single store)	Y	Y	Y	X	X	Y	X	X	X	Y	X	05	13%	
Starbucks Greener Stores	Program (group of stores)	Y	Y	X	Y	X	X	X	X	X	Y	X	04	10%	
Nike Store Paris	Unit (single store)	Y	Y	Y	Y	X	Y	X	X	X	Y	X	06	15%	
Ecoalf Store Paris	Unit (single store)	Y	Y	X	X	X	N	X	X	N	Y	X	03	8%	
Ecoalf Store Madrid 01	Unit (single store)	Y	Y	X	X	X	Y	X	X	X	Y	X	04	10%	
Ecoalf Store Madrid 02	Unit (single store)	N	Y	X	N	Y	N	Y	Y	N	Y	Y	06	15%	
Ecoalf Store Milan	Unit (single store)	Y	Y	X	N	N	N	N	X	N	Y	Y	04	10%	
Big Store London	Unit (single store)	Y	Y	X	Y	N	X	N	N	N	N	N	03	8%	
Moncler Store London	Unit (single store)	Y	Y	X	N	Y	X	Y	X	X	Y	X	05	13%	
		COUNT	08	09	02	03	02	03	02	01	00	08	02		
		SHARE	20%	23%	5%	8%	5%	8%	5%	3%	0%	20%	5%		
9R Strategies															
Narrow Resource Loops		Slow Resource Loops			Closed Resource Loops				Subtitle						
R0 Rethink		R3 Reuse			R7 Repurpose				Y - yes, the strategy could be identified						
R1 Refuse		R4 Repair			R8 Recycle				N - no, the strategy couldn't be identified						
R2 Reduce		R5 Refurbish			R9 Recover				X - no enough information available						
		R6 Remanufacture													

From the analysis of the data produced, the prevalence of strategies to Narrow Resource Loops represented 43% of the initiatives detected, out of a total of 40. Strategies to Slow Resource Loops were detected in 12 occurrences, being noted in 07 of the 09 cases studied. Finally, strategies to Close Resource Loops were detected 11 times, with a strong prevalence of Design for Recyclability initiatives. When analyzing the performance of the cases in comparison, the sample showed the application of 4.5 strategies on average, and the project with the highest number of initiatives aligned with the strategies for Circular Design was the **Nike Store Paris** and **Ecoalf Store Madrid**, both with 06 occurrences.

2.3.7. REVIEW OF CORPORATIVE SUSTAINABLE REPORT

Publicly listed companies in the construction and retail industries regularly revise and enhance their stated commitments to sustainability through Corporate Social Responsibility (CSR) reports, typically released alongside their annual financial reports (Commission, 2023). While these reports are primarily aimed at informing stakeholders, promoting brand identity, and asserting market leadership, they also offer valuable insights into how sustainability principles influence broader business strategies and operations (Commission, 2023).

For the purposes of this literature review, nine CSR documents emitted by the major European fashion and clothing retailers (Retail-Index, 2021) were selected for more detailed analysis. Together, they operate more than 17.000 stores in Europe (Retail-Index, 2021). The documents were reviewed, and the findings were presented in summary form in the Annexes section, with references to the sustainable

practices or attributes of retail buildings and interior fit-outs highlighted. Opportunely, the goals, commitments, and achievements related to energy consumption and emissions were listed also. Additional points of interest arising from the set of CSR documents reviewed are listed as follows:

- i) Inditex group (H&M Group, 2023), the biggest European fashion retailer, had its carbon trajectory validated by the Science Based Targets initiative (SBTi) by 2020; since then, the group has adopted the threefold global strategy: Energy, Water, and Biodiversity Strategies. Regarding the built environment, Inditex has invested in certifications (LEED and BREEAM) of its own facilities and monitoring closely the energy consumption and emissions of the entire operation. No mention of the construction process or retail fit-outs was identified.
- ii) H&M group (H&M Group, 2023), the second in ranking by turn-over (2021), was one of few that presented evidence of actions over the built environment and fit-out processes, and the adoption of circular design practices.
- iii) LVMH group (LVMH Group, 2022), the French multinational holding and conglomerate specializing in luxury goods that operates 1.203 stores in Europe (Retail-Index, 2021), mentioned the implementation of an operational guideline with sustainability performance targets, related to store's thermal insulation, air quality, energy and water consumption, and interior design. The group also presented their targets of reducing energy consumption per square meter in stores over time,

In common, all the companies presented their commitment to the adoption of 100% renewable energy, to carbon neutrality (with differences in the time horizon of achievement), to the reduction in water use, and to the reduction (and avoidance when possible) of waste generation.

Regarding energy consumption, strategies such adoption of LED lighting, local energy generation, and active monitoring with building management systems were the most cited. Regarding carbon neutrality, all retailers represented in this sample reinforced their commitments but also highlighted how challenging has been to get a reduction in Scope 3, considering the amount and scale of supply chains upstream and downstream.

2.3.8. SUBSECTION SUMMARY

This subsection discusses the importance of sustainability within the construction industry, particularly in retail fit-out projects. It starts with an overview of sustainable development principles and how they are implemented in the construction sector. The section emphasizes the role of Circular Economy and Circular Design strategies in promoting sustainability.

Key points include a review of the principles and drivers that influence the adoption of sustainable practices in construction projects, which include External Drivers - the actions of governments, international organizations, and customers; Corporate-level Drivers - cover the internal business motivations, like corporate image, culture, and vision; Property-level Driver – regarding the issues related to the property value and operational costs management through sustainable design solutions; Project-level Drivers – which consider the design decisions that enhance construction efficiency; and finally, Individual-level Drivers – related to the personal motivations and social conscience driving individuals (highlighting the retail designer's role) to adopt green practices.

Overall, the sub-section advocates for a comprehensive and integrated approach to sustainability in the construction industry, emphasizing resource conservation, cost efficiency, and human adaptation through sustainable design and circular economy principles.

The Circular Design concept is presented and discussed, highlighting its principles and methodologies as part of the Circular Economy (CE) framework. The Circular Design principles focus on understanding the impact of design decisions on all stakeholders and incorporating feedback loops. Reinforces that the design process involves continuously zooming in on user needs and zooming out to consider systemic implications.

Facing the challenge of deploying such concepts in the retail design sector, a framework proposed by ARUP is presented in detail. The ARUP's Circular Fit-out in Retail Stores Guide emphasizes the design phase's role in increasing circularity by offering the "9R Strategy". A set of recommendations is translated into a "toolbox" to enable circular design practices. Overall, the sub-section underscores the significance of Circular Design in promoting sustainability through a comprehensive, iterative process that integrates CE principles at every stage of a building's life cycle.

This section also brings an overview of sustainable retail design initiatives on the course. The retail industry has increasingly embraced sustainability, driven by consumer demand for greener operations and reduced environmental impacts. Major players like IKEA, Starbucks, Nike, and Ecoalf are leading the change with notable initiatives. As a first rehearsal of the methodology that is used in the case study, the 9R Strategy is adopted to identify evidence of circular design practices in such projects. The analysis highlights the prevalence of the "Refuse" and "Reduce" strategies in sustainable retail design, focusing on the right material specification and reuse, leading to reduced raw material usage and enhanced recyclability.

Finally, the research efforts are shifted from the retail unit level to the retail corporate level, to cast a vision of the "state-of-commitment" of major European fashion retailers (covering over 17,000 stores in the continent) with a sustainability agenda. The analysis highlights sustainable practices in retail buildings and interior fit-outs, energy consumption, and emissions.

In the next section, this theoretical review dives into the Life Cycle Assessment theory and practice. This investigation intends to consolidate the concepts and procedures to be followed in applying this methodology to a case study.

2.4. LIFE CYCLE ASSESSMENT

Building performance assessment has become crucial for professionals in the construction sector. This involves evaluating a building's environmental attributes using standardized criteria, which helps in setting high environmental standards and promoting sustainability (Ding, 2008). Different stakeholders prioritize various aspects of building performance, making it challenging to use a single approach for evaluation (Ding, 2008).

Environmental building assessment methods aim to provide a comprehensive evaluation of a building's environmental impact, guiding owners and designers towards better practices (Cole, 1998). These methods help in organizing environmental data and measuring progress towards sustainability goals. Ideally, these assessments should be introduced early in the design phase to allow for collaboration between design and assessment teams, ensuring that environmental considerations are integrated from the start (Cole, 1998).

This section delves into this topic with the aim of building a solid knowledge base that enables the application of its methods, as part of the effort required to achieve the objectives of this research. In due course, it also explores its restrictions and challenges, anticipating some of the challenges that will arise when developing the case study.

2.4.1. THE ROLE OF ASSESSMENT TOOLS

Construction has faced criticism for its contribution to environmental issues, ranging from the overuse of global resources in construction and building operations to pollution of the surrounding environment (Ding, 2008). Efforts towards green building design and the utilization of environmentally conscious materials are already in progress. However, depending solely on project design or on-site management to achieve sustainable development goals or mitigate environmental impacts is inadequate in addressing the present challenges. Surprisingly, minimal attention has been paid to prioritizing environmentally friendly designs during the project appraisal phase, which is optimal for integrating environmental considerations (Ding, 2008).

The performance of buildings has become a significant focus for professionals in the construction sector, with environmental building performance assessment emerging as a key aspect of sustainable construction (Ding, 2008). The definition of building performance varies based on the different interests of stakeholders engaged in building development. For instance, a building owner might prioritize financial performance, while occupants may prioritize factors like indoor air quality, comfort, health, and safety. Employing a singular approach to evaluate a building's environmental performance and meet all user needs is challenging (Ghahramani et al., 2024). Hence, an optimal environmental building assessment should encompass the diverse requirements of all involved parties in the development process (Cole, 1998).

The fundamental purpose of an environmental building assessment method is to offer a thorough evaluation of a building's environmental attributes, employing a standardized and confirmable set of criteria and goals (Cole & Kernan, 1996). This approach enables building owners and designers to strive for elevated environmental standards. Moreover, it fosters environmental consciousness within building practices and sets a foundational path for the construction industry to advance toward environmental conservation and the attainment of sustainability objectives. The method serves as a framework for organizing environmental data, providing an impartial evaluation of building performance, and gauging progress toward sustainability goals (Cole, 1998).

According to Ding (2008), the more effective way of achieving sustainability in a project is to consider and incorporate environmental issues at an early stage, even before a design is conceptualized. However, the assessment process is usually conducted when the design of the project is almost finalized. Therefore, the use of environmental assessment methods as design guidelines cannot be sufficient. Consequently, for environmental building assessment methods to be useful as a design tool, they must be introduced as early as possible to allow for early collaboration between the design and assessment teams (Ding, 2008).

2.4.2. THE LIFE CYCLE ASSESSMENT (LCA)

Life Cycle Assessment (LCA) is a standardized methodology, as outlined in ISO 14040–14044:2006 (International Organization for Standardization, 2006), grounded in scientific principles, aimed at evaluating the environmental impacts throughout the lifecycle of a product or service. By incorporating a comprehensive range of impact categories, LCA can offer a holistic perspective in decision-making processes, considering not only the biophysical environment but also the social and economic aspects influenced by decisions, when combined with complementary methodologies (Pryshlakivsky & Searcy, 2021).

LCA considers the entire life cycle of a product, from raw material extraction and acquisition, through energy consumption, material production and manufacturing, to the use and end-of-life treatment and final disposal, as presented in Fig. 41. Through such a systematic overview and perspective, the shifting of a potential environmental burden between life cycle stages or individual processes can be identified and opportunely avoided (International Organization for Standardization, 2006). LCA addresses the environmental aspects and impacts of a product system. Economic and social aspects and impacts are, typically, outside the scope of the LCA. Other tools may be combined with LCA for more extensive assessments, such as Life Cycle Costing (International Organization for Standardization, 2006). The Life Cycle Costing (LCC) considers all the costs that will be incurred during the lifetime of the product or service, this includes purchase price and all associated costs (delivery, installation, insurance, etc.); operating costs, including energy, fuel and water use, spares, and maintenance; and end-of-life costs (such as decommissioning or disposal) or residual value (International Organization for Standardization, 2006).

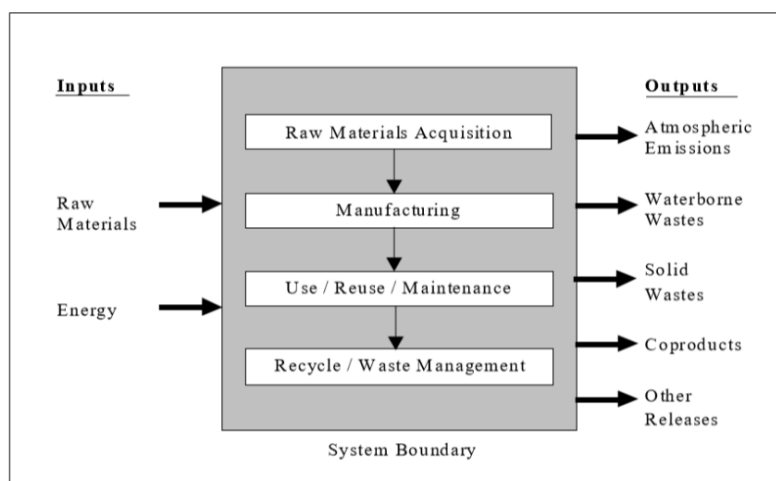


Fig. 41 - LCA Scoping and Inventory diagram.

Source: Piotrowska et al. (2019)

LCA is a relative approach, which is structured around a functional unit. This functional unit defines what is being studied. All subsequent analyses are then relative to that functional unit, as all inputs and outputs in the Life-cycle Inventory (LCI) and consequently, the Life-cycle Inventory Assessment (LCIA) are related to the functional unit (International Organization for Standardization, 2006). Moreover, the Life-cycle Assessment is an iterative technique, in which the individual phases of an LCA use results of the other phases, what is commonly called "burden shift". The iterative approach within and between the phases contributes to the comprehensiveness and consistency of the study and the reported results (International Organization for Standardization, 2006). A Life Cycle Assessment (LCA) also offers a holistic means of measuring the total energy usage in buildings, including the operating energy and a deeper appreciation of embodied energy. An LCA includes 04 steps (Fig. 42): the **Goal and Scope definition**, the **Inventory Analysis**, the **Impact Assessment**, and the **Interpretation of the Results** (International Organization for Standardization, 2006), as described after the figure bellow.

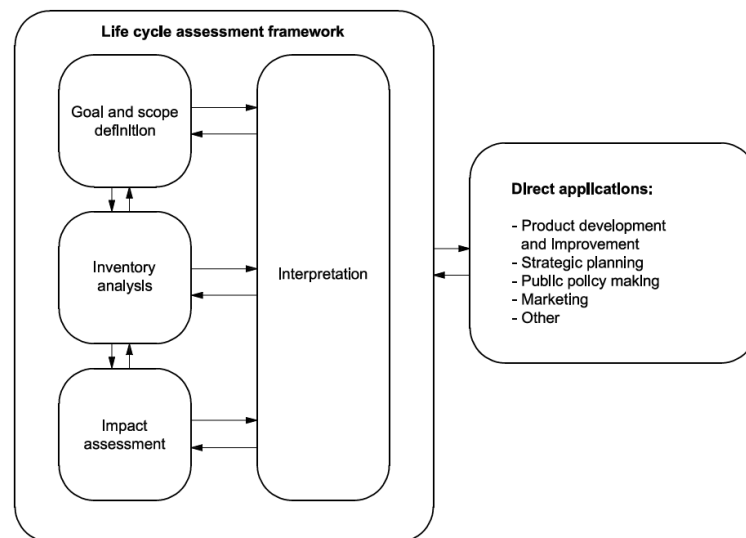


Fig. 42 - Stages of an LCA.

Source: (International Organization for Standardization, 2006)

- **STEP 01: Goal and Scope of the study** (International Organization for Standardization, 2006):

It involves defining the objective of an LCA, the reasons for conducting the study, the target audience and how the results are to be used must be clarified.

When designing the scope of an LCA, the product system to be studied, the system boundaries, the functional unit, the allocation procedures and the LCA methodology must be defined. In addition, the assumptions, limitations, data requirements, interpretation and the following type of report to be produced must be considered.

- **STEP 02: Life-cycle Inventory Analysis (LCI)** (International Organization for Standardization, 2006):

This step involves all collection of quantitative and qualitative data for each unit process that is included within the system boundary. The captured data are to be classified into four main categories: inputs (energy, raw material, ancillary, and other physical inputs); product, co-products, and waste; releases to air, water, and soil; and other environmental aspects.

- **STEP 03: Life-cycle Impact Assessment (LCIA)** (International Organization for Standardization, 2006):

The LCIA is highly dependent on the quality of the LCI and a clear definition of the system boundaries. The Life-cycle Impact Assessment includes the following mandatory elements: selection of the impact categories, indicators, and characterization models; assignment of LCI results to the selected impact categories (classification); and the calculation of category indicators results (characterization).

The results can be normalized, grouped, and weighted according to the goal of the study, type of report, and audience.

- **STEP 04: Life-cycle Interpretation** (International Organization for Standardization, 2006):

The goal and scope definition and the interpretation phases of the life-cycle assessment frame the study, while the other phases, LCI and LCIA, produce information on the product system.

The Life-cycle Interpretation is a technique to identify, quantify, check, and evaluate the results obtained from previous steps. Throughout this process, significant issues must be identified, and the completeness, sensitivity, and consistency of the findings must be checked. Conclusion, limitations, and recommendations are also the final product expected.

Regarding the categories assessed, in a brief overview, according to EN 15978:2012 there are 20 environmental impact categories (14 main environmental impact categories + 06 category indicators) possible to be considered as the result of the assessment process (European Standard, 2011), as described below:

- **Climate change total (GWP-total), fossil (GWP-fossil), biogenic (GWP-biogenic), and land use (GWP-luluc)** (European Standard, 2011):

Indicator of potential global warming due to emissions of greenhouse gases to the air. Divided into 3 subcategories based on the emission source: (1) fossil resources, (2) bio-based resources, and (3) land use change. Unit: kg CO₂-eq.

- **Ozone depletion (ODP)** (European Standard, 2011):

Indicator of emissions to air that destroys the stratospheric ozone layer. Unit: Kg CFC-11-eq.

- **Acidification (AP)** (European Standard, 2011):

Indicator of the potential acidification of soils and water due to the release of gases such as nitrogen oxides and sulphur oxides. Unit: kg mol H⁺.

- **Eutrophication-freshwater (EP-freshwater)** (European Standard, 2011):

Indicator of the enrichment of the freshwater ecosystem with nutritional elements, due to the emission of nitrogen or phosphor-containing compounds. Unit: kg PO₄ eq.

- **Eutrophication-marine (EP-marine)** (European Standard, 2011):

Indicator of the enrichment of the marine ecosystem with nutritional elements, due to the emission of nitrogen-containing compounds. Unit: kg N-eq.

- **Eutrophication-terrestrial (EP-terrestrial)** (European Standard, 2011):

Indicator of the enrichment of the terrestrial ecosystem with nutritional elements, due to the emission of nitrogen-containing compounds. Unit: mol N-eq.

- **Photochemical ozone formation (POCP)** (European Standard, 2011):

Indicator of emissions of gases that affect the creation of photochemical ozone in the lower atmosphere (smog) catalysed by sunlight. Unit: kg NMVOC-eq.

- **Depletion of abiotic resources – minerals and metals (ADP-minerals & metals)** (European Standard, 2011):

Indicator of the depletion of natural non-fossil resources. Unit: kg Sb-eq.

- **Depletion of abiotic resources – fossil fuels (ADP-fossil)** (European Standard, 2011):

Indicator of the depletion of natural fossil fuel resources. Unit: MJ, net calorific value.

- **Human toxicity – cancer, non-cancer (HTP-c)** (European Standard, 2011):

Impact on humans of toxic substances emitted to the environment. Divided into non-cancer and cancer-related toxic substances. Unit: CTUh.

- **Eco-toxicity (freshwater) (ETP-fw)** (European Standard, 2011):

Impact on freshwater organisms of toxic substances emitted to the environment. Unit: CTUe.

- **Water use (WDP)** (European Standard, 2011):

Indicator of the relative amount of water used, based on regionalized water scarcity factors. Unit: m³ world eq. deprived.

- **Land use (soil physical quality - SPQ)** (European Standard, 2011):

Measure of the changes in soil quality (Biotic production, Erosion resistance, Mechanical filtration). Unit: Dimensionless.

- **Ionizing radiation, human health (IRP)** (European Standard, 2011):

Quantifies the damage to human health and ecosystems linked to the emissions of radionuclides. Unit: kBq U-235.

- **Particulate matter emissions (PM)** (European Standard, 2011):

Indicator of the potential incidence of disease due to particulate matter emissions. Unit: Disease incidence.

Impact categories are not the be-all and end-all of measuring environmental impacts. In many cases, it makes sense to translate them into one aggregated metric, that makes the data comparable (Saro, 2022). Such information is produced during the LCIA (Life cycle inventory assessment) by adopting different methods that involve diverse impact indicators and unit measures. These methods convert the emissions into impact category indicators at the midpoint level (such as acidification, climate change, or ecotoxicity), while others employ category indicators at the endpoint level (such as damage to human health, or damage to ecosystem quality) (Saro, 2022).

For the purposes of this research, the Climate Change category will be appropriated as the main indicator, followed by energy and water consume quantifications.

2.4.3. LCA MODULES

The European Standard 15978:2011 (European Standard, 2011) details the system boundary (Fig. 43) in a complete building life-cycle assessment and each module is described next:

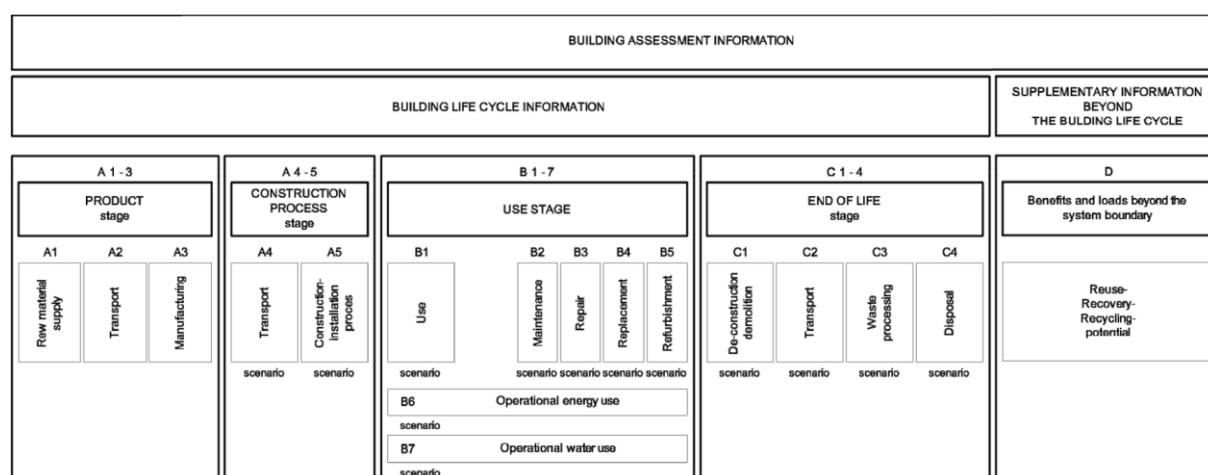


Fig. 43 - Stages of the building assessment.

Source: (European Standard, 2011)

- **Product Stage (Modules A1 to A3)** (European Standard, 2011):

Covers the "Cradle to Gate" processes for the materials and services used in the construction. It covers raw materials extraction (A1), transportation to factory (A2), and manufacturing (A3).

- **Construction Process Stage (Modules A4 and A5)** (European Standard, 2011):

Covers the processes from the factory gate to the completion of the construction work. Module A4 includes all the transportation of materials, products, and construction equipment to and from the construction site. Also, losses due to transportation are acknowledged. Module A5 accounts for all activities performed on the construction site, from the site preparation, and passing through all construction activities, up to the production, transportation, and waste management during and at the end of the construction.

- **Use Stage (Modules B1-B7)** (European Standard, 2011):

Covers the period between the completion of construction work to the moment when a building is deconstructed or demolished.

Module B1, Installed Product in Use, refers to the impact that arises from the normal conditions of use of components of the building. Module B2, Maintenance, refers to all maintenance procedures performed in the building fabric and systems, accounting for the production and transport of the components used for the maintenance procedure up to the final cleaning process after the completion of the service. Module B3, Repair, refers to fixing procedures operated during the usage phase. Module B4, Replacement, refers to the substitution of building elements. Module B5, Refurbishment, refers to major renovations in the layout, technical systems, and/or change of use. Modules B6 and B7, Energy and Water use respectively, refer to the consumption of these resources alongside the usage phase.

- **End of Life Stage (Modules C1 to C4)** (European Standard, 2011):

This stage starts when the building is decommissioned and is not intended to have any further use. Demolition and deconstruction are considered according to the type of construction and building techniques. Module C1, Deconstruction, refers to all operations related to deconstruction, demolition, and dismantling. Module C2, Transport, refers to the transport of all

material to the disposal destination. Module C3, Waste Reuse, Recovery, or Recycling, refers to waste processing as inputs for new construction with or without manufacturing process, according to its nature. Energy recovery from materials is also considered, with some restrictions. Module C4, Disposal, refers to all possible post-transportation treatment that is necessary before disposal, and disposal itself.

- **Benefits and Loads Beyond the System Boundary (Module D)** (European Standard, 2011):

Accounts components for reuse and materials for recycling that left the system boundary (Fig.. 26).

2.4.4. LCA IN RENOVATION PROJECTS

The refurbishment of current buildings is recognized as a key strategy for mitigating the environmental effects linked with construction. Regarding embodied impacts, repurposing existing structures can lessen the need for new materials to be sourced, produced, and installed. Despite the extensive literature on energy-efficient retrofitting, fewer studies delve into the variances in the overall embodied impacts of significant renovations. The reuse of the structural and envelope components provided most of the reductions, as most of the renovation was of the interior components and finishes (Hasik et al., 2019).

According to Hasik et al. (2019), the terms retrofit, refurbishment, renovation, and reuse of buildings are frequently used interchangeably. Retrofit typically refers to adding features to enhance performance in specific areas, such as energy efficiency or structural integrity. Refurbishment and renovation both involve modifying and improving existing buildings to bring them up to an acceptable condition (European Standard, 2011). Additionally, adaptive reuse refers to transforming a building from one specific use to another.

The European Standard 15978:2011 (European Standard, 2011) delineates the renovation substage within module B5 of the use stage, referring to substantial technical or functional alterations to a building that extends beyond regular maintenance, upkeep, or anticipated repairs and replacements. According to this Standard (European Standard, 2011), the boundary description for module B5 in a renovation case must comprise:

- Production of new building components (Modules A1-A3).
- Transport of new components (including the production of materials lost during transport) (Module A4).
- Construction and waste management during the refurbishment process (including the production of materials lost during refurbishment) (Module A5).
- Waste management of the refurbishment process and end-of-life considerations (Modules C1 to C4).

Moreover, the European Standard 15978:2011 also states that whether the refurbishment process was not considered in the initial assessment, and/or the nature of this change affects the service life, building type, or use, a new assessment shall be performed.

At this point, some consideration about what is included and excluded in calculations of embodied energy is reasonable. Beyond the recurrent discussion about the inclusion (or not) of transport, construction, and/or waste management in several LCAs that intend to be comparable, this paper seeks to lighten the importance of viewing the total embodied energy in two dimensions: the initial and the recurring embodied energy. While the former tends to be appropriate in most LCA studies, the latter tends to be under-reported.

According to Forsythe (2017), recurring embodied energy relates to established buildings because it manifests over the life of the building rather than upon the newly built structure. As highlighted by Forsythe & Wilkinson (2015), the primary study available that delved into recurring energy in depth was Cole & Kernan (1996) examination of life-cycle energy usage in office buildings. Although somehow dated, it remains a valuable resource for understanding embodied energy as a multidimensional concept. For instance, (Forsythe & Wilkinson, 2015) highlight that despite internal finishes accounting for only 12-15% of the initial embodied energy, these materials are frequently replaced throughout the building's lifespan, often incorporating components with high embodied energy. Consequently, the cumulative energy associated with fit-out eventually surpasses that of high-initial-embodied-energy elements like the building's structure when considering a full life-cycle approach. Additionally, (Forsythe & Wilkinson, 2015) note that building services represent 20-25% of the initial embodied energy but, these services are closely intertwined with internal refurbishment work, thus contributing significantly to recurring embodied energy over the building's entire lifespan (Forsythe, 2017).

Recurring embodied energy and energy efficiency are at the core of retail and (internal) commercial building renovation. Both markets – Retail and Office - present a high Churn Rate (Tsolaki & Menzies, 2016). Churn Rate refers to the movement of building occupancy due to organizational changes, with effects on the physical spaces (Tsolaki & Menzies, 2016). According to a study conducted among the Chartered Institution of Building Services Engineers (CIBSE) facilities managers, churn emerges as one of the most substantial operational expenses for any organization, with most of this expenditure originating from fit-out and related building services (Brittain, 2004). This expenditure is estimated to amount to £2 billion annually in the UK (Brittain, 2004). While this expenditure may be deemed essential to fulfil business goals, it falls short of aligning with sustainability objectives. Fig. 44 presents this recurring of retail fit-outs as a component of the business model, both due to the demand for renovation from the same tenant and due to the alternance of tenants in the commercial space.

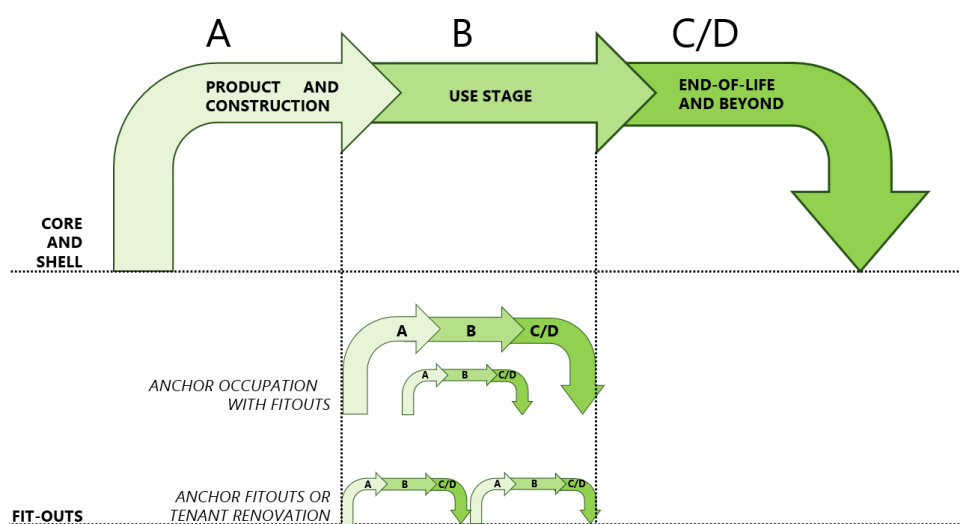


Fig. 44 - Recurring nature of retail fit-outs.

Source: Author

Forsythe (2017) performed an extensive and multi-method research on the office building occupation in the Sidney, Australia, context where he found a churn rate of 8,2 years. This short period reinforces the relevance of acknowledging the recurring embodied energy in LCA. In the retail industry context, beyond the churn that could be considered an internal lever of renovation processes to answer

strategic, operational, and commercial pressures, also a high tenant turnover is noticed (Tsolaki & Menzies, 2016). Since these same causes, commercial fit-out design for retail presents a service life even shorter, accounting for 02 to 10 years (Fieldson & Rai, 2009).

Based on these findings, it is possible to argue that the recurring embodied energy could potentially exceed the initial embodied energy when considering the building's lifespan. These conclusions reinforce the notion that addressing recurring embodied energy is a critical issue that requires more comprehensive attention in office and retail buildings. The issue here is that many LCA studies do not consider the renovations that most buildings go through before reaching the end of life. Moreover, just a few recognize the peculiar nature of the retail industry. This paper intends to contribute to filling this gap, by applying a proper LCA methodology to a retail fit-out project.

2.4.5. LCA IN INTERIOR FIT-OUTS

Buildings, along with their interiors, significantly contribute to greenhouse GHG emissions due to the continuous effects of their operation and the embodied carbon within the materials used in their construction (Ruuska & Häkkinen, 2015). As mentioned before, embodied carbon encompasses the carbon dioxide emitted throughout the manufacturing, transportation, and construction processes of building materials, as well as emissions at the end of their life cycle.

Typically, life cycle analysis calculations are based on a 60-year lifespan for a building and the embodied carbon within building materials is immediately present and permanently embedded within the physical components of the structure (Glasser et al., 2020). Initially, the impact of materials used in constructing the "Core and Shell", particularly in concrete and steel structures, outweighs the impact of the building envelope and interior fit-out combined (Fig. 45). However, the cumulative effect of interior renovations (recurring embodied carbon) surpasses these numbers before the end of service life (Glasser et al., 2020).

When comparing the life cycles of interiors, which undergo renovation or replacement approximately every 15 years on average, to the 60-year building model, it becomes apparent that interiors can have a greater impact on the building's lifespan than the original structure, as supported by (Glasser et al., 2020), in their research about office buildings fit-outs. While one may argue that 15 years is not a defensible number when considering office fit-outs, in the case of retail operations this cycle can be even shorter.

"Turnover is even faster than five years. This is what we're learning. We also have a lot of restaurants and retail. So those are key sectors or sub-sectors of building occupancy that I'm targeting to understand tenant improvement [impacts]."
(Glasser et al., 2020)

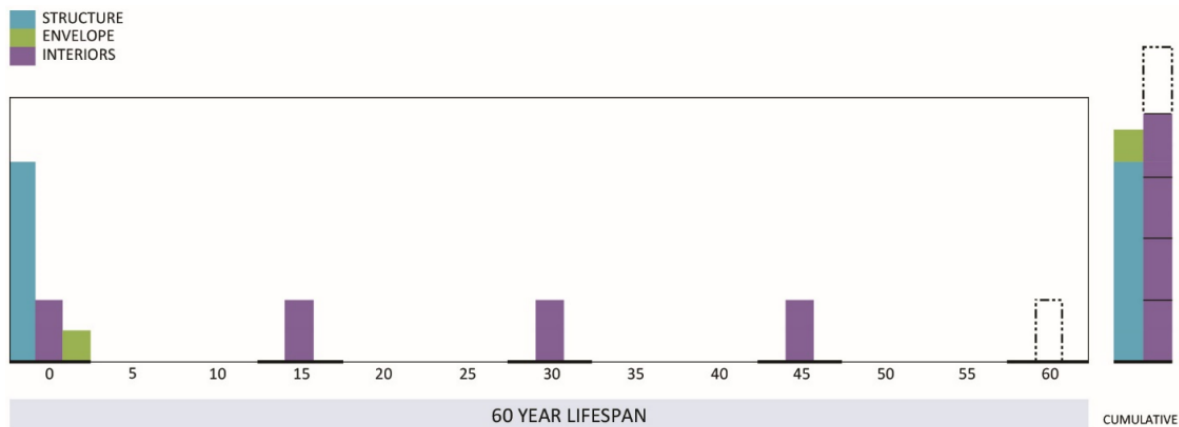


Fig. 45 - Conceptual embodied carbon in an office building.
Source: Glasser et al. (2020)

According to Glasser et al. (2020), interior design professionals have had to consider a multitude of often conflicting considerations throughout their design process, such as aesthetics, functionality, durability, cost-effectiveness, maintenance, and various other factors. However, sustainability and occupant well-being have gained increasing prominence as design criteria over the past few decades, due to the emergence of initiatives like LEED, BREEAM, WELL, and similar programs (Feijão et al., 2024). These initiatives have enhanced our general comprehension of the correlation between design choices and outcomes.

It has become evident that to effectively address environmental concerns, this broader set of criteria must influence early decision-making processes, rather than merely serving as a retrospective evaluation at the project's conclusion. The attempt to conduct separate analyses of numerous products and materials linked to a particular project, often numbering in the hundreds or even thousands, poses a significant obstacle for any project team (Glasser et al., 2020).

"As we make it easier for people to do the right thing or to select the right materials, the more they will do it... If you think about being an interior designer for a hotel, you are specifying in some cases over 10,000 items. That means they must understand 20,000 items at least because you need to have a comparative baseline to pick and say this one is better... So, they are typically building relationships with certain manufacturers or producers who they are going to be relying on to help them." (Glasser et al., 2020)

Within the scope of an LCA, the fundamental product data used for assessments and relied upon by designers originates from manufacturers. This product information is mirrored in Environmental Product Declarations (EPDs) and Health Product Declarations (HPDs). An Environmental Product Declaration (EPD) is an extensive, globally acknowledged report that relies on product data submitted by the manufacturer and validated by a third party (EPD, 2024). It outlines how a product impacts the environment across its life cycle. EPDs adhere to a standardized set of Product Category Rules (PCRs), enabling the comparison of products within the same category. Typically, EPDs remain valid for a period of five years (EPD, 2024).

However, this context of high technical demands limits its large-scale adoption by its manufacturers. Furthermore, this condition also ends up directing the investments of these manufacturers (those who perform LCA of their products to obtain the EPD) to those products that have

greater demand and sales volume. This fact results in limitations of the databases (Glasser et al., 2020). In the context of this research, this is a very sensitive point, since it studies the feasibility of a methodology that combines the use of data from LCA analysis with Circular Design strategies to improve retail fit-out projects on the path to sustainability. Given the ecosystemic nature of the Circular Design process and the novelty of the solutions generated, the materials resulting from this process will very rarely have life cycle data available. Something that generates significant difficulties in the approximation of these methods.

2.4.6. LCA CHALLENGES

Even though LCA methodologies have gained acceptance and prominence in recent years, their incorporation into interior design processes has faced several challenges. In a study performed by Glasser et al. (2020), the authors interviewed many stakeholders (interior designers, topic experts, manufacturers, and LCA software developers) trying to identify such challenges. The main findings are presented below:

- **Inaction** (Glasser et al., 2020):

The consequences of neglecting life cycle assessment, especially regarding carbon emissions, are not immediately apparent. There are no obvious indicators of the resulting harm or the associated costs and liabilities. Incorporating LCA into design or construction practices is not obligatory, which reduces the motivation to integrate LCA considerations into the process.

- **Complexity** (Glasser et al., 2020):

LCA deals with a great amount of data mostly not presented in a timely and user-friendly format. This condition converts into difficulty in access or interpretation for the average retail or interior designer.

- **Limited Database** (Glasser et al., 2020):

As mentioned before, efforts to broaden the scope of products included in LCA or carbon assessment tools are underway, but progress is not always straightforward. For companies with a wide range of products or highly variable product lines, the process of gathering data and pursuing an EPD for each item can be both time-consuming and costly. Additionally, some product categories lack defined Product Category Rules (PCR), posing a limitation. Without an applicable PCR for their product category, even well-intentioned manufacturers cannot produce an EPD for their product(s) because the necessary standardized rules do not yet exist.

- **Data Consistency** (Glasser et al., 2020):

A clean database is essential for software that supports comparisons between not only products but also product types used for the same purpose. The baseline assumptions, including PCR, impact units, and life cycle estimation, must align to make a meaningful comparison.

- **Model Integrity** (Glasser et al., 2020):

Some interior finishes often are not properly defined in modelling, particularly during the initial design phases when the design is still evolving, despite this being the stage where carbon impact information would be most beneficial for decision-making. Additionally, in some instances, the modelling software cannot export the environmental property information required by third-party LCA software.

Additional considerations regarding model integrity pertain to the accuracy of the modelling process itself. Early-stage design modelling tends to be less accurate compared to the final model, given the ongoing evolution and adjustments in the design.

- **Cost** (Glasser et al., 2020):

As designers integrate research and consideration of additional criteria into their workflow, their overhead or fees should account for this added effort. Manufacturers must commit to obtaining product EPDs for inclusion in the LCA process and utilize them to enhance their products in the future. Software designers need to enhance their capacity and robustness to encourage adoption. As emerging tools, strategies, knowledge bases, and policies evolve and gain mainstream acceptance, the financial impacts should become less noticeable or, at the very least, common to all stakeholders.

- **Time** (Glasser et al., 2020):

Making well-informed decisions requires investing time upfront in the design process, which goes against the current trend of striving to shorten project timelines through any available means. Nonetheless, to achieve optimal outcomes in material selection, it is essential to dedicate time to assess and evaluate the available options.

The retail industry presents a positive distinction regarding this point. Considering that new store concept designs are evaluated before being replicated in scale, this first project round (Conceptual or Flagship Store) usually offers more time for the development, conceptual phase, and critical thinking.

- **Furniture and Fixture** (Glasser et al., 2020):

Evaluating the consequences of furniture selection poses difficulties. Furniture typically consists of multiple components, utilizes various materials, under extensive options, and can substantially affect a project's carbon footprint. Moreover, furniture is not consistently detailed in BIM models. Additionally, there is no standardized LCA or EPD data available for comparison when selecting furniture.

Additionally, retail projects used to rely on original and exclusive designs of exhibition equipment. It presents an extra challenge regarding data inventory.

- **Visual Obsolescence** (Glasser et al., 2020):

Regarding carbon impact in new construction, the focus typically lies on materials with substantial quantities or higher impacts, such as structural systems and envelope materials, projected to endure for 60 years or more. However, in interior and retail design, the scenario differs slightly. Materials like wallboard, flooring, and ceilings are predominant in quantity. The lifespan of interior finishes and furniture varies based on material and usage, often falling short of the longevity of base building components. This variability must be considered in LCAs. As many interior designers emphasize, "Interior finishes often deteriorate aesthetically before reaching their functional lifespan," indicating frequent replacement before their intended use period ends.

- **LCA and Carbon Knowledge into Practice** (Glasser et al., 2020):

Change can be difficult, particularly when it involves well-established skills and techniques honed throughout one's education and career. Like individuals in any field, design professionals cultivate approaches and habits that yield success. However, when faced with the imperative to address existential threats and seize opportunities to effect change, adapting

can be arduous even for interior designers at the forefront of integrating embodied carbon impacts into their practice.

- **Leadership** (Glasser et al., 2020):

The direction and priorities of an organization are established by its leadership. While individual champions have played pioneering roles in the green building movement within organizations and beyond, the influence of leadership in shaping the company's trajectory and igniting tangible progress should not be underestimated.

- **Policy** (Glasser et al., 2020):

Policies and building codes are powerful components of change. They promote fairness and broaden market acceptance by mandating a uniform baseline standard of care from all stakeholders. Such policies hold particular significance when geared towards the common good, even if their implementation demands extra effort, shifts in practice, or inconvenience.

Despite these challenges, there is a growing recognition of the importance of integrating Life Cycle Assessment (LCA) into interior design processes to mitigate environmental impacts and promote sustainability. Addressing these barriers requires concerted efforts from designers, manufacturers, software developers, and policy makers (Glasser et al., 2020). By enhancing data accessibility and consistency, improving modelling tools, and fostering a culture of sustainability within organizations, the industry can overcome these obstacles. Furthermore, leadership commitment and supportive policies can drive the widespread adoption of LCA, ensuring that environmental considerations become an integral part of the design process, ultimately leading to more sustainable retail environments (Glasser et al., 2020).

2.4.7. SUBSECTION SUMMARY

Environmental building assessment methods provide a structured way to evaluate and improve the environmental performance of buildings. These methods support building owners and designers in striving for better practices and advancing towards sustainability goals. For maximum effectiveness, these assessments should be introduced early in the design phase to ensure comprehensive integration of environmental considerations throughout the project.

Life Cycle Assessment (LCA) LCA is a scientific methodology, used to evaluate the environmental impacts throughout a product's lifecycle. It covers stages from raw material extraction to disposal, aiming to avoid shifting environmental burdens between stages. The LCA process includes four steps: Goal and Scope definition, Inventory Analysis, Impact Assessment, and Interpretation of Results.

LCA modules outlines the system boundary for a complete building life-cycle assessment, including: Product Stage - Covers raw materials extraction, transportation, and manufacturing; Construction Process Stage - Involves transportation to the construction site and all on-site activities; Use Stage - Includes maintenance, repair, replacement, refurbishment, and resource use during the building's life; End of Life Stage - Encompasses deconstruction, transport, waste processing, and disposal; and, Benefits and Loads Beyond the System Boundary - which Accounts for reuse and recycling of materials beyond the initial system boundary.

Renovating existing buildings can mitigate environmental impacts by reducing the need for new materials. However, many LCA studies overlook the embodied energy in renovations. In the retail sector, interior fit-outs significantly contribute to greenhouse gas emissions due to the embodied carbon and

recurring embodied carbon effects. In many cases, renovations or replacements of interiors have a greater impact over a building's lifespan than the initial construction.

Environmental Product Declarations (EPDs) provide essential data for LCA, but their availability can be limited. The study aims to combine LCA with Circular Design strategies to improve retail fit-out projects' sustainability, despite the challenges posed by limited life cycle data for innovative materials.

2.5. OVERALL SUMMARY

The literature review presented in this section explores three key themes that define the territory of this study and provide the tools and instruments necessary for conducting the investigative part of this research. The first theme dedicates the retail Industry, focusing on the production of its built environment and the specific challenges and opportunities related to implementing a sustainability agenda. The second theme examines how the concepts of Sustainability and Circularity have been applied to the built environment, guiding the search for strategies applicable to retail fit-out projects. The third theme, which is highly instrumental, explores the standardized concepts and procedures for conducting Life Cycle Assessments (LCA), a methodology utilized in the analysis of the case study.

The subsection dedicated to the Retail Industry and Retail Design offers an overview of the production context of its built environment. This industry, which drives global supply chains and accounts for 40% of GHG emissions, represents 7% of the EU building stock (Building Performance Institute Europe et al., 2011). However, the environmental impact of this industry in the built environment is often overshadowed by the overall effects of retail operations. According to Jesse et al. (2022), 95% of the environmental impact is generated during the production and transportation of the goods sold, with 5% arising from direct operations, including buildings production and operation.

In this context, this research aims to contribute to the understanding and mitigation of these impacts. From the investigation conducted, the following points are worth highlighting and synthesizing, as their knowledge will inform the exploration of the subsequent case study:

- Firstly, it is essential to recognize that the choice of a building for commercial use is primarily determined by its location. Commercial areas in cities respond to historical processes and urban evolution, making this factor dominant over others. This often leads to extensive renovation and adaptation processes aimed at converting or updating buildings for uses not initially planned, with a significant environmental impact.
- Secondly, it is important to consider that despite the large area occupied by retail, the production of these spaces is not a core activity of retail companies. The creation and implementation of commercial spaces are intermediate activities within a broader set of initiatives that enable the physical offering of products to consumers. As a result, these spaces are typically analyzed from the perspective of cost (implementation and operation) or return on investment, but rarely from the perspective of environmental impact. This situation has been changing due to pressure from consumers and the legal environment.
- Another characteristic of the built retail environment that challenges an environmental agenda is the high rate of renewal of commercial spaces in increasingly shorter cycles. This is due to the perishability of retail operations, which often fail to withstand economic challenges, and the accelerated obsolescence of store models, pressured by the need for renewal and innovation in the competition for consumer attention. These factors shorten the investment horizon for strategies that ensure better environmental performance of projects.

- In their quest for consumer attention and distinction, retail companies invest in creating highly distinctive store atmospheres. These spaces are perceived as unique and support novel consumption experiences, often resulting in highly customized designs. Consequently, interior architecture and display equipment are typically designed for specific purposes and with exclusive designs, limiting the application of circular design strategies and greater use of locally available materials.
- Finally, and no less importantly, this literature review reinforces and affirms the role of the retail designer - usually a professional from engineering or architecture, but with additional training in psychology, consumer science, and business administration - as a potential mediator in the adoption of a green agenda in the retail-built environment.

This context of low corporate drive for improving the environmental performance of projects, limited opportunities for intervention in the design of buildings that house retail operations, the predominance of interior architecture interventions, the short lifespan of store atmospheres, and the high standardization of spaces regardless of location or building characteristics has led to the consolidation of a model for renewing retail spaces that normalizes these conditions - the retail fit-out. Understanding its functioning and implementation patterns, considering a project flow model (the RIBA Plan of Work, in this study), becomes imperative for investigating the potential adoption of circular design strategies in retail design practice, the main objective of this research.

The second theme reviewed – Sustainability - forms the backdrop and motivation for the academic program that based the production of this work. For this reason, little effort was spent characterizing or describing it, as extensive knowledge has been and continues to be produced on this topic. Instead, the focus was on gaining a better understanding of its application to the built environment through the drivers and barriers to its implementation, which will be considered when exploring the case study. Akadiri et al. (2012) enumerate the three main objectives to be achieved by a sustainable building: Resource Conservation, Cost Efficiency, and User-oriented Design. This basic and generic framework is also applicable to retail projects, with appropriate adjustments. Due to the time and resource constraints of this research, the study focuses on the first objective, while remaining committed to the other two; in other words, maintaining a commitment to the "real thing."

Circular Economy is presented as a subtheme within Sustainability, serving both as a prerequisite and as a driver. The principles of Circular Economy have found fertile ground for adoption in retail companies. Its ecosystemic nature, commitment to business outcomes, value chain vision, and application elasticity favor its implementation across all areas of organizations. This approach assigns a central role to design under the principles of reducing raw material consumption and waste generation, maximizing the service life of materials and products, and regenerating natural systems. By empowering design in this way, organizations are invited to adopt a more proactive and transformative attitude, guided by the operational dimension of Circular Economy, the Circular Design.

Circular Design proposes strategies and tools for the ideation and implementation of more sustainable design solutions. These methodologies have been evolving and adapting to meet the specificities of markets and contexts. This is the case of the *Circular Fit-out in Retail Stores Guide*, proposed by the British consultancy ARUP (Ayalp & Santoro, 2022). This guide suggests considering dozens of design initiatives that foster more circular solutions in retail fit-out projects, organized into nine strategic approaches. A framework for ideating a new, more Circular retail design which is applied in this research at two points: first, as an attempt to measure the occurrence of Circular Design strategies in recent sustainable retail projects; and second, in the development of the case study, by speculating on its applicability in combination with Life Cycle Assessment.

The review of cases and current practices in sustainable retail, along with the review of recent Corporate Annual Reports from the nine largest retail companies in Europe, seeks to establish a snapshot of the "state of sustainability" of these corporations concerning their store-built environments. This analysis supports the relevance of the case study by demonstrating that the Brazilian corporation and its circular store case are aligned both in governance for sustainability and in project maturity (presented and explored in this research) with the European corporations analyzed. Additionally, this review serves as an inspiration, offering design insights considered in the idea exploration phase applicable to the case study.

The third theme studied to form this theoretical background - Life Cycle Assessment - aims to build the necessary knowledge for its application as part of the research method used in the case study development. The application of LCA has a technical nature, and its results are highly influenced by the goals, scope, and boundaries established by the researcher. For this reason, this investigation focused not only on learning the standardized procedures necessary for its application but also on identifying the peculiarities to be recognized in an assessment of a retail fit-out renovation.

This knowledge supported the execution of a new LCA of the retail fit-out that is the subject of the case study developed in this research, with detailed procedures provided in the next section, where the Case Study is developed. The results of this assessment were classified by materialities with the highest potential for environmental harm in the GWP (Global Warming Potential) category, referred to here as "hotspots." Circular Design strategies proposed by ARUP were then applied to these hotspots in an attempt to integrate the methods (LCA and Circular Design) to produce more sustainable solutions early in the design stages. The effectiveness and applicability of this method are discussed in the conclusions of the Case Study section.

3

CASE STUDY

3.1. INTRODUCTION

After reviewing the scientific production related to the carbon intensity in retail fit-out projects in three renowned scientific databases for research – Web of Science, Scopus, and Google Scholar -, very few research based on case studies could be found. Emphasis can be given to the work of Fieldson & Rai (2009), who performed a GHG assessment of each life stage of a typical department store fit-out with 5000 sqm in the United Kingdom, considering the original project performance in comparison to three enhanced scenarios for the materials specifications.

The present case study will be partially inspired by the work of Fieldson & Rai, by comparing an enhanced design scenario to a “as usual” one. However, it differs and brings some novelty by adopting as the object not a typical retail store, but a unit designed under Circular Design principles. The case study is the self-proclaimed first Circular store in Brazil, opened in 2021, and that was designed with the architectural coordination of this author.

The exploration of a case study serves multiple objectives within the scope of this research. First, by bringing visibility in the academic environment of a retail fit-out which was a forerunner in adopting circular design strategies in Brazilian retail; Second, by providing qualified data about the design and construction processes, allowing the realization of an Life Cycle Assessment (LCA) as a mean to verify the embodied carbon and recurring embodiment carbon performance of the project, whose results corroborate with the initial assumption that the last one use to be underestimated; Third, as an additional delivery of the LCA, a list of most environmental harmful materials applied in the project is provided, giving opportunity to the exploration of design alternatives; Forth, by applying a Circular Design framework for retail projects and verifying its effectiveness in enhancing a project in the late design stages; Last, but not least, by offering a possible path of work to future researchers or designer in the field of green retail design.

Accomplishing these general objectives demands the completion of the following activities:

- i) Recover and report the case study and its context of development.
- ii) Establish the parameters and criteria under which the case will be evaluated.
- iii) Measure the results produced in terms of embodied energy and carbon through LCA.
- iv) Identify the potential environmental offenders of the project under study.
- v) Search for improvements based on the application of a Circular Design framework.
- vii) Consolidate learnings and recommendations for future similar studies.

3.1.1. METHODOLOGY AND WORKPLAN

Throughout a retail designer's professional career, opportunities to develop a new design concept from scratch are very rare. A new store model demands changes and efforts on many levels: on the operational side, in adapting the product mix, in the volume of products in the store, and in the display strategies, to name just a few; on the store execution side, a lot of effort is allocated to the design stage, in the search for technical solutions, new materials, in the development of new display strategies, in the construction of supply chains, in the approval of solutions, in the commissioning and maintenance services, among many others. This demands a lot of energy, time, and budget. Resources that are usually scarce in the retailer's agenda. For all these reasons, the recurrence of projects to improve performance over established design standards tends to be much more frequent than the new ones.

Considering this context, and considering that at the time of the development of the Renner Re+ Circular Store (2019–2021) there was still little knowledge about circular design practices, a timely question arises: **What if, three years after its implementation, the design team had the opportunity to back to the project to improve it under the light of a circular design framework, what could be achieved?**

In an attempt of answering this question, and fulfilling the objectives of this research, a roadmap is presented in Fig. 46, and described below:

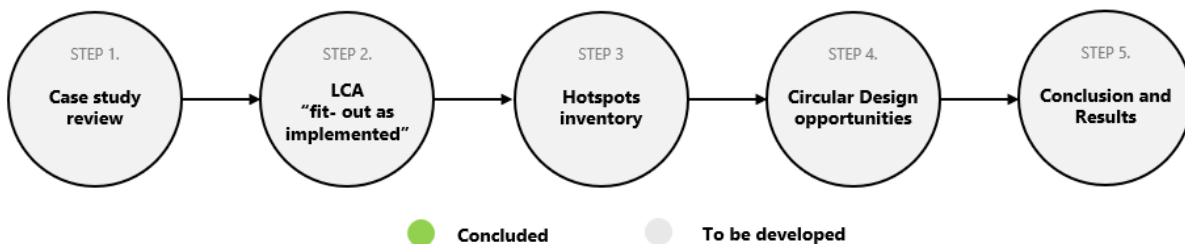


Fig. 46 - Case study roadmap.
Source: Author

- **Step 01 – Case study review:**

Reviewing the study case is an opportunity to recover all the objectives, expectations, and limitations that forged the design and decision context. It is assumed that these principles are still valid and represent the client's point of view.

- **Step 02 - Life Cycle Assessment "fit-out as implemented":**

The review of the BREEAM application dossier includes the initial LCA report (conducted by the client) that instrumented the choosing between design scenarios while in RIBA Stage 02 of development, which resulted in the Renner Re+ retail concept design.

Performing an LCA demands many decisions regarding scope, boundaries, and inventory. For this reason and considering that this research proposes a comparison between the current sustainability and circularity states of the original project with future scenarios, a new LCA is performed by the author.

- **Step 03 – Hotspots inventory:**

As one of the results obtained through the LCA, the most environmentally harmful materials (hotspots) of the project are identified. This list will be the main support for testing the application of Circular Design strategies in the search for alternative solutions.

- **Step 04 – Circular Design opportunities:**

The current design context presents a relevant evolution in the availability of tools to ease the circular design ideation process in comparison to 2019-2020', when the project was developed.

This research adopts the framework proposed by ARUP - Circular fit-out in r(Ayalp & Santoro, 2022) design principles (Ayalp & Santoro, 2022) – to produce and qualify the ideation and production of design options and scenarios. ARUP's framework offers a contextualized and specific model to foster the adoption of circular design strategies in retail fit-outs, possibly being the only one of its kind freely available.

Verifying the effectiveness of this tool for producing more sustainable alternatives to the hotspots identified by LCA will be one of the main investigations of this work.

- **Step 05 – Conclusion and Results**

The final step reflects on the research process and its ability to provide some possible answers to the research problems and meet the research objectives.

3.2. APPROACH TO THE PROJECT

3.2.1. CONTEXT

This project belongs to Lojas Renner S.A., a Brazilian corporation, founded in 1965 that employs more than 24.000 people. The corporation manages a fashion and lifestyle retail ecosystem with more than 650 stores in Brazil, Argentina, and Uruguay (Lojas Renner, 2023). According to the company's corporate annual report (Lojas Renner, 2023), their retail flagship brand is Lojas Renner (a fashion department store accounting for more than 400 units), and they also own four other retail brands: Camicado (a houseware store with more than 100 stores), YouCom (a young fast-fashion store, with more than 110 stores operating), Ashua (a plus-size fashion store for women, with 10 stores), and Repassa (the biggest second-hand online store in Brazil). All the stores are corporate-owned, and the retail design concepts are developed in close collaboration between the internal architects and external architectural/retail design consultancies.

The company has presented a strong commitment to the sustainable agenda. In 2021 the corporation submitted to the Science Based Targets Initiative (SBTi) its Scope 1, 2, and 3 emissions reduction targets for 2030, which was approved (Lojas Renner, 2023). In the same year, Lojas Renner launched its Zero 2050 commitment, as presented in the Fig. 47 and Fig. 48 below:

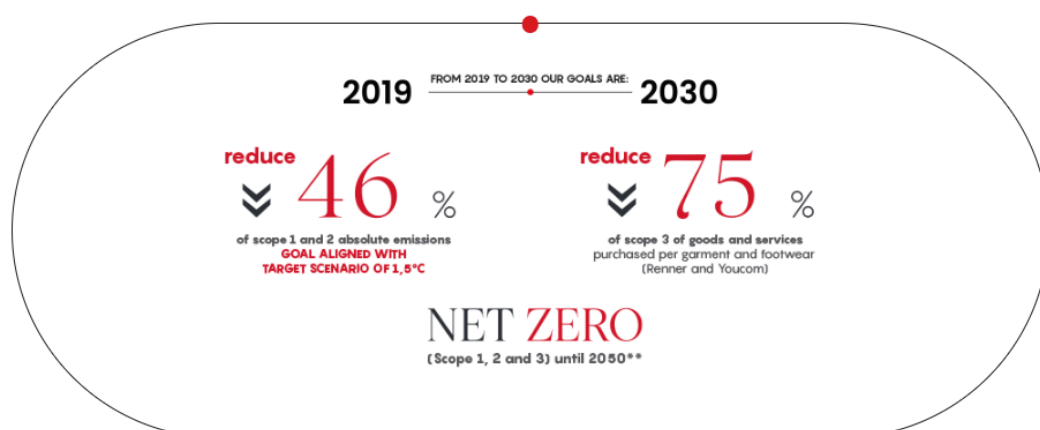


Fig. 47 - Lojas Renner's commitment to low carbon economy transition.
Source: Lojas Renner (2023)

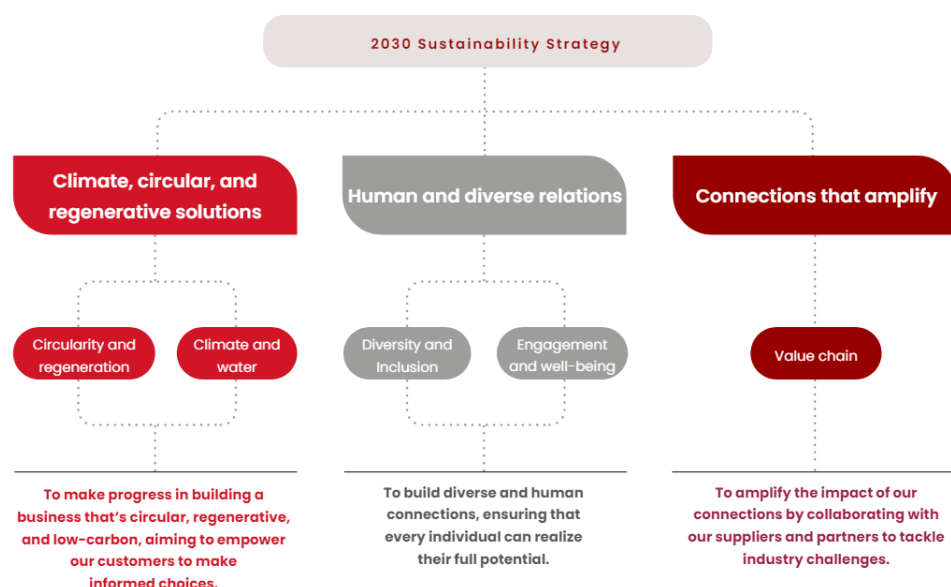


Fig. 48 - Lojas Renner's 2030 Sustainability Strategy.
Source: Lojas Renner (2023)

The company's commitment to sustainability is ongoing and can be verified by some facts, achievements, and initiatives supported as published (Lojas Renner, 2023):

- 100% of corporate energy consumption provided from renewable and low-impact sources.

Lojas Renner has worked to reduce energy consumption by investing in eco-efficient stores and efficient logistics, and by using renewable energy and low-impact sources. As a result, nowadays 100% of corporate energy consumption comes from solar, wind, and/or small hydroelectric plants. The company also invested in a wind farm in Tacaratu (Pernambuco State, Brazil), that has powered more than 170 stores and the new Distribution Center, which opened in 2023.

- 40% of stores with low water consumption.

The company is committed to decreasing usage in its operations and strategic suppliers, while eliminating the disposal of chemicals containing restricted substances in textile and footwear manufacturing. The goal for 2025 is to reach 60% of garments produced with low water consumption; and, by 2030, 40% of Renner stores with low water consumption.

- 100% of greenhouse gas emissions neutralized by compensation measures.
- 35,4% reduction in absolute corporate emissions of CO₂ when comparing 2023 against 2019 in Scopes 1 and 2.
- 99,15% of cotton products offered in stores are made with certified cotton.
- 93,1% of viscose products offered in stores are made with certified viscose.
- Supporting the Sustainable Apparel Coalition (SAC) and Higg Index.
- Supporting the Business Ambition for 1,5°C (United Nations).
- Supporting the Fashion Industry Charter for Climate Action.

Such initiatives have resulted in recognition and certifications worldwide, to quote:

- 8th listing year and 1st fashion retailer in the world in the Dow Jones Sustainability Index (DJSI) 2023.
- 2nd best fashion retailer in the world in ESG risk ranking of Sustainalytics.
- 11th consecutive listing year, rating A (2023), in the Climate Change Index of Carbon Disclosure Project (CDP).

The company has followed a new construction model for stores since 2014, based on LEED certification guidelines. From the learnings with the first certified units, many premises, concepts, and criteria were explored as possible improvements to be rolling-out in the stores chain. Initially, those more focused on energy saving, as the Energy and Asset Management Project that provided new technologies in automation, lighting, and air conditioning, were implemented delivering efficiency gains in Renner's stores.

Since 2018, Lojas Renner has been integrating the Circular Economy Principles into the new store designs, constructions, renovations, and furniture development. This approach has led to significant improvements in material consumption optimization, waste reduction, and the use of highly recyclable materials. The following analysis of the Circular Store Lojas Renner Re+ Jacarepaguá (subsection 3.2.3.6) intends to provide evidence of adoption of such strategies.

In 2021, Lojas Renner made history as the first Brazilian retail brand to open a store focused on eco-efficiency and minimizing environmental impacts – the first Circular Store in Brazil. The store followed the BREEAM (Building Research Establishment Environmental Assessment Methodology) and LEED (Leadership in Energy and Environmental Design) guidelines intending to reach certification. Since the knowledge acquired, this Circular Design concept – called Renner RE+ - was implemented as the new standard, and has been applied nationwide in shopping malls, new constructions, street stores, and renovations.

3.2.2. RENNER JK - THE FORMER RETAIL DESIGN STANDARD

The "Renner JK" retail design standard (2014-2021) was the result of many years of incremental improvements and refinements applied to the standard that was been implemented at that time. The name "JK" is a tribute to shopping mall that hosted the first unit of this type – named Shopping Iguatemi Juscelino Kubitschek (JK) -, a high-end destination shopping mall located in São Paulo, Brazil.

Renner JK is a standard characterized by heavily built Façades (Fig. 49) with a great variety and quantity of materials used, evoking characteristics related to quality and sophistication. The "closed box" type shop-windows (- Renner JK Façade and Shop-window Source: Lojas Renner (2022a)) respond to the demands of visual merchandising that require a large staging of the exhibited pieces. A fact that again corroborates the excess of construction and lighting resources.



Fig. 49 - Renner JK Façade and Shop-window
Source: Lojas Renner (2022a)

Store interiors present a complete characterization of internal spaces through the application of coatings and finishes on 100% of flooring, ceiling and wall surfaces (Fig. 50 and Fig. 51).



Fig. 50 - Renner JK Interiors
Source: Lojas Renner (2022b)



Fig. 51 - Renner JK Interiors
Source: Lojas Renner (2022b)

Furniture and exhibitors (Fig. 52) are completely custom-made, presenting a huge variety of designs and materialities, according to the store' department.

08 Materials



26 Display variations



Fig. 52 - Clothing display system of Renner JK standard – Materialities and Variations.
Source: Architecture Team (2020)

Since 2018, the Renner JK design standard started presenting many signs of obsolescence and misalignment with commercial objectives. To quote few of them:

- The Lojas Renner's commitment to sustainability goals started demanding a new approach to the retail-built environment, with better environmental performance.
- An outdated architectural and interiors design image.

The next sub-section presents the new concept design standard – Renner Re+ - designed to address answers to these questions. After that, a quantitative comparison between both standards (JK and Re+) is presented in Tab. 04, sub-section 3.2.3.6, highlighting the main achievements of the update under the scope of Circular Design Strategies by applying the ARUP's framework (Ayalp & Santoro, 2022).

3.2.3. CIRCULAR STORE RENNER RE+ - NEW RETAIL DESIGN STANDARD

3.2.3.1. THE PILOT UNITS

The Circular Store Renner Re+ retail design standard (2021-onwards) was implemented initially in two units, both in the Rio de Janeiro city, Brazil, between October 2021 and March 2022: the first, Lojas Renner Re+ Park Jacarepaguá, comprising approximately 2,500.00 sqm, and the second the retrofit of Lojas Renner Re+ Shopping Rio Sul, with approximately 6,000.00 sqm of surface. Both projects were submitted to Certification processes, LEED ID+C Retail v4 and BREEAM Refurbishment and Fit-out, achieving the Gold and Excellent standards, respectively.

As a result of this process, the stores were opened within the committed deadlines and budgets and have exceeded their revenue generation targets. All project objectives were achieved and the Lojas Renner Re+ Concept Design was ratified as the new standard and model to be followed in the chain's roll-out. Under the scope of this research, the case study will focus exclusively on the Park Jacarepaguá unit, due to its from scratch nature.

3.2.3.2. THE OBJECT LOCATION

The Lojas Renner Circular Store Re+ Jacarepaguá fit-out was the first occupancy of one anchor space in the new Multiplan Park Shopping Jacarepaguá, or simply Park Jacarepaguá. The shopping mall opened its doors in November 2021 accounting 39,000 square meters of leasable area spread across a mix of 249 stores, a supermarket, a gym, a multipurpose events center, a permanent ice-skating rink, and about 2,000 parking spaces.

The enterprise is located in the West Zone of Rio de Janeiro city (Fig. 53), in Brazil, and serves a population estimated at around 700 thousand inhabitants with enormous demand for services, commerce, and leisure - in addition to being a generator of around 8 thousand direct jobs and indirect.

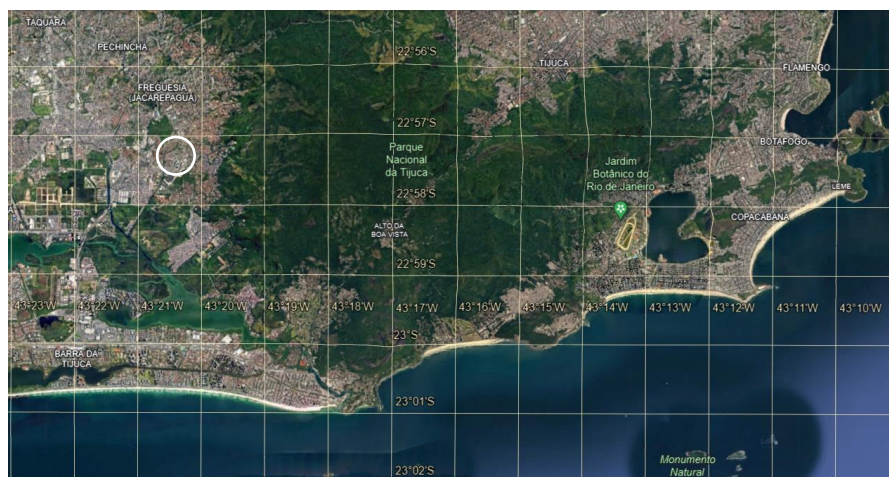


Fig. 53 - Aerial view of Rio de Janeiro City with approximate location of Park Shopping Jacarepaguá.
Source: Google Earth (2024)

The building was built between 2018 and 2021 on a greenfield site. According to information extracted from the Multiplan's website (the asset owner), Park Jacarepaguá was designed and built using modern sustainable technologies and following the best environmental practices, being already suitable

for obtaining the LEED seal (achieved in 2023, Silver level). A computational simulation of the building in aerial view is presented in Fig. 54.



Fig. 54 - Aereal view of Park Jacarepaguá Shopping.
Source: Park Jacareguá (2020)

3.2.3.3. THE CORE AND SHELL SPACE

Lojas Renner was the first tenant in a 2.240 sqm space located on the level 01st of the complex, which means one level above the ground floor, where the public entrances are situated. The space was delivered as "core and shell", corresponding to a water-proofed space with the peripheral envelope in concrete block masonry, and all concrete and metal structural frames exposed. In a view from the outside of the building it seems to be complete but, internally, all the finishes, furniture, and building services, like lighting, pipes, and air conditioning are not even installed. All these installations were implemented by the tenant. Fig. 55 presents the location of the rented unit in the level 01 of the building, confirming its condition as an anchor space, Fig. 56 shows a generic section of it, and Fig. 57 presents the space as received in a typical Core and Shell state.

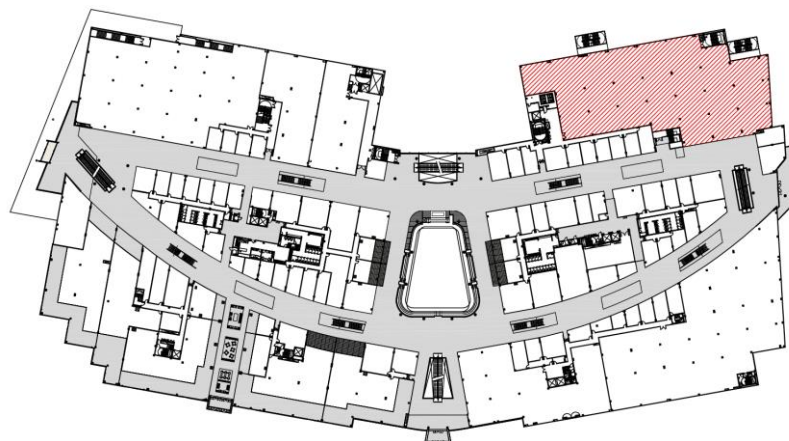


Fig. 55 - Floor plan of level 01, Park Jacarepaguá Shopping, with Lojas Renner location.
Source: Park Jacarepaguá (2019a)

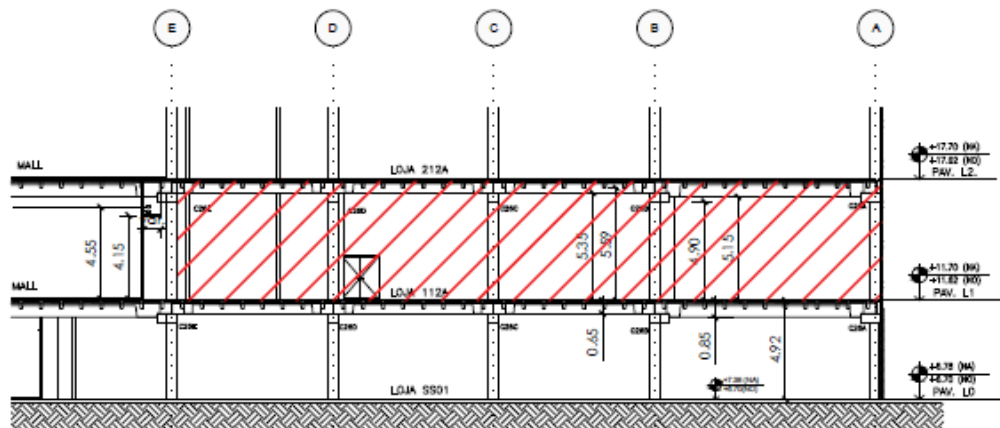


Fig. 56 - Generic Section plan of the rented area.
Source: Park Jacarepaguá (2019b)



Fig. 57 - Rented area as received.
Source: Park Jacarepaguá (2019c)

3.2.3.4. THE RETAIL DESIGN CONCEPT

As previously discussed, the environmental identity of a store is the product of several factors: type of merchandise sold, layout and navigation logic, level of experience to be offered to the shopper, implementation cost, just to quote a few of them; above all, it intends to build a unique atmosphere, in which the brand's value offering is presented through architecture and its materials. In this context, by recognizing that the practice of retail design is a particular area of architecture in which it is used to convey messages and foster consumer behavior, this subsection offers a brief contextualization of this approach that ends up determining several decisions that affect the built environment.

The Renner Re+ retail concept design primarily seeks to give prominence to the exposed merchandise. Aligned with the premises of Circularity, which first recommend a critical reflection on the effective need to make and build (R for Reduction), this Concept Design intends to build a discreet, lasting, and contemporary atmosphere, in which noble materials coexist with raw finishes, giving to the environment a strong personality. The palette of materials sought a harmonic composition, without high

contrasts, and with great visual durability (Fig. 58). The tones move from white to grey, with touches of warmth given by the wood in furniture, and coatings. The choice of materials considered factors such as availability, durability, and ease of maintenance.



Fig. 58 - Basic material palette.
Source: Architecture Team (2020a)

In the Sales zone, the navigation is structured along a central axis, called Alameda. This element, which starts at the Storefront and goes to the Dressing Rooms, crosses the entire store, serving as the main browser for the shopper. This area also presents some destination departments, such as the Beauty and Perfumery and the Shoe-gallery, The back-office area hosts the storage area, employee's resting rooms, administrative rooms, and technical rooms. A schematic vision of store layout is provided in Fig. 59.



Fig. 59 - Store's schematic layout – Main floor and Mezzanine.
Source: Architecture Team (2020b)

The storefront (Fig. 60 **Erro! Fonte de referência não encontrada.**) exploited the opening to its maximum. The reduction of materials brought greater permeability and connection with the mall, in addition to capturing a strong identity from the use of the stainless-steel railing that reproduces the construction lines of the Renner logo and generates an identity graphic pattern. In comparison to the former façade's solution, this solution presented a relevant reduction in construction material (83% less raw material consumption by volume).



Fig. 60 – Renner Re+ Jacarepaguá Façade.
Source: Lojas Renner (2022)

Just after the store's entrance, the Digital Showcase (Fig. 61)- an open shop-window - claims protagonism by deconstructing the recurrent "closed-box" shop-window solution and converting it into an open focal point that attracts the visitor to take the first steps inside the store. This solution replaced the old pattern of built and closed showcases used in Renner JK pattern with a solution that eliminated constructions and materials.



Fig. 61 - Renner Re+ Jacarepaguá Alameda and Digital Showcase.
Source: Lojas Renner (2022c)

Along the Alameda, special collections, fashion cores, resting areas, tasting points, digital interactions, and other non-ordinary exhibition solutions alternate, ensuring vitality throughout the entire route. This is a very structuring and distinctive element in shape, finishes, lighting, and mix deliveries. The Alameda also features the store's main content space: the Re Space (Fig. 62). In this space, with a scenic approach, Lojas Renner's sustainable and circular initiatives and practices are presented to customers. An educational and pedagogical space that makes tangible the results obtained by the brand in its journey to sustainability.



Fig. 62 - Renner Re+ Jacarepaguá Re Space.
Source: Lojas Renner (2022a)

The store also innovates by redesigning two specialty destination areas:

- Beauty and Perfumery: The new Perfumery Renner (Fig. 63) innovates widely in its relationship with the customer. The experience with the product is prioritized, the products are grouped by category, and all the furniture was redesigned seeking lightness, transparency, building a welcoming atmosphere. Opportunely, the volume of raw material allocated in the exhibitors and displays was reduced by 30%.



Fig. 63 - Renner Re+ Jacarepaguá Beauty and Perfumery.
Source: Lojas Renner (2022e)

- Footwear: The Renner Re+ store innovates by presenting the Shoe Gallery space (Fig. 64). A hybrid interaction zone, which recognizes and legitimizes the different purchasing behaviours recurring in this category: Contextualized (assisted purchase) and Functional Purchase (self-service purchase).



Fig. 64 - Renner Re+ Jacarepaguá Shoe-gallery.
Source: Lojas Renner (2022b)

The apparel sector (Fig. 65) occupies the rest of the selling area, which accounts for around 81% of the Sales area and holds the best opportunity to get results by redesigning the display solutions adopting circular design strategies, due to the high number of equipment allocated. Such strategies are presented next in sub-section 3.2.3.6.



Fig. 65 - Renner Re+ Jacarepaguá Apparel sector.
Source: Lojas Renner (2022d)

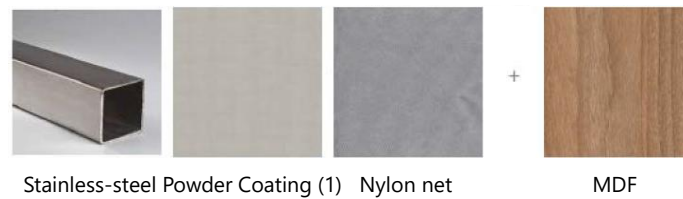
In addition to these spaces, the Dressing Room experience was completely redesigned (Fig. 66). At the gender-defined fitting rooms, the booths were expanded, new finishes and lighting solutions were adopted and, also, a larger area for circulation and waiting between booths was reserved to fostering social interaction. This waiting area was environmentally qualified using resting furniture, the presence of biophilia, a cozy lighting, and the dynamic LED signage landscape.



Fig. 66 - Renner Re+ Jacarepaguá Dressing room.
Source: Lojas Renner (2022f)

Furniture and displays continue to be made entirely to measure, a common practice in this sector despite the missed opportunity to apply circular design concepts more heavily to these elements. Still, the "Reduction" principle was implemented in three aspects: reduction in the variation of materials, reduction in the variety of displays that make up the exhibition system and reduction in the amount of material applied to build each element, always in comparison to the previous solution (Renner JK standard), as shown in Fig. 67 below:

04 Materials



16 Display variations



Fig. 67 - Clothing display system Renner Re+ - Materialities and Variations.
Source: Architecture Team (2020)

The store adopts a lighting strategy that illuminates only in areas with products are exhibited and eliminates lighting over the main store circulations. Thus, while give visual prominence to the merchandise, spare in the lighting equipment installed. The store also adopts 100% of its lighting in LED and meets the installed power limits required by environmental certifications. Even so, after performing the LCA, the lighting system proved to be very environmentally impactful.

3.2.3.5. BRIEF REVIEW ON BREEAM CERTIFICATION PROCESS

The development of the Circular Store Renner RE+ Jacarepaguá was highly influenced by the BREEAM framework, and the level of certification aspired by the client respectively. A consultancy firm, based in London, was hired to evaluate the certification potential of the project and once confirmed, to lead, and conduct the certification process, supporting and demanding all the technical teams based in Brazil.

The certification scheme adopted was the BREEAM International Refurbishment and Fit-out. This scheme is organized into 10 environmental sections – Management, Health and Well-being, Energy, Transport, Water, Materials, Waste, Land Use and Ecology, Pollution, and Innovation – each of which demands minimum requirements (prerequisites) and scoring credits for complying with specific recommendations.

The main strategies adopted that hold strong correlation with this study are organized by BREEAM section and listed below:

- Materials:
 - Performance of a Life Cycle Analysis (LCA) and evidencing how the LCA has benefited the building in terms of measuring and reducing its environmental impact.
 - Development of a sustainable procurement plan.
 - Design of architectural solutions to increase the durability and resilience of the fit-out by protecting vulnerable parts from damage and degradation.
 - Design of architectural solutions and providing evidence of appropriate measures to optimize the use of materials, by reducing materials, designing out of waste, improving circularity, reusing materials, adopting materials with high recycled content, designing for disassembly, and mitigating packaging waste.

This section calls for initiatives directly linked to Circular Design strategies and reinforces the importance of LCA in measuring environmental impact. Confirming the effectiveness of the combined adoption of these tools as a way of designing "green retail" is one of the central objectives of this research.

- Management:
 - Elaboration of a comprehensive sustainability brief, including responsibility matrix and execution plan; establishment of follow-up routines and providing evidence that such actions have impacted the initial project briefing.
 - Performing a Life Cycle Cost Assessment (LCC) according to ISO 15686-5:2008 exploring the costing effect of different design options at the Concept Design stage.
 - Assignment to an individual to monitor and report the energy use, water consumption, waste generation, and transport data from all on-site refurbishment and fit-out processes.

These commitments triggered discussions with all relevant stakeholders about the project's sustainability goals through scenario discussions based on quantified evidence.

- Health and Wellbeing:
 - Simulation of the lighting system on Dialux to address EN 12464-1 - Light and lighting - Lighting of workplaces - Part 1: Indoor workplaces - requirements for retail.
 - Adoption of all lighting in LED, limiting the light intensity in back of house areas at 350-500lux, and sales area at 750 lux.
 - Adoption of finishes, coatings, varnishes, and glues with low VOC (Volatile Organic Compound) and formaldehyde content.

The light strategy is one important component of the retail atmosphere construction. However, this system is marked by its environmental burden due to two main reasons: the excessive consumption of raw (and rare) materials to produce the pieces of equipment, and the operational energy demanded to put them in operation. In this context, procedures that intend to optimize the lighting system are very welcoming from an environmental perspective.

- Energy:
 - Provision of an energy modelling according to BREEAM standards, aiming at performance 3% higher than the ASHRAE 90 baseline.
- Water:
 - Assessment of water consumption and comparing it against a baseline performance.
 - Reduction of the water consumption by selecting highly efficient components, with flow reduction.
- Waste:
 - Implementation of a waste management plan with detailed actions to favour the packaging takeback, reuse of off-cuts, and other wastes.
 - Targeting, monitoring, measuring, and reporting of the amount of waste created on-site, and its destination.
 - Development of solutions to prevent resources and materials from going to landfills.
 - Design of design solutions for functional adaptability, such as flexible partitions and lighting systems, modularization and standardization, avoiding chemical joints, and ensuring maintenance access to technical systems.

The problem around retail fit-outs is grounded in their recurring nature, which constantly combines waste generation with raw-material demand. Classifying and quantifying this construction-demolition-waste (CDW) is the first step to trigger circular design initiatives that reduce the environmental burden in the End-of-Life phase.

As a result of this extensive process, on 03rd January 2022, the Circular Store Renner Re+ Jacarepaguá was certified under the BREEAM International Refurbishment & Fit-out scheme with the rating Excellent (Certificate number BREEAM-0094-4538), scoring 81,7%. A remarkable achievement with no precedent in the Brazilian retail.

3.2.3.6. CIRCULAR DESIGN STRATEGIES

At the time of the project Renner Re+ Jacarepaguá, mid-2019, the concepts of Circular Economy still found little dissemination both in the Brazilian business environment and in the architecture and construction sectors. Developing such a project was a novelty even for the architecture firm hired to design the project, which, until that moment, did not have any expertise in projects of this nature. On the other hand, they had other important asset: the in-depth customer knowledge built on more than 10 years of creative technical partnerships in dozens of previous store projects. This level of mutual trust and maturity of the relationship has proven paramount in the face of the development of the project and its challenges.

Posed this context, and in the absence of an architectural framework for circularity in retail fit-outs to be followed at that time, the design team started exploring many design proposals under the scrutiny of the basic commandments of the Circular Economy, which were (at that time) the 3Rs model (Reduce, Reuse, and Recycle).

Now, when the project is under review and future design scenarios are to be studied in the context of this master's research, there is room for a verification of the effectiveness of that design process using as an analysis tool the 9R framework for Circular Retail Fit-outs proposed by ARUP (Ayalp & Santoro, 2022) and previously presented in subsection 2.2.2.4. The results of this exploration are presented in Tab. 3 and the initiatives are detailed next.

Tab. 3 - Assessment of Circular Design strategies adoption.
Source: Author, adapted from Ayalp & Santoro (2022)

9R STRATEGY FOR CIRCULAR RETAIL FIT-OUT, based on Circular Design Guide ARUP2022														
		Dematerialization Responsible Sourcing Performance Procurement Design for Durability Design for Repair Design for Adapt. and Flex. Design for Remanufacture Design for Manuf. and Ass. Design for Modularity Design for Recyclability Design for Disassembly												
		R0/1	R2	R3	R4	R4	R5	R6	R7	R7	R8	R9		
FIT-OUT SYSTEM	DESIGN INITIATIVE OR SPECIFICATION	STRATEGY											COUNT	SHARE
STOREFRONT	Modularization and industrialization of façade solution	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	08	29%
STOREFRONT	Reduction in the number of components and raw materials used in the fabrication of façade	Y	N	N	N	N	N	N	N	N	N	N	01	4%
STOREFRONT	Reduction in volume and mass of the general solution	Y	N	N	N	N	N	N	N	N	N	N	01	4%
STOREFRONT	Avoidance of finishing processes, favoring raw materials in natural state (Stainless Steel)	Y	N	N	Y	N	N	Y	N	N	Y	N	04	14%
FLOORING	Fitting room flooring in vinyl with 12% recycled content	N	Y	N	N	N	N	N	N	N	N	N	01	4%
FLOORING	Vynil flooring with supplier's waste collection program	N	Y	N	N	N	N	N	N	N	N	N	01	4%
CEILING	Reduction of covered ceiling area in gypsum in the selling zone	Y	N	N	N	N	N	N	N	N	N	N	01	4%
WALLS	Standardization of the wall covering in dry-wall according to comercial dimensions of the board	Y	N	N	N	N	N	N	N	N	N	N	01	4%
FURNISHING	Reduction in the design variation in the new exhibition system	N	N	N	N	N	N	N	N	Y	N	N	01	4%
FURNISHING	Reduction in the number of components and raw materials used in the fabrication of exhibitors	Y	N	N	N	N	N	N	N	Y	N	Y	03	11%
FURNISHING	Avoidance of finishing processes, favoring raw materials in natural state (Stainless Steel)	Y	N	N	Y	N	N	N	N	N	Y	N	03	11%
FURNISHING	Reduction in volume and mass of the fixtures	Y	N	N	N	N	N	N	N	N	N	N	01	4%
LIGHTING	All lights installed directly in ellectrical grid	N	N	N	N	Y	Y	N	N	N	N	N	02	7%
		COUNT	09	02	00	03	02	01	02	01	03	03	02	
		SHARE	32%	7%	0%	11%	7%	4%	7%	4%	11%	11%	7%	
9R Strategies														
Narrow Resource Loops		Slow Resource Loops			Closed Resource Loops			Subtitle						
R0 Rethink		R3 Reuse			R7 Repurpose			Y - yes, the strategy could be identified						
R1 Refuse		R4 Repair			R8 Recycle			N - no, the strategy couldn't be identified						
R2 Reduce		R5 Refurbish			R9 Recover			X - no enough information available						
		R6 Remanufacture												

After evaluating the initiatives implemented in the project using the ARUP framework, the prevalence of initiatives supported by the dematerialization of solutions (finishing and materials) was identified. This evidence confirms the project guidelines when it was carried out (RIBA stage 01 - Preparation and Briefing): search for solutions that activate circularity while reducing implementation costs. Based on the data presented above, it is also possible to verify the effectiveness of the initiatives to industrialize solutions (namely facades and displays) as opportunities for Circular Design strategies implementation.

Another relevant inference generated from the data above is the identification of the new facade solution as the main recipient of the Circular Design strategy among the systems in this fit-out. However, this apparent achievement of the project proves to be relative when evaluating this solution from the perspective of its environmental impact through the LCA. This is a relevant finding produced by this research: the adoption of Circular Design solutions can lead to a lower environmental impact of these solutions; however, this correlation is not direct and should be duly audited.

- **New Storefront Design**

- Business as usual / Renner JK (Fig. 68):
The storefront is perceived as the “first impression” of the brand, which used to lead to overinvestment of materials and money in this area; the previous façade solution was heavily built, with a bulk number of premium materials deployed, and big internal showcases; demanding a significant volume of raw material and finishing processes to build a tailor-made solution. This design required the following materials: acrylic, aluminium, carbon-steel, MDF, and several types of coatings (paints, varnishes, and foils). If implemented, this design would consume 230 cubic-meters of store space.
- Circular Design / Renner Re+ (Fig. 69):
The façade solution is modularized and produced off-site, providing the possibility of disassembly and reuse. The entrance opening is enlarged delivering more connection between mall and store and reducing the enclosed area. The material was heavily reduced in volume, and in variety, accounting only three different types: tubular profiles in stainless steel (avoiding any process of coating), MDF boards, and tempered glass. The off-site production concept adopted for the façade contributed to reduce the waste produced in the manufacturing and installation processes, in addition to ensuring excellent quality in execution. The built façade solution consumed only 40 cubic-meters of store space.
This solution proved that RIBA stage 2 (Concept Design) and RIBA stage 4 (Technical Drawings) are the most effective in promoting the adoption of Circular Design strategies. In Concept Design (RIBA stage 2), a completely new approach was proposed to meet the client's expectations (RIBA stage 01 – Preparation and Briefing), under the influence of Circular Design strategies. The next stage (RIBA stage 03 – Spatial Coordination) had little influence on this process, and the detailed solution, with the respective materiality commitment, was produced in Technical Design (RIBA stage 04). In this stage, the industrialization project of the solution and prototyping were developed, with an effective legacy in enabling the Manufacturing, Assembling and Disassembling strategies.
- Circular Design strategies proposed, but not implemented:
Railing in timber instead of stainless steel.

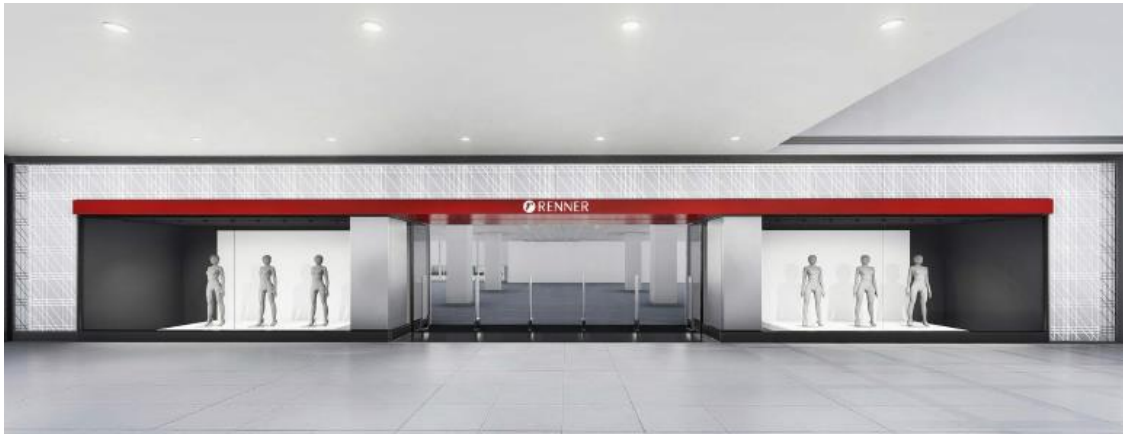


Fig. 68 - Computational simulation of former Renner JK's Façade solution.
Source: Architecture team



Fig. 69 - Computational simulation of Circular Renner Re+ 's Façade solution.
Source: Architecture team

The store's interiors have received several pro-circularity initiatives that, in addition to delivering their environmental legacy, have also contributed to a drastic transformation of the internal atmosphere, as can be seen in the comparison between Fig. 70 (standard Renner JK interiors) and Fig. 71 (standard Re+ interiors). The initiatives adopted are better described in the sequence of images.



Fig. 70 - Computational simulation of former Renner JK's interior design.
Source: Architecture team



Fig. 71 - Computational simulation of Circular Renner's Re+'s interiors design.
Source: Architecture team

- **Flooring**

- Business as usual / Renner JK:
The flooring pattern applied in the Renner JK standard follows the following logic: sales areas in porcelain flooring; changing room and back areas in vinyl tile flooring.
- Circular Design / Renner Re+:
The new standard Re+ followed the same flooring pattern of the former but bringing two enhancements: the specification of a vinyl floor with more recycled material in its composition; the specification of a product covered by the installation and end-of-life waste collection program operated by its supplier (Tarkett, Restart program).

Considering that it was impossible to change the flooring solution, given the client's desire to maintain the current (porcelain and vinyl tile), the scope was reduced to choosing the product and supplier specifications. In this context, stage 04 of RIBA (Technical Drawing) was the stage in which this solution was effectively implemented. Here, the discreet activation of Circular Design Strategies was accompanied by a low performance gain in terms of environmental impact, as confirmed in the LCA.

- Circular Design strategies proposed, but not implemented:
Changing the porcelain floor finish in the sales area for another material considering two options: i) shifting for a vinyl flooring; or ii) shifting for a low environmental impact porcelain flooring.

- **False Ceiling**

- Business as usual / Renner JK:
all internal surfaces (walls and ceilings) used to be covered with gypsum boards (drywall system) and finished in plaster and paint.
- Circular Design implemented / Renner Re+:
in the Sales area (around 2.000 sqm) the upper floor slabs were left exposed, receiving only the finishing in paint. This measure reduced in 79% the amount of gypsum boards for the ceiling in this zone.

Reflecting on the process of adopting Circular Design strategies to make this initiative viable, it is important to mention that this was perhaps the change that most changed the look of the interiors of this store. The partial removal of the false ceilings that exposed the overhead installations and roof slab contributed greatly to the validation of a new aesthetic, in which the use of fewer finishes was associated with sustainability, instead of simplicity or resources poverty. In this context, the discussions and visions produced throughout the Concept Design (RIBA stage 2) were decisive for its approval by the client. In the next stage - Spatial Coordination (RIBA stage 3) - the geometric coordination of the exposed overhead installations (electrical systems, fire prevention, air conditioning, lighting, among others) was worked on so that the result would be acceptable without detracting from the perception of the environmental quality of the space by the clients. Next, in the Technical Detailing stage (RIBA stage 4), these design strategies were duly detailed and specified to be budgeted and executed.

- **Peripheral Walls**

- Business as usual / Renner JK:
the internal lining of the peripheral walls of the Sales Area was executed in the floor-to-ceiling standard, according to the manufacturer's instructions, but without applying any rationale for using the panels based on their commercial measurements. Such negligence often resulted in up to 5 kg/sqm of plaster waste.
- Circular Design implemented / Renner Re+:
the peripheral walls had their covered surface reduced in height up to the level of the lighting fixtures. This measure allowed the drywall system was paged

according to the commercial measures of the board to mitigate cuts and waste, which reduced the amount of gypsum waste to 1,5 kg/sqm of covering.

Regarding the Circular Design implementation, this initiative faced the same validation challenges as the false ceiling removal and followed the same approval path.

- Circular Design strategies proposed but not implemented: shifting of gypsum board for wood-based panels, and the galvanized metal structure for wood-frame.

- **Exhibition fixtures and furniture**

- Business as usual / Renner JK:
the display system was highly customized to each product department and merchandise demand. This situation led to a very complex and tailor-made system, that accounted for more than 26 display variations, employing up to 08 different materials in their construction.
- Circular Design implemented / Renner Re+:
The new solution focused on standardization and modularity, which allowed parts and components to be interchanged between displays, optimizing the system. This new condition reduced display variation by 39% (16 display variations), and the new design solution reduced materiality to just 04 - stainless steel, MDF, polyester and wood - while reducing material demand by about 36% (mass measurement).

The deployment of Circular Design strategies in this fit-out system started on RIBA stage 01 (Preparation and Briefing) when the client demanded a complete renovation of the exhibition and display system guided by reduction on display variations and reduction in material consumption. At the same time, considering that these solutions are already produced through industrial manufacturing processes, much energy was allocated to modularity strategies and equipment configuration as platforms for receiving "universal" accessories. This process was exhaustively explored during the Concept Design stage (RIBA stage 02) through digital prototypes (images, renderings) and tested in the following stage (Spatial Coordination - RIBA stage 03) when the solutions were physically prototyped and could be evaluated both in their constructive aspects (assembly, materiality, durability, stability, disassembly, maintenance), and in their commercial aspects (quality of product display and capacity of products displayed). The Technical Detailing (RIBA stage 4) consolidated the solutions previously tested and developed.

- **Lighting System**

- Business as usual / Renner JK:
all lights are built into the plaster ceiling or are installed in mouldings, which limited their flexibility and performance.
- Circular Design implemented / Renner Re+:
The new light solution adopts directional surface-mounted luminaires installed directly on the lighting grid, allowing great flexibility of use and easy maintenance. This evolution was supported by software simulations and calculations produced during the Spatial Coordination development (RIBA stage 03). In the following

stage (Technical Detailing – RIBA stage 4) the solutions were properly addressed to market products.

Since this overview of the Circular Design Strategies adopted in the Circular Store Renner Re+ Jacarepaguá, it is possible to perceive which achieved some effectiveness. The results were inventoried by simple occurrence count and these number are presented in the Fig. 72 below:

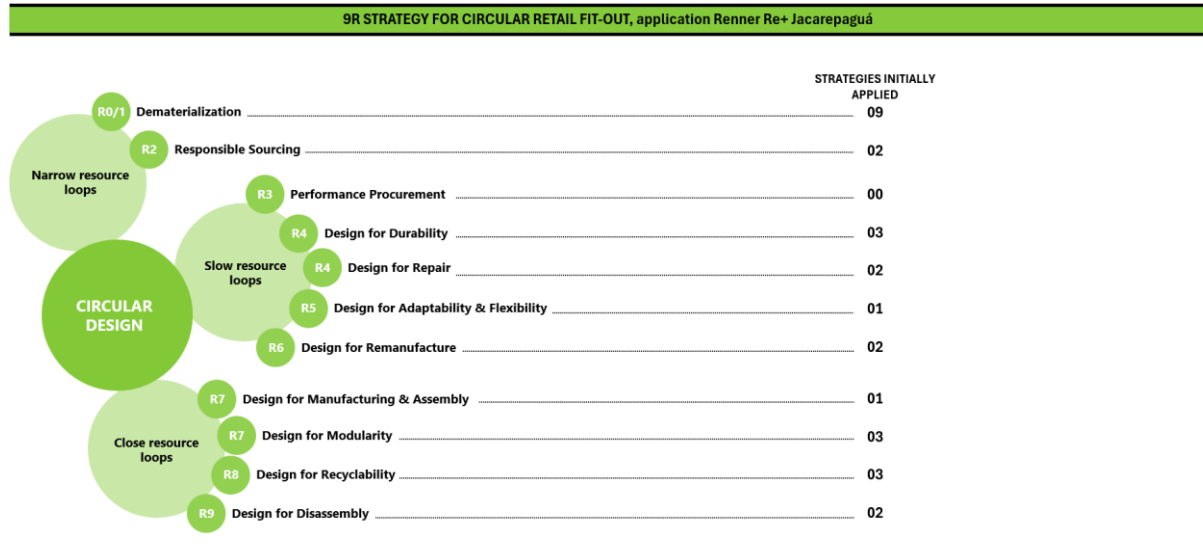


Fig. 72 - Counting Circular Design strategies applied at Renner Re+ Jacarepaguá.

Source: Author, adapted from Ayalp & Santoro (2022)

The results show a strong emphasis on reducing raw materials - **Rethink, Refuse, and Reduce strategies / R0, R1, and R2** - by redesigning architectural and exhibition solutions. Under the light of the RIBA framework, these strategies compose the “Narrow resource loops” directive, which delivers results with little dependence on ecosystem solutions. In other words, it is possible to identify the prevalence of solutions that depend almost exclusively on retail designer decisions, without the involvement of other actors or supply chains.

Otherwise, the **Reuse Strategy / R3**, is very ecosystemic and its deployment depends on establishing partnerships, agreements, contracts, and usually demanding the creation of innovative value chains. This inventory confirmed how challenging this development can be. On the other hand, other strategies that compose the “Slow resource loops” directive, which means “keep the products in use” (Ellen MacArthur Foundation, 2016) had more application due to the increasing industrialization of solutions, and avoidance of finishings (coatings, paintings) which enable **Repairing, Refurbishing and Remanufacture / R4, R5, and R6** procedures in future.

The off-site production of some fit-out systems (façade and exhibition displays) is the most responsible for the viability of the strategies under the “Close Resource loops” directive. Advanced thinking, good design, material control, and controlled fabrication that are characteristics of industrial processes, are strong enablers of good End-of-Life measures, such as **Recycling, Repurposing, and Recovering / R7, R8, and R9** respectively.

Thus, aiming to consolidate a quantitative approach for this analysis, a comparison was made between the solutions given to the fit-out systems in the two store models - Renner JK and Renner Re+

- explaining the gains obtained from the application of Circular Design strategies. These numbers are presented in Tab. 4.

Tab. 4 - Renner JK x Renner Re+ standards comparison.

Source: author

RENNER JK x RENNER RE+ - Comparison by quantification						
FIT-OUT SYSTEM ENTITY		MATERIAL AND/OR TECHNOLOGY				
		Renner JK	Quantity	Renner RE+	Quantity	Variation
STOREFRONT	Façade and Shop-windows	Temperated glass, MDF, steel-carbon structure, acrylic sheets, aluminium composed (ACM) sheets, enamel painting	230,00 m ³	Temperated glass, stainless steel rail, aluminium composed (ACM) sheets, and rolling metallic curtain, linear lighting in LED	39,25 m ³	-83% (total cubage in project)
FLOORING	Selling Área	Porcelain tile	1970,00 m ²	Porcelain tile	1970,00 m ²	No variation in quantity; only especification
	Dressing-room	Vinyl flooring in tiles	110,00 m ²	Vinyl flooring in tiles	110,00 m ²	No variation in quantity; only especification
	Back-office	Vinyl floorin in blankets	267,00 m ²	Vinyl flooring in blankets	267,00 m ²	No variation in quantity; only especification
CEILINGS	Selling Área and Back-office	Dry-wall system with moulding elements, with skim coating and painting	1.999,00 m ² dry-wall; 349,00 m ² direct painting	Partially finished in Dry-wall system, with skim coating and painting; Partially, direct painting over ceiling slabs.	507,00 m ² dry-wall; 1.841,00 m ² direct painting	-79% (Dry-wall); +527% (Direct painting)
WALLS	Peripheral Walls	Dry-wall system with skim coating and painting floor-ceiling	492,00 m ²	Dry-wall system with skim coating and painting limited in height	492,00 m ²	Variation in design, but no in quantity
FURNISHING	Apparel Section (81% of selling area net)	Stell-carbon, powder painting (03 variations), acrylic, aluminium, and glass	26 designs; Wall-exhibitor: 62,06kg	Stainless-steel, MDF (02 variations), Polyester;	16 designs; Wall-exhibitor: 39,75kg	-50% (Materialities); 39% (Design variations); -36% (Mass per unit)
LIGHTING	Selling Área	Linear and Spot LED	23.698 W (installed power)	Linear and Spot LED	26972 W (installed power)	+114% (installed power)

These numbers corroborate the previous conclusion regarding the extent of reduction measures based on design choices and industrialization. The new Façade's solution presents impressive 83% reduction in occupied space, with a proportional reduction of installed material. This condition ensured response in 08 of the 09 Circular Design strategies under the ARUP framework. The combination between design and industrialization also delivered remarkable results through the new exhibition and displays system. The new family presented three advances in comparison to the previous solution: reduction on material variety, reduction in design variations, and reduction in material mass per unit.

Despite these apparently promising results, it is worthy notice they do not present a full picture. The adoption of Circular Design strategies must be seen as a path to better decisions in favor of Circularity and Sustainability. However, the effectiveness of them under an environmental perspective demand an environmental assessment, in which the results in embodied carbon and environmental impacts are quantified and exposed. In the next sub-section are presented the main findings of the Life Cycle Assessment performed by the client as a tool to improve design decision in the Concept Design stage (RIBA stage 02), and as a mandatory component of the BREEAM Refurbishment and Fit-out certification application dossier.

3.2.3.7. FIRST LIFE CYCLE ASSESSMENT

As part of the BREAAAM certification process, a Life Cycle Assessment (LCA) performed by a sustainability consultancy in close collaboration with the Design Team explored six different design scenarios aiming the client to understand the environmental profile of each of them, supporting the decision-making process during the starting of the Concept Design (RIBA stage 2), as presented in the Tab. 5. The final report of this assessment (Giugliani & Morales, 2021) was used as the single research source to the development of this section.

Tab. 5 - Design scenarios evaluated by Design Team.
Source: Giugliani & Morales (2021)

SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5	SCENARIO 6
Reduction of ceiling lining plasterboard system	Reduction of ceiling lining plasterboard	Reduction of ceiling lining plasterboard	Reduction of ceiling lining plasterboard	Reduction of ceiling lining plasterboard	Reduction of ceiling lining plasterboard
Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system
Change of the structure of the metal mezzanine by wood	Change of the structure of the metal mezzanine by wood	Use of Steel Mezzanine	Change of the structure of the metal mezzanine by wood	Change of the structure of the metal mezzanine by wood	Use of Steel Mezzanine
Change of porcelain flooring by vinyl flooring	Change of porcelain flooring by vinyl flooring	Use of Porcelain tiles	Use of Porcelain tiles	Use of Porcelain tiles	Use of Porcelain tiles
Cement type: CPII	Optimization of the concrete mix of concrete slab on grade	Optimization of the concrete mix of concrete slab on grade	Optimization of the concrete mix of concrete slab on grade	Optimization of the concrete mix of concrete slab on grade	Optimization of the concrete mix of concrete slab on grade
Cement type: CPII	Optimization of the mortar mix_concrete slab	Optimization of the mortar mix_concrete slab	Optimization of the mortar mix_concrete slab	Optimization of the mortar mix_concrete slab	Optimization of the mortar mix_concrete slab
Improvements and changes in furniture	Improvements and changes in furniture	Improvements and changes in furniture	Improvements and changes in furniture	Improvements and changes in furniture	Improvements and changes in furniture
Use of Steelframe for partitions	Use of Steelframe for partitions	Use of Steelframe for partitions	Use of Steelframe for partitions	Change of the wall frame from steel to wood	Change of the wall frame from steel to wood

This opportunity inventory followed Circular Design strategies, as presented before, and the technical brainstorm resulted on 06 possible future design scenarios. The design options explored improvements on ceilings, walls and floorings coverings and structure; alternatives on the mezzanine structure (metal x timber); improvements on the exhibition furniture and displays (materials reductions and service life extension by design improvements); optimizations in the types of cement and mortars (replacement of clinker by fly ash); and a new Façade's design. These scenarios were scrutinized from the following variables:

- Readiness-to-market of the solution or material.
- Availability for supplying in country-scale.
- Approval of the solution before technical and legal authorities.
- Availability in time.
- Availability under controlled budgetary stress.
- Potential of environmental contribution based on LCA early estimation (Fig. 73).

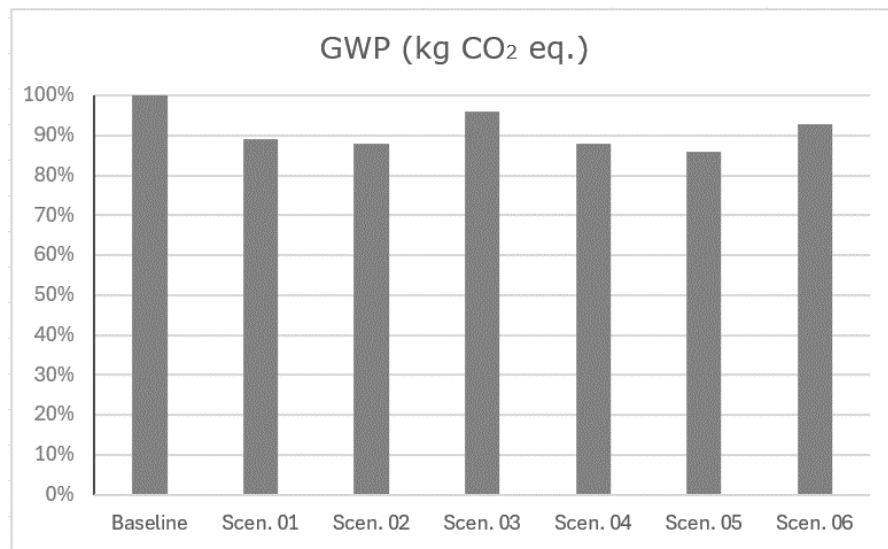


Fig. 73 - Global Warming Potential (GWP) of each scenario evaluated against baseline.
Source: Giugliani & Morales (2021)

Although these scenarios for improved environmental performance were assessed, the teams encountered significant challenges. Within the project's stipulated deadline, the initial analysis did not identify a qualified supplier willing to forgo the use of toxic preservatives for treating the wood intended for the mezzanine structure. Unfortunately, in the Brazilian market, the most used preservative is CCA (Chromium, Cadmium, Arsenic), which has been shown to pose potential toxicity risks during production, use, and disposal. Consequently, the decision to opt for a metallic mezzanine was made for this specific reason (Giugliani & Morales, 2021). This condition determined the unfeasibility of Scenarios 01, 02, 04, and 05. Scenario 06 was declined by the client's decision to avoid the risk of increasing the load of combustible materials in the project, which could present some risk of approval by the Fire Department, with an effect on the approval period of the respective project.

Thus, the less promising (according to the GWP assessment), but more feasible one (according to the feasibility assessment carried out by the client and project team) – the Scenario 03 - was chosen and the design proposals were converted into design solutions as the project evolved from Concept to Technical Design (project development from RIBA stage 02 to stage 04). In RIBA Stage 04, the Architectural and Engineering systems were completely resolved and detailed, compounding a complete technical photography of the project that is then ready for procurement, construction, and for a new Life Cycle Assessment round.

A 20-year service life was adopted for the new LCA study, which was conducted following ISO 14044 and EN15978. The eToolLCD software was adopted to model the infrastructure's environmental impacts and the critical review (as demanded by ISO 14044) was conducted by an eToolLCD consultant.

After performing the LCA considering RIBA 04 documentation for Scenario 03, the results were compared with a baseline reference. This baseline is composed by the average performance of previous LCA processes performed in Renner JK units). These numbers are presented in the Tab. 6:

Tab. 6 - Summary of results for improved design (Scenario 3) against baseline - 20 years study period.
Source: Giugliani & Morales (2021)

Characterised Impacts Per m2 Usable Floor Area		Baseline	Improved Design	Improved Design Savings Against Baseline
Environmental Impacts				
Global Warming Potential, GWP	kg CO2 eq	330	320	3,03%
Ozone Depletion Potential, ODP	kg CFC-11 eq	4,10E-05	4,00E-05	2,44%
Acidification Potential for Soil and Water, AP	kg SO2 eq	2,9	2,9	0,0%
Eutrophication potential, EP	kg PO4 eq	1,5	1,5	0,0%
Photochemical Ozone Creation Potential, POCP	kg ethylene	0,27	0,27	0,0%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	0,012	0,012	0,0%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	4100	4000	2,44%

The results confirmed a discreet reduction few categories (GWP, ODP, and ADPF), and no changes in the others, what demanded a deeper understanding of the effective contribution of the each of the initiatives proposed in Scenario 03 combo. The results, with emphasis on GWP category, are exposed in the Tab. 7, presented below.

Tab. 7 - Low impact strategies impact against baseline - 20 years study period.
Source: Giugliani & Morales (2021)

Design Strategy Performance			
Strategy	Initiative	Change	GWP
Reduce Material Use	Ceiling framing (steel grid) reduction	from 2741.5 to 1079.3kg of steel;	0,52%
Reduce Material Use	Ceiling lining plasterboard reduction	from 1293.15 to 509.1m2 of plasterboard, skim plaster finish and paint	1,03%
Ceiling improvements	Increased PVA latex painting	from 1284.1 to 2550.55 m2	-1,08%
Reduce Material Use	Internal wall lining plasterboard reduction	from 955.4 to 566.88 m2 of plasterboard, skim plaster finish and paint	0,44%
Store façade changes	Glass reduction	from 73.98 m2 to 37.39 m2	0,19%
Store façade changes	Increased door steel roller door area	from 20.35 to 45.1275m2	-0,09%
Store façade changes	Increased Aluminum Composite Material	from 200.79 to 208.75 m2	-0,23%
Store façade changes	Inclusion of Stainless steel	from 0 to 676.16 m2	-0,40%
Store façade changes	Reduction of MDF	from 164.89 to 8.49 m2	0,16%
Store façade changes	Increased structural steel framing	from 1361.95 to 2095.32	-0,33%
Store façade changes	Plasterboard removal	from 100 to 0 m2	0,26%
Furniture improvements	Changing type and quantities.		-0,04%

The study exposed discreet, but positive, contribution of the initiatives that make up Scenario 03, but casts a shadow over 02 strategies in which was posed great expectations due to their apparent outstanding performance under the perspective of the Circular Design adoption:

- New façade solution:
It was pointed out by the LCA that the new model increases the structural steel and stainless-steel consumption, which largely returns the environmental impacts saved by the reduction of other materials, eclipsing the gains arising from the drastic reduction in materiality.
- New Exhibition system:
Like what happens with the new façade solution, the new furniture set in brushed steel neutralizes the gains obtained by reducing materials.

As a final contribution of the LCA Report (Giugliani & Morales, 2021), the paper highlights its contribution to test and validating the design concepts and improving the retail design's environmental profile, especially leading the project for the reduction of materials. However, end-of-life scenarios were

not included given the limitations of the scope. Opportunely, recommendations were made for future projects by the sustainability consultancy as listed below:

- Upgrading the façade's design testing material alternatives to stainless steel.
- Adoption of nontoxic wood for structures and walls (e.g. mezzanine structure in timber);
- Carrying out specific studies that address the operational stage of the store, focusing on energy consumption.
- Making use, whenever possible, of circular strategies (reuse, remanufacturing, recycling, ...).

Such recommendation has been appreciated in the course of this work when alternative designs are considered under the light of the Circular Design strategies.

3.2.3.8. SUBSECTION SUMMARY

This subsection presented the case study of the Renner Circular Store Re+ Jacarepaguá. The production of this material marks the completion of the first stage of the methodology developed for the investigation of this case study, as illustrated in Fig. 74 below. This accomplishment also directly addresses one of the objectives outlined in the introduction of this work: to document, within an academic framework, the challenges faced, and the design process undertaken in the creation of a new Retail Concept Design influenced by Circular Design strategies.

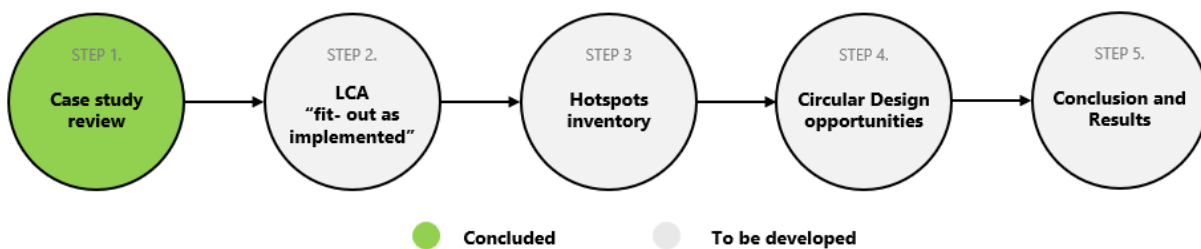


Fig. 74 - Case study roadmap status.

Source: Author

The detailed description of the case, both in its technical aspects and conceptual elements (particularly in the context of Retail Design strategies), aims to share a part of the reality of this professional practice. The hope is that this account can serve as a reference for other retail designers who are challenged to design green retail environments.

From this review, several findings and conclusions should be highlighted:

- It was observed that a high level of ESG (Environmental, Social, and Governance) maturity is required for similar corporations to take their first steps toward adopting Circular Design strategies in their physical retail operations.
- The substantial effort and investment needed to create a new retail model were also evident. The magnitude of this challenge confirms that this is a unique opportunity and that advancing a sustainability agenda in retail fit-outs necessarily involves incremental approaches and the refinement of existing store standards.
- The review of the project's submission process for BREEAM certification highlighted the utility of adhering to a certification system, as it sets out various activities that induce more

sustainable solutions, including the requirement for conducting an LCA (Life Cycle Assessment).

- The review of the LCAs conducted during RIBA stages 02 and 04 revealed their contribution to generating design scenarios, with their potential being most effective when carried out in the early stages of design (RIBA 02).

Despite the modest quantitative results, as evidenced by the percentage reduction in the Global Warming Potential category when comparing Renner JK and Renner Re+ standards, the consolidation of the Renner Circular Store Re+ retail standard has played an important role in Brazilian retail by materializing a concrete stance and commitment to a more sustainable retail environment, initiated by the largest fashion retailer in the country. This initiative places responsibility on others, triggering a promising chain reaction.

The next section begins the experimental stage of this research, in which the aim is to explore on possible improvements to the design under the light of a Circular Design framework developed for application in retail fit-outs, combined with results derived from the LCA. Assessing the effectiveness of this combined methodology (Circular Design + LCA) constitutes the main achievement of this master's research.

3.3. EXPERIMENTAL PLAN

3.3.1. PLANIFICATION

This section starts the investigation phase of this work. After reviewing the study case, the achievements regarding sustainability and circularity were identified and qualified. In addition, some ideas for future enhancements were collected. The following developments are dedicated to achieving the objectives of this research. The following sequence of activities will be pursued along this trajectory, as anticipated in the roadmap presented in subsection 3.1.1.:

- **Conducting a new Life Cycle Assessment - LCA “fit-out as implemented”**

The execution of an LCA is a highly particular exercise. Throughout the process, numerous decisions made by the researcher to align the study with its objectives affect the process individually and through iteration. From defining the goals and scope to conducting the inventory and allocating flows based on the available database, and finally interpreting the results, each stage demands significant decision-making (through choices and trade-offs) from the responsible researcher.

The need to conduct a new LCA within the scope of this research is justified for two main reasons:

- First: Due to the aforementioned reasons, which ultimately limit the capacity to analyze the results obtained in the LCA conducted during the RIBA 2 and RIBA 4 stages of project development, presented previously.
- Second: Due to the necessity to quantify environmental impacts from the perspective of the retail fit-out required by this research, which is limited to analyzing the impacts of architectural components (interior architecture and display equipment) and structural supports for interior architecture (mezzanine structures and facades), without considering Mechanical, Electrical, and Plumbing

(MEP) systems. Such systems were considered in the first LCA, conducted during the design phase and submitted to the BREEAM.

Thus, the section 3.3.2 is dedicated to present the LCA process of the Renner Re+ Jacarepaguá fit-out. In subsection 3.3.2.1, the main delimiters, constraints, and assumptions made will be presented. Subsection 3.3.2.2 elucidates how the flow and material inventories were conducted. Subsection 3.3.2.3 presents and evaluates the results of this LCA and discusses the main environmental offenders of the project, referred to here as "hotspots." The search for circular design strategies to mitigate these effects will be the focus of the next section.

- **New Circular Design strategies**

Based on the findings of the previous activities and supported by ARUP's guideline for circular fit-out in retail (Ayalp & Santoro, 2022), new circular design strategies are speculated and proposed in subsection 3.3.3.1.

- **Results**

After performing these activities, this section is concluded with a reflection on the effectivity of the applied method on attending the research objectives.

3.3.2. SECOND LIFE CYCLE ASSESSMENT "FIT-OUT AS IMPLEMENTED"

3.3.2.1. GOAL AND SCOPE

The goal of this Life Cycle Assessment is to provide the profile and deep knowledge of the environmental performance of the Renner Re+ Circular Store Jacarepaguá fit-out in the original design and construction conditions.

The scope of this study has been conducted following the EN 15978 Standard. The functional unit that best reflects the core purpose of this project and allows present and future comparisons to different designs under the same goal and scope, is the one square-meter Gross Floor Area over the life span.

The object of this assessment is the entire fit-out, including all the upstream and downstream processes needed to characterize the space as a Renner Re+ Circular Store and provide its structure, operation, maintenance, and final demolition and disposal. Considering the limitations on access to technical information, only the materials and processes related to the structural and architectural configuration of the space were considered in this LCA. Technical installations dedicated to climatization, electrification and cabling, and fire protection, were not considered in the inventory phase. The inventory includes the extraction of raw materials or energy, as well as the release of substances back into the environment, up to the point where inventory items exit the system boundary, either during or at the end of the project's life cycle.

The system boundary of this LCA is presented below (Fig. 75), following the guidance given by EN15798.

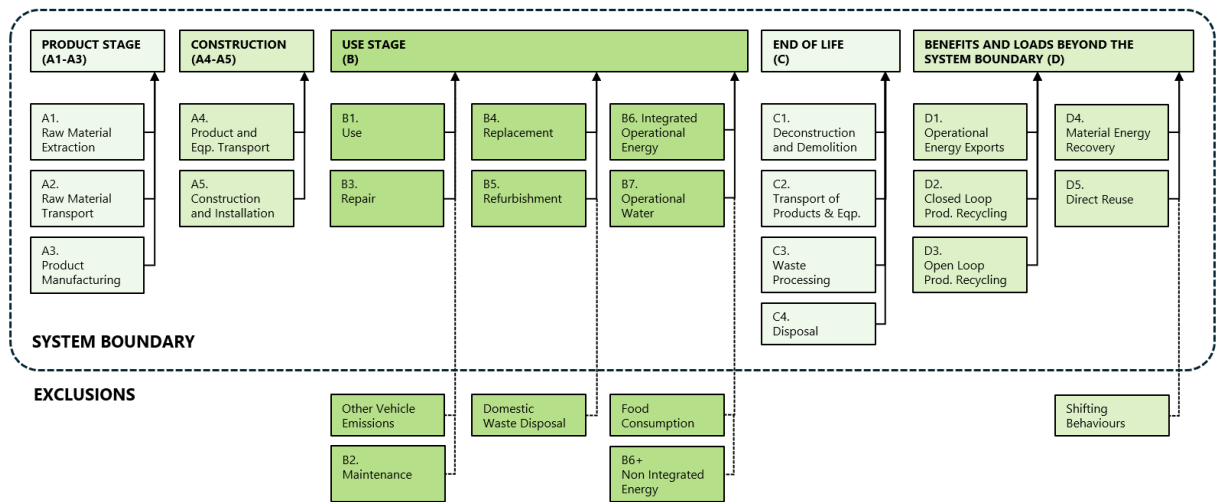


Fig. 75 - Case study System Boundary.

Source: Author, adapted from EN15798

This LCA was performed using the application One Click LCA Student (International) Business version, cloud-based. This license is provided free of charge for proven academic purposes and is limited to one year of usage. One Click LCA was selected due to a combination of factors: freely availability, friendly interface, extensive database, and commercial success, being compliant with more than 80 building Regulations, Legal Local Requirements, and Standards (including EN15978 and Level(s), in the European Union) and Certification frameworks globally according to the software provider.

The environmental indicators that have been included in the study are listed in the Tab. 8:

Tab. 8 - LCA Impact Categories.

Source: Author, adapted from OneClick LCA

LCA IMPACT CATEGORIES		
IMPACT CATEGORY	ABBREVIATION	UNIT
Global Warming Potential	GWP	kg CO ₂ eq
Biogenic Carbon Storage	BIO-CO ₂ storage	kg CO ₂ eq bio
Ozone Depletion Potential	ODP	kg CFC-11 eq
Acidification	AP	kg SO ₂ eq
Eutrophication	EP	kg PO ₄ eq
Formation of Ozone of Lower Atmosphere	POCP	kg Ethenee
Abiotic Depletion of Potential for non fossil	ADPE	kg Sbe
Abiotic Depletion of Potential for fossil resources	ADPF	Mj
Use of Renewable Primary Energy Resources as Raw Materials	PERM	Mj
Total Use of Primary Energy (ex. Raw Materials)	-	Mj
Total Use of Renewable Primary Energy	PERT	Mj
Total Use of Non Renewable Primary Energy	PENRT	Mj
Use of New Fresh Water	FW	m ³

The EN15978 cut-off criteria were used to ensure that all relevant potential environmental impacts were appropriately represented:

- Mass – if a flow is less than 1% of the mass at either a product level or individual process level, then it has been excluded.
- Energy – if a flow is less than 1% of the energy at either a product level or individual process level, then it has been excluded.

- The total of neglected input flows per module, e.g. per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4, and module D shall be a maximum of 5% of energy usage and mass.
- Environmental relevance: if a flow meets the above criteria for exclusion, but is considered to potentially have a significant environmental impact, it has been included. All material flows that leave the system (emissions) and whose environmental impact is higher than 1% of an impact category have been included.

Allocation rules follow EN15804 as given below:

- Allocation will respect the main purpose of the studied processes. If the main purpose of combined processes cannot be defined, economic allocation may be used to divide resources and emissions between the products.
- The principle of modularity is maintained. Where processes influence the product's environmental performance during its life cycle, they will be assigned to the module where they occur.
- The sum of the allocated inputs and outputs of a unit process is equal to the inputs and outputs of the unit process before allocation. This means no double counting of inputs or outputs is permissible.

Regarding the completeness of this LCA, the study follows EN15804 procedures for the exclusion of inputs and outputs:

- All inputs and outputs to a (unit) process shall be included in the calculation, for which data are available.
- Data gaps may be filled by conservative assumptions with average or generic data.
- Conservative assumptions in combination with plausibility considerations and expert judgment can be used to demonstrate compliance with these criteria.

In accordance with ISO14044 an independent critical review of this LCA was performed by the same professional and consultancy responsible for the Life Cycle Assessment conducted in the design phase of the project as part of BREEAM certification process.

3.3.2.2. INVENTORY PROCESS

The identification and quantification of inputs and outputs is based on the following documents provided by Lojas Renner's Architecture and Engineering team and produced during the design and building phases:

- **Bill of Quantities (BoQ) - LPU-RNR-00491-SH JACAREPAGUA**

The Bill of Quantities (Fig. 76 and Fig. 77), called in Brazil "*Lista Unitária de Preços (LPU)*", was produced by the external architecture team as the main component of the bidding process along with the full technical project (RIBA stage 4). This spreadsheet inventories all the construction and materials demanded by the fit-out, leaving space to fill in possible activities and supplies that are missing or do not perfectly fit into the activities already listed in the document, as accused by the bidding construction companies. The document is a tailor-made tool, produced by the client's internal technical team, and accumulates more than 10 years of usage and improvement. The full version of this document, with the quantifications related to the Renner Re+ Jacarepaguá fit-out that has applied in this LCA exercise, is available in the Annexes Section.

  		R10.2 LPU R10.2 - Versão para uso das construtoras e escritórios, exclusivas para lojas do projeto RE+ e Certificadas março-21																																																									
LOJAS RENNER / CAMICADO / YOUCOM / ASHUA DIVISÃO DE LOJAS DAEx - Departamento de Arquitetura, Engenharia e Expansão LPU - LISTA DE PREÇOS UNITÁRIOS																																																											
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PROJETO: RNR - 00491 - SHOPPING JACAREPAGUÁ Sigla: RNR Cód Obra: 00491 Nome Obra: SHOPPING JACAREPAGUÁ Endereço: Rua/Av: Estrada de Jacarepaguá Nº: 6.069 Complemento: Bairro: Jacarepaguá Estado: Rio de Janeiro Cidade: Rio de Janeiro CEP: 22753-033	Valor Total do Orçamento: R\$ - Área Total Construída: 2.577,25 m² Custo por m²: R\$ - /m² Benefícios e Despesas Indiretas (BDI): 0,00% Leis Sociais (LS):		MENU GERAL DAS GUIAS (hiperlink) A Manual da LPU Geral B Resumo de Valores B1 Resumo de Valores - RE+ e Certificação C LPU Geral - Preenchimento D BDI e Faturamento Direto E Dashboard																																																								
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Fig. 76 - BoQ Lojas Renner summary page.
 Source: Lojas Renner's Architecture and Engineering Department



LPU GERAL - PRECIFICAÇÃO DE OBRAS

Obra: RNR - 00491 - SHOPPING JACAREPAGUÁ

Região: SUDESTE

Cidade: Rio de Janeiro

Tipo: Projetos de Inauguração

Inauguração Lojas Renner

Construtora:

0

Legenda:

Legenda:

Entrada de dados de valores e observações

Entrada de dados de quantidade e Faturamento Direto (FD)

Informar com "X" se o item é devido Certificação ou RE+

Para Itens de Fachada RE+, orçar em Omissões linhas específicas

* NÃO ESQUECER: Limpar filtros após finalizar o orçamento

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT
238	2	04	04.02	04.02	CIVIL	Divisórias				RN	YC	CM						
239	3	04	04.02	04.02.01	CIVIL	Paredes de gesso acartonado - dry wall				RN	YC	CM						
240	4	04	04.02	04.02.01.001	CIVIL	Divisória em gesso acartonado dry wall simples, esp. 7,5cm	m²			RN				396,36				-
241	4	04	04.02	04.02.01.002	CIVIL	Divisória em gesso acartonado dry wall simples, esp. 10cm	m²			RN								-
242	4	04	04.02	04.02.01.003	CIVIL	Divisória em gesso acartonado dry wall simples, esp. 15cm	m²			RN								-
243	4	04	04.02	04.02.01.004	CIVIL	Divisória em gesso acartonado dry wall dupla, esp. 7,5cm	m²			RN				201,06				-
244	4	04	04.02	04.02.01.005	CIVIL	Divisória em gesso acartonado dry wall dupla, esp. 10cm	m²			RN				203,24				-
245	4	04	04.02	04.02.01.006	CIVIL	Divisória em gesso acartonado dry wall dupla, esp. 15cm	m²			RN								-
246	4	04	04.02	04.02.01.007	CIVIL	Divisória em gesso acartonado dry wall simples resistente a umidade (placas RU), esp. 7,5cm	m²			RN								-
247	4	04	04.02	04.02.01.008	CIVIL	Divisória em gesso acartonado dry wall dupla resistente a umidade (placas RU), esp. 7,5cm	m²			RN				10,45				-
248	4	04	04.02	04.02.01.009	CIVIL	Divisória em gesso acartonado dry wall simples resistente a umidade (placas RU), esp. 10cm	m²			RN								-
249	4	04	04.02	04.02.01.010	CIVIL	Divisória em gesso acartonado dry wall duplas resistente a umidade (placas RU), esp. 10cm	m²			RN				43,62				-
250	4	04	04.02	04.02.01.011	CIVIL	Divisória em gesso acartonado dry wall simples resistente a umidade (placas RU), esp. 15cm	m²			RN								-
251	4	04	04.02	04.02.01.012	CIVIL	Divisória em gesso acartonado dry wall dupla resistente a umidade (placas RU), esp. 15cm	m²			RN								-
252	4	04	04.02	04.02.01.013	CIVIL	Divisória em gesso acartonado dry wall simples resistente a fogo (placas RF), esp. 7,5cm	m²			RN								-
253	4	04	04.02	04.02.01.014	CIVIL	Divisória em gesso acartonado dry wall dupla resistente a fogo (placas RF), esp. 7,5cm	m²			RN								-
254	4	04	04.02	04.02.01.015	CIVIL	Divisória em gesso acartonado dry wall simples resistente a fogo (placas RF), esp. 10cm	m²			RN								-
255	4	04	04.02	04.02.01.016	CIVIL	Divisória em gesso acartonado dry wall simples dupla a fogo (placas RF), esp. 10cm	m²			RN								-
256	4	04	04.02	04.02.01.017	CIVIL	Divisória em gesso acartonado dry wall resistente a fogo simples (placas RF), esp. 15cm	m²			RN								-
257	4	04	04.02	04.02.01.018	CIVIL	Divisória em gesso acartonado dry wall resistente a fogo dupla (placas RF), esp. 15cm	m²			RN								-
258	4	04	04.02	04.02.01.019	CIVIL	Cantoneira de arremate para paredes de gesso	m			RN								-
259	4	04	04.02	04.02.01.020	CIVIL	Divisória em gesso acartonado dry wall simples, esp. 12,5cm	m²					CM						-
260	4	04	04.02	04.02.01.021	CIVIL	Prenchimento de parede de gesso com lã de rocha	m²			RN		CM						-
261	4	04	04.02	04.02.01.022	CIVIL	Prenchimento de parede de gesso com lã de vidro	m²			RN	YC							-
262	4	04	04.02	04.02.01.023	CIVIL	Reforços estruturais para paredes de gesso	m²			RN	YC							-
263	4	04	04.02	04.02.01.024	CIVIL	Divisória em gesso acartonado dry wall simples resistente a umidade (placas RU), esp. 12,5cm	m²					CM						-
264	3	04	04.02	04.02.02	CIVIL	Divisórias leves				RN	YC	CM						
265	4	04	04.02	04.02.02.001	CIVIL	Divisória MDF com revestimento melamínico, cor branca	m²			RN								-
266	4	04	04.02	04.02.02.002	CIVIL	Divisória MDF com revestimento melamínico, cor branca	m²			RN								-
267	4	04	04.02	04.02.02.003	CIVIL	Divisória MDF com revestimento melamínico, cor preta	m²			RN								-
268	4	04	04.02	04.02.02.004	CIVIL	Divisória MDF com revestimento melamínico, cor amêndoa rústica	m²			RN								-
269	4	04	04.02	04.02.02.005	CIVIL	Divisória em compensado naval com revestimento melamínico, cor branca	m²			RN								-
270	4	04	04.02	04.02.02.006	CIVIL	Divisória em compensado naval com painéis modulados, revestimento melamínico e núcleos com características termoacústicas com lã de vidro, esp. 35mm, cor branca	m²			RN								-
271	4	04	04.02	04.02.02.007	CIVIL	Divisória revestida com régua de piso laminado dispostas na horizontal	m²			RN								-
272	4	04	04.02	04.02.02.008	CIVIL	Cantoneira PVC para arremate das arestas de paredes com material amadeirado, cor caramelo	m			RN								-
273	4	04	04.02	04.02.02.009	CIVIL	Cantoneira em alumínio. acabamento anodizado fosco	m			RN								-

Fig. 77 BoQ Lojas Renner inventory sample page.

Source: Lojas Renner's Architecture and Engineering Department

The scope of this study covers all processes related to the internal architectural and structural configuration of the space. Due to time constraints and access to detailed technical information, inputs related to technical services are not included in this study. Furthermore, it was assumed that such installations follow both standard technical requirements and respond to the demands produced by architectural decisions. A summarized version of the scope is provided in the Tab. 9 and Tab. 10. **Erro! Fonte de referência não encontrada.**, and the detailed scope is presented in the Annexes Section.

Tab. 9 - Summary of Structural Scope of Life Cycle Inventory.

Source: Author

LCA FIT-OUT AS IMPLEMENTED - Structural scope per group			
ESCOPO DE CONSTRUÇÃO (PT)	BUILDING SCOPE	YES	NO
01 <i>Despesas Indiretas</i>	Indirect Expenses		x
02 <i>Civil_Infraestrutura</i>	Building_Infrastructure	x	
03 <i>Civil_Supraestrutura</i>	Building_Superstructure	x	
04 <i>Civil_Paredes e Painéis</i>	Building_Walls and Partitions	x	
05 <i>Civil_Esquadrías e Serralheria</i>	Building_Windows, Doors and Metal Works	x	
06 <i>Civil_Coberturas e Proteções</i>	Building_Roofs and Coverages	x	
07 <i>Civil_Revestimentos, Pinturas e Tratamentos Especiais</i>	Building_Finishings, Paintings, ans Special Finishes	x	
08 <i>Civil_Pisos e Pavimentações</i>	Building_Floors and Pavings	x	
09 <i>Civil_Aparelhos e Metais</i>	Building_Sanitary Equipments	x	
10 <i>Civil_Propaganda e Equipamentos</i>	Building_Furniture and Equipments	x	
11 <i>Civil_Acessibilidade</i>	Building_Accessibility	x	
12 <i>Civil_Limpeza e Serviços Complementares</i>	Building_Cleaning and Services	x	
13 <i>Hidro_Instalações Hidrossanitárias</i>	Hidro_Hidrosanitary Installations		x
14 <i>Elétrica, Som, Segurança e Automação_Instalações</i>	Electricity, Sound, Security, Automation_Installations		x
15 <i>PPCI</i>	Fire Protection		x
16 <i>Climatização_Instalações de Climatização</i>	HVAC_Installations		x
17 <i>Mobiliário</i>	Furniture and Equipments	x	

Tab. 10 - Operational Scope of Life Cycle Inventory.

Source: Author

LCA FIT-OUT AS IMPLEMENTED - Operational scope		
EQUIPMENTS AND/OR SYSTEM	YES	NO
Appliances: Dishwashers, Entertainment, Laundry Appliances, Workstation		x
Communications		x
Cooking Equipments		x
Water Heating		x
Electrical Parasitic Loads		x
Fire Protection		x
HVAC		x
Industrial Manufacturing Equipment		x
Lifts, Elevators and Conveying		x
Lighting	x	
Monitoring Control and Automation		x
Power Generation and Storage		x
Refrigeration		x
Safety and Security		x
Water Pumping		x
Water Removal and Treatment	x	
Water Supply	x	
Desktops, Printers		x
Workshops, Garage & Misc.		x

- **Consumption Report - RNR DASHBOARD BI BREEAM**

This report, fed by the Contractor during the construction phase, follows and quantifies the consumption of water, energy, and diesel oil (only freights managed by the contractor) during the 120 days of work. The document also classifies and quantifies both the construction waste produced and the volume of material applied with Volatile Organic Compounds (VOC) in their composition, together with the receipt construction element. The full version of this document is presented in the Annexes Section and a summary page is presented below in Fig. 78 **Erro! Fonte de referência não encontrada..**

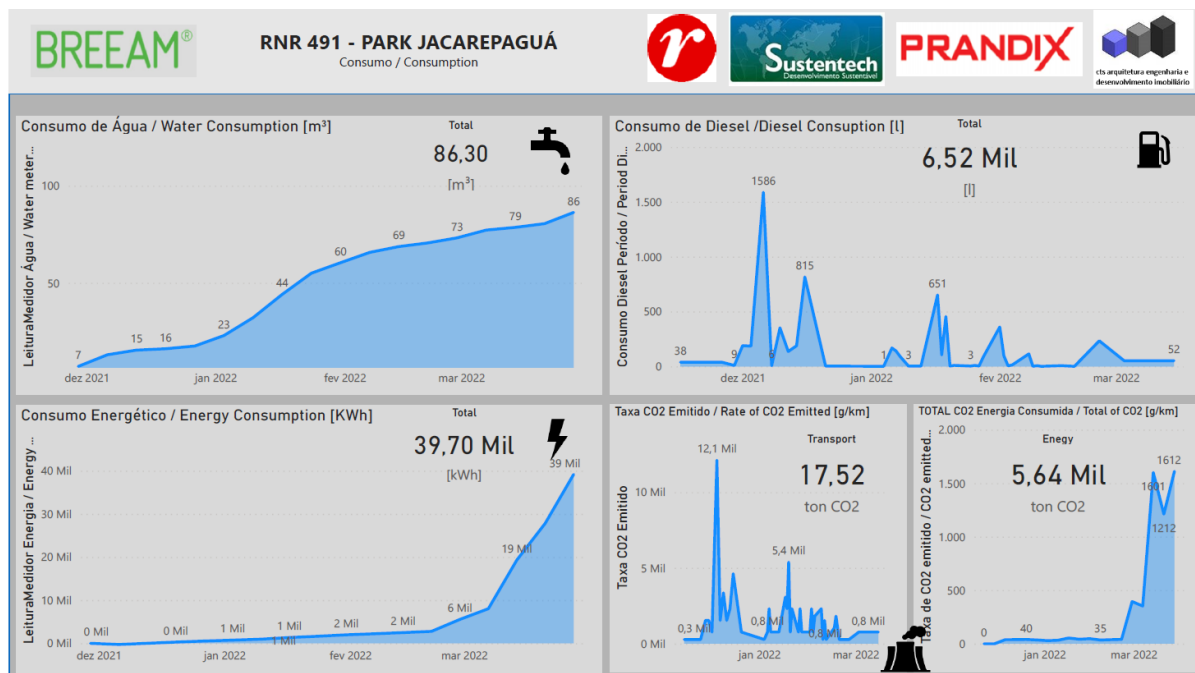


Fig. 78 - Construction Consumption Report summary page.

Source: Contractor

All data extracted from these documents was appointed in LCA software tool – OneClick LCA – either by perfect match (when the material or flow found an ideal match with OneClick LCA database), or by close affinity (when the material or flow adopted in the project found an acceptable similar in the software database).

This procedure, which is completely acceptable under the standardized procedures, reinforces the need for a robust database to sustain the quality of the assessment, and the consequent limitations that this condition imposes when proposing alternative specification scenarios considering materials unsupported by an Environmental Product Declaration (EPD).

3.3.2.3. LIFE CYCLE IMPACTS ASSESSMENT

The results of the Life Cycle Assessment “fit-out as implemented” are presented in the EN15978 reporting format considering a 20-year service life in the Tab. 11 and Fig. 79. This duration was selected because the study focuses on a retail department store, which typically undergoes more frequent full

renovations compared to other types of buildings. Deep renovations are considered in 10-year intervals and Maintenance activities (Section B2) are excluded from this study due to the lack of information.

In the absence of a benchmark to compare the results obtained with those that would be references for a typical retail fit-out operation, the results below covering all categories are presented for informational purposes. For the purposes of developing this research, only data from the Greenhouse Gases (GHG) category will be deeply analysed and interpreted. A full vision of the LCA report provided by OneClick LCA is available in the Annexes section.

Tab. 11 - Life Cycle Assessment Results – 20 years study period.
Source: Author, data from OneClick LCA

LCA FIT-OUT AS IMPLEMENTED - Results								
LCA Section	Result Category	GHG	ODP	AP	EP	POCP	ADPE	ADPF
	Unit	kg CO ₂ e	kg CFC11e	kg SO ₂ e	kg PO ₄ e	kg Ethenee	kg Sbe	MJ
A1-A3	Construction Materials	2,84E+05	1,23E-01	1,32E+03	2,73E+02	1,38E+02	6,04E+04	3,26E+06
A4	Transportation to site	3,37E+03	6,57E-04	1,46E+01	3,17E+00	2,22E-01	2,26E+01	9,23E+04
A5	Construction/installation process	3,24E+04	9,95E-03	1,26E+02	2,50E+01	1,02E+01	4,54E+03	3,47E+05
B1	Use phase	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
B3	Repair	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
B4-B5	Mat. Replacement & Refurbishment	4,79E+04	3,48E-03	2,77E+02	3,11E+01	5,73E+01	8,75E+00	6,86E+05
B6	Energy consumption	4,63E+04	3,40E-03	2,59E+02	4,98E+01	1,08E+01	1,87E-01	6,77E+05
B7	Water use	3,92E+03	2,81E-04	2,68E+01	6,25E+00	9,43E-01	1,18E-02	5,71E+04
C2	Waste transport	2,97E+03	5,86E-04	1,36E+01	2,96E+00	1,78E-01	2,15E+01	8,50E+04
C3	Waste processing	9,75E+01	1,31E-05	6,84E-01	9,70E-02	3,32E-02	4,51E-03	1,30E+03
C4	Waste disposal	1,15E+03	2,06E-04	8,43E+00	1,80E+00	2,30E-01	7,97E-04	1,64E+04
D	External impacts (not includ. in totals)	-9,26E+04	-5,22E-03	-4,11E+02	-5,46E+01	-5,07E+01	-7,26E-01	-1,24E+06
TOTAL		4,22E+05	1,34E-01	2,05E+03	3,93E+02	2,17E+02	6,50E+04	5,22E+06
TOTAL per internal gross área (sqm)		1,64E+02	5,22E-05	7,96E-01	1,53E-01	8,42E-02	2,52E+01	2,03E+03

B2 and C1 Sections: Not Assessed

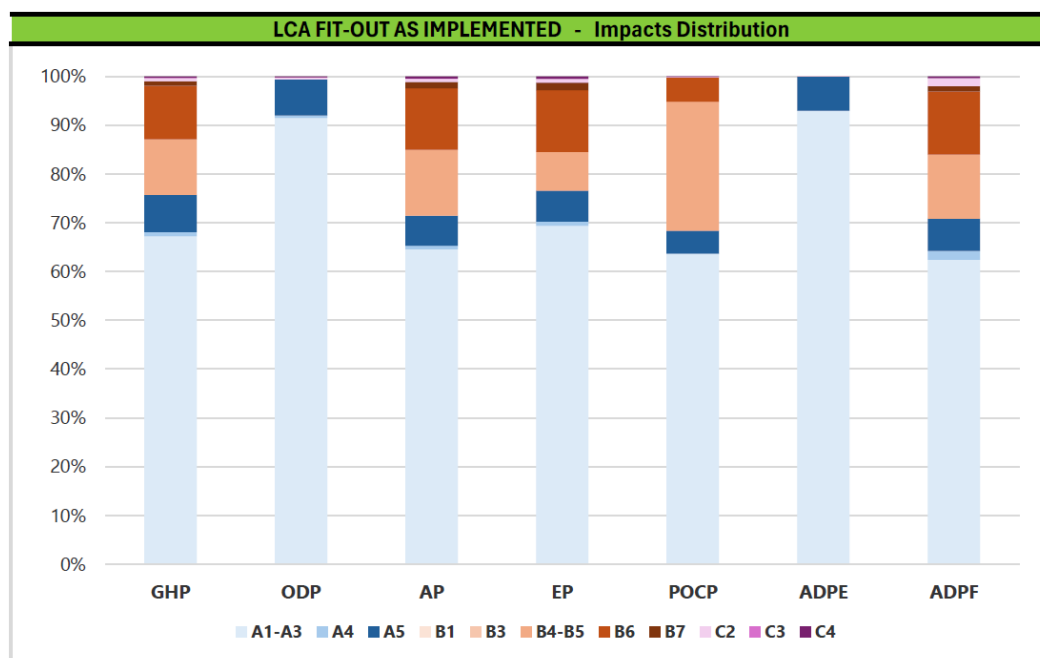


Fig. 79 - Impact distribution by LCA section
Source: Author, data from OneClick LCA

One objective of this research is to demonstrate the importance of adopting a whole-life emissions approach to understanding the impact of store design. This objective is partially accomplished with the numbers presented above. From them, it is confirmed the prevalence of the Product stage, also called **Cradle to Gate phase (A1 to A3 sections)**, as the determinant of the environmental performance of the project, accounting for no less than 60% of the impacts in all categories, peaking at 67% of the total GWP. This finding reinforces the opportunity to enhance the project that held in the designer's hands, being this the responsible for designing the project's materials. Next, the **Material Replacement and Refurbishment sections (B4-B5)** present relevant impacts in most categories, suggesting the effects of the recurring nature of renovations in retail projects. The third section worth mentioning is **Energy Use (B6)**, which highlights the importance of enhancing the project's energy efficiency. Even considering the Brazilian energy matrix composed mostly of renewable sources. Specifically in this case study, Lojas Renner acquires energy in the Free Market with the prevalence of solar sources. Finally, the **Construction section (A5)** presents an overall impact that accounts for 5% of the total average in GWP category.

The result of this LCA also demonstrates the consumption of **embodied energy** in the production of materials and execution of the work, as well as the **recurring embodied energy** due to the processes of replacement of materials and renovations (typical of renovation processes), as presented in the Tab. 12 and Fig. 80. Such consumption presents a similar distribution of its impacts throughout the LCA sections, as well as the GWP category, whose greatest impacts occur in stages A1-A3, B6, B4-B5 and A5, respectively.

Tab. 12 - Energy and Water use by LCA section
Source: Author, data from OneClick LCA

LCA FIT-OUT AS IMPLEMENTED - Energy and Water				
Result category		Total use of renewable primary energy	Total use of non renewable primary energy	Use of net fresh water
LCA Section	Unit	MJ	MJ	m3
A1-A3	Construction Materials	6,69E+05	3,87E+06	2,19E+04
A4	Transportation to site	3,85E+02	9,22E+04	1,66E-01
A5	Construction/installation process	1,91E+05	3,88E+05	1,65E+03
B1	Use phase	0,00E+00	0,00E+00	0,00E+00
B3	Repair	0,00E+00	0,00E+00	0,00E+00
B4-B5	Mat. replacement and refurbishment	1,97E+05	8,11E+05	3,42E+03
B6	Energy consumption	6,50E+05	6,77E+05	1,75E+02
C1	Deconstruction/demolition	NC	NC	NC
C2	Waste transport	1,39E+02	8,46E+04	0,00E+00
C3	Waste processing	3,04E+02	2,36E+03	2,77E-01
C4	Waste disposal	2,37E+02	1,66E+04	2,39E+00
D	External impacts (not included in totals)	-1,07E+05	-1,32E+06	-1,01E+03
TOTAL		1,72E+06	6,00E+06	2,72E+04
TOTAL per internal gross área (sqm)		6,66E+02	2,33E+03	1,05E+01

B2 and C1 Sections: Not Assessed

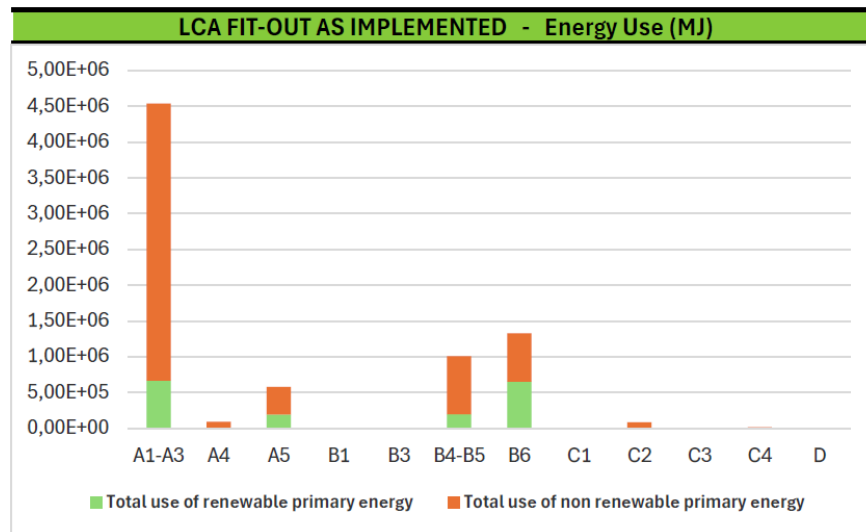


Fig. 80 - Energy use (MJ) by LCA section
Source: Author, data from OneClick LCA

Regarding **Water Consumption** (Fig. 81), stages A1-A3 (Construction Materials), B4-B5 (Material Replacement and Refurbishment), and A5 (Construction Process) again presented the highest consumption of this resource. However, contrary to what might be expected, stage B7 (Water Use), which accumulates operational water consumption throughout the building's service life, proved to be of little relevance when compared to the water requirements in the previously mentioned stages.

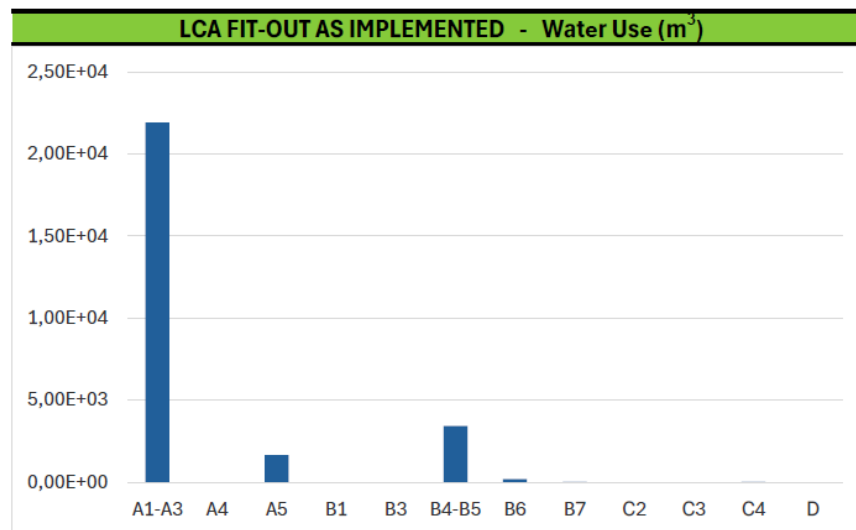


Fig. 81 - Net Fresh Water Use (m³) by LCA section
Source: Author, data from OneClick LCA

This analysis of the results of the "fit-out as implemented" LCA consolidates the completion of another stage of this investigation, as indicated in the roadmap below (Fig. 82):

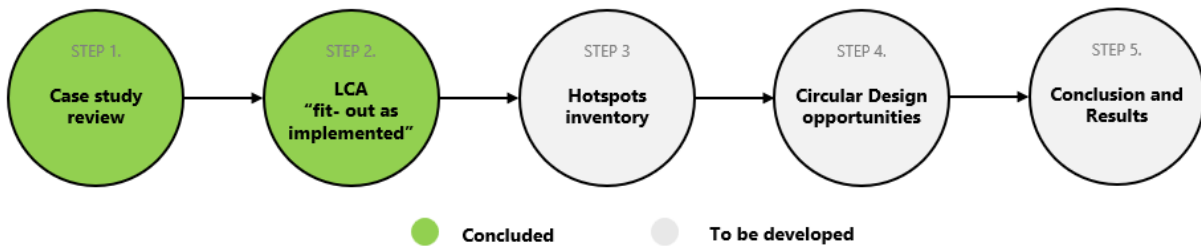
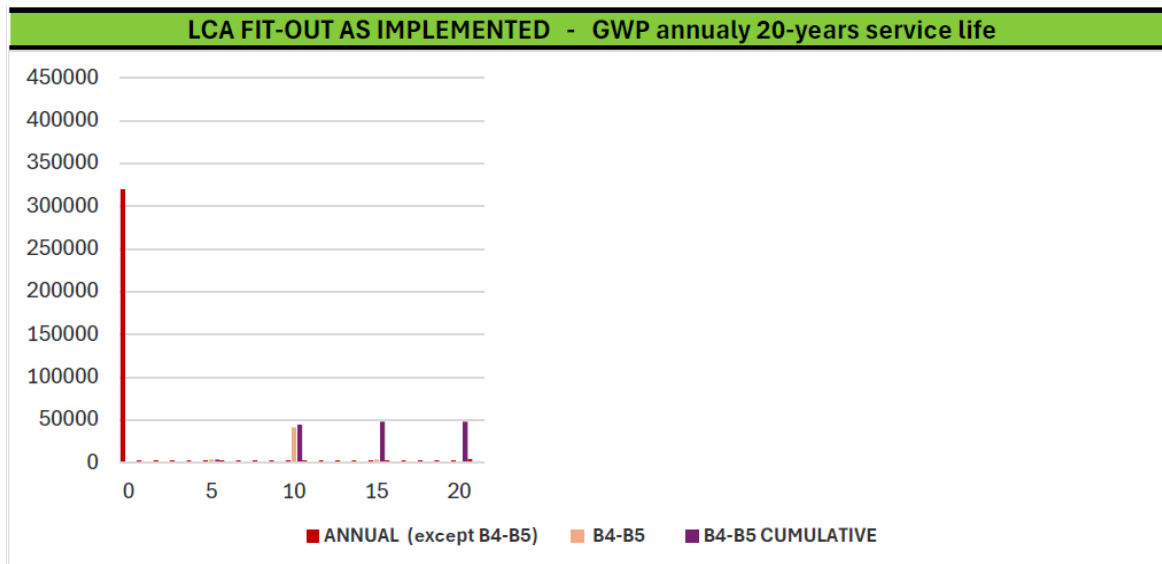


Fig. 82 - Case study roadmap status.

Source: Author

From this point, this study focuses on the Global Warming Potential (GWP) category, also known as Embodied Carbon, to performing its analysis and inferences. For the purposes of this study, GWP is assumed to be the main impact indicator to be followed. Thus, in order to better understand the effects of the recurring nature of retail facilities, two GWP emissions scenarios are simulated as presented in Fig. 83 and Fig. 84: an occupancy period of 20 years and 60 years, respectively. The first, refers to the average lifespan of a typical retail fit-out before a complete renovation; the second, refers to the average lifespan of a retail building.

The graphs show the initial impact generated by the store's implementation (year 01), covering stages A1-A5. From the second year onwards, the GWP impacts related to the water and energy consumed by the store are added annually. These impacts, identified in the red bars, include emissions generated in all stages, except B4-B5. These emissions are added to those generated by renovations (B4-B5) carried out at intervals of 05 years (small renovations), 10 years (medium-sized renovations) and 20 years (large renovations).

Fig. 83 - GWP (kg CO₂e) per year and cumulative – 20-year service life

Source: Author, data from OneClick LCA

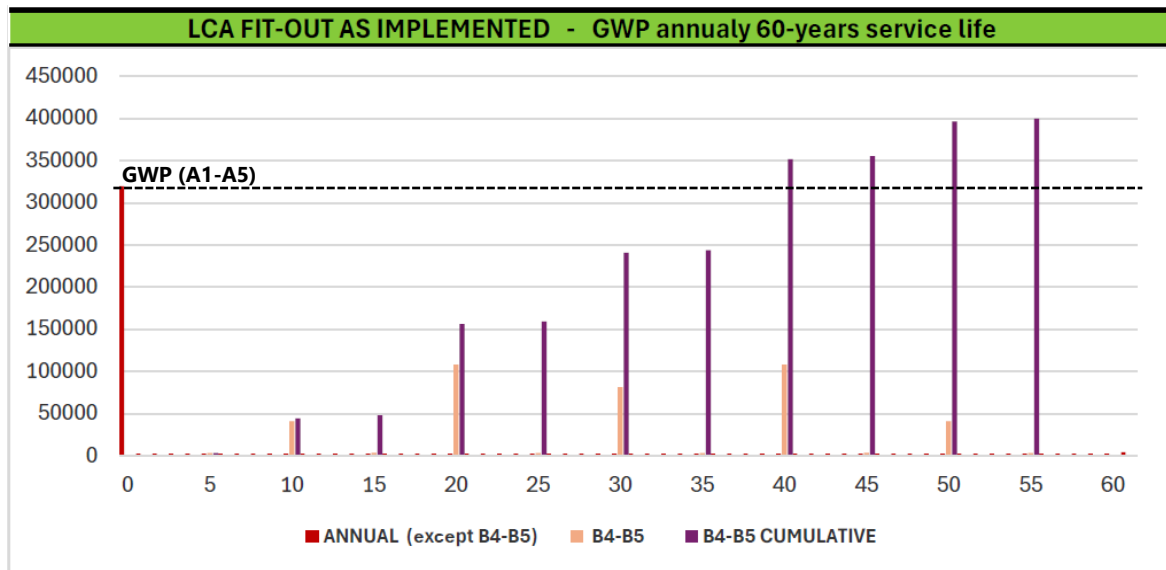


Fig. 84 - GWP (kg CO₂e) per year and cumulative – 60-year service life
Source: Author, data from OneClick LCA

When extending the service life period, the effects of the recurring nature of fit-outs are exposed. According to the data provided by this LCA, in a 40-year operation period of Renner Re+ Jacarepaguá, the cumulative embodied carbon emitted by renovations overlaps the initial emission (A1-A5). These findings corroborate one of the initial assumptions that motivated this work: **Recurring embodied energy and emissions are underestimated in retail fit-outs**. Such characteristics were hidden when the study period was limited to 20 years, a typical horizon considered by retail executives. These "new beginnings" at short intervals typical of retail, long before the end of the service life of operations, increase the demand for new products, materials and raw materials, with their consequent environmental impact.

In this context, a more careful analysis of the construction products and materials used becomes relevant, aiming to establish their potential for generating GHG emissions specifically in the project of this case study. So that, once identified, they can be replaced by other less offensive solutions and specifications. Fig. 85 presents a first level of classification of these materials by type of resource. The specific materials will be identified later in this work.

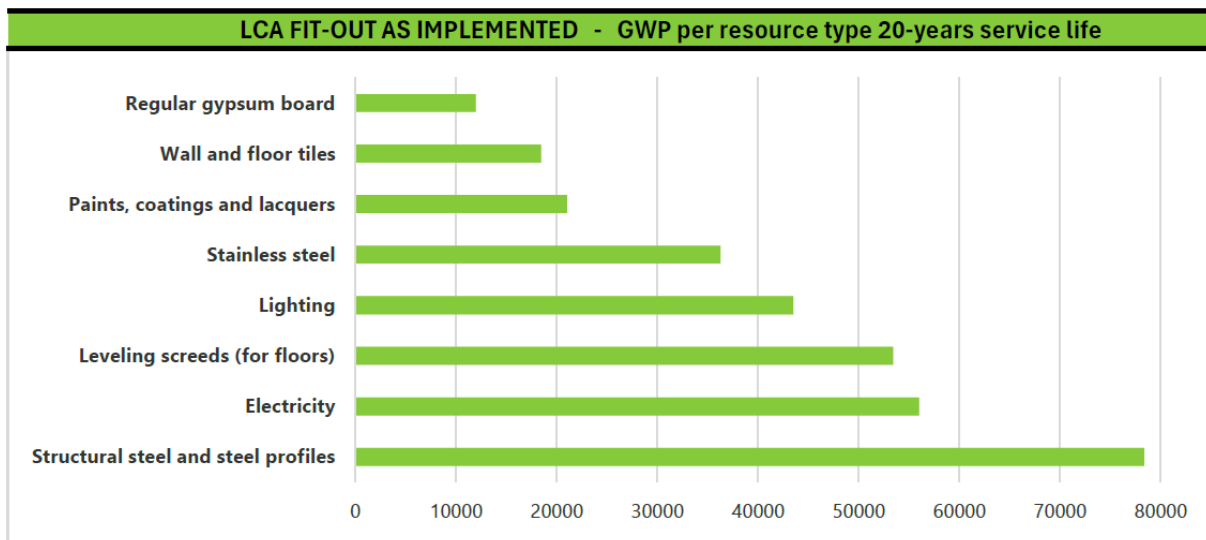


Fig. 85 - GWP (kg CO₂e) per Resource Type – 20-year service life

Source: Author, data from OneClick LCA

The results draw a clear vision of the resources that deliver more environmental impact in the project. **Structures in steel produce 18,5% of the total**, due to the 31 tons of material allocated in the load-bearing structures of the mezzanine and façade. Next, the **energy consumption answers for 13,5% of GWP impacts**, reinforcing concerns regarding energy performance. The **mortar screed used for flooring levelling accounts for 12,5% of the total**. This seems to be linked with the condition of this fit-out as the first occupancy over a Core and Shell space. Thus, the volume of mortar allocated in the first levelling is bigger than in the following fit-outs, which led to these impacts. The fourth position in this ranking of most impactful resources in this fit-out is occupied by the **lighting system, which produces 10,3% of the greenhouse gases**. This system must be analysed with some caution, for three reasons: one, due to the lack of a specific database of the products used in the project, the allocation of an apparent similar product can produce relevant deviation; two, considering the variety of materials and processes involved in the fabrication of this type of equipment, a relevant impact is expected indeed; three, this system, after the climatization system, is the main energy consumer in the project reinforcing its commitment to a good energy performance. In the next position, the impact produced by the **stainless steel used to produce the façade and exhibition furniture accounts for 8,5% of GWP impact**, which recommends a future comparison between the impacts of this solution versus a carbon-steel painted solution (largely adopted by other retailers). Finally, the next resource types are all related **to walls and finishing elements, which together account for 12,2% of the embodied carbon emissions**.

The Sankey diagram presented in the Fig. 86 offers a data visualisation of the greenhouse gases flow, bringing also a quantitative dimension represented by the width of the arrows that is proportional to the flow rate.

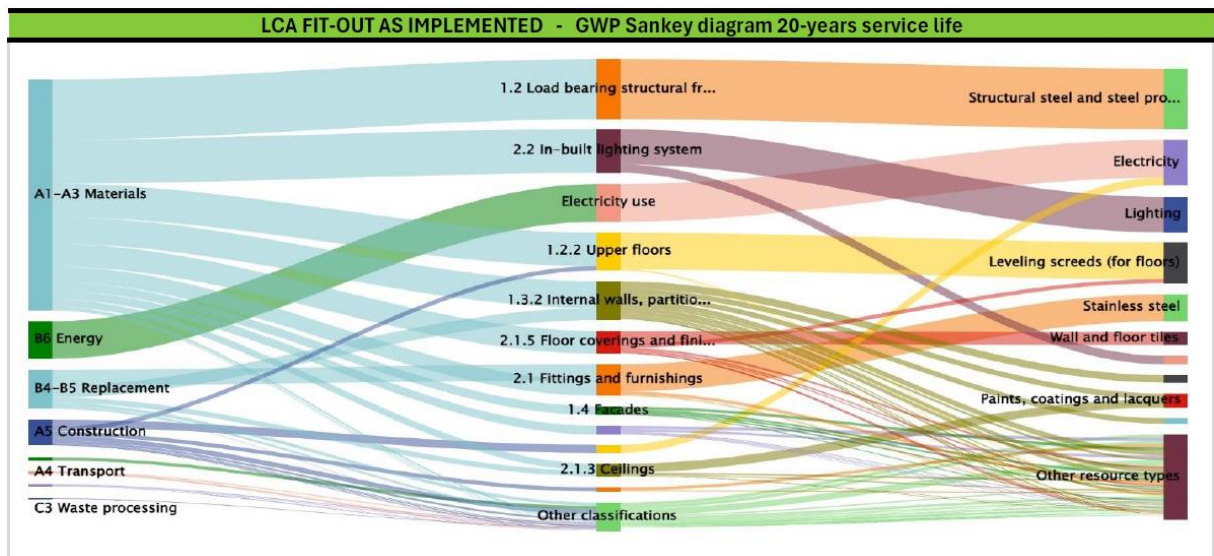


Fig. 86 - Global Warming Potential - Sankey diagram
Source: OneClick LCA

Sankey diagram emphasizes the major transfers or flows within the system. It helps to identify the most important contributions and consolidates the main findings of this analysis:

- The prevalent impact of the Cradle to Gate (A1-A3) and Replacement (B4-B5) phases to determine the GWP behavior of the project.
- The resource-types and materials that contribute most to Global warming, what suggest a future analysis of alternative solution.

As mentioned previously, this LCA study also points out the top 20 GWP most contributing materials in the Cradle to Gate phase (A1-A3) of this project, as presented in the Tab. 13 **Erro! Fonte de referência não encontrada..**

Tab. 13 - Top 20 most Global Warming contributions (A1-A3)

Source: Author, data from OneClick LCA

LCA FIT-OUT AS IMPLEMENTED - GWP TOP20 most contributing materials				
#	MATERIAL	FIT-OUT SYSTEM	GLOBAL WARMING - CRADLE TO GATE (A1-A3)	
			IMPACTS (ton. CO2e)	CONTRIBUTION (%)
1	Structural steel profiles, generic, 20% recycled content, I, H, U, L, and T sections, S235, S275 and S355	Structures & Stairs	74	35,8%
2	Floor screed mortar, cement screed, 1500 kg/m3, EPD coverage: > 1500 kg/m3	Flooring	40	19,4%
3	Stainless steel long products, 7700-8100 kg/m3	Fitting and Furnishing	19	9,2%
4	Porcelain glazed tile, 22 kg/m2	Flooring	15	7,3%
5	Gypsum plaster board, generic, 6,5-25 mm (0.25-0.98 in), 10.725 kg/m2 (for 12.5 mm/0.49 in), 858 kg/m3	Intern. walls & partitions	10	4,8%
6	Metal framing components for gypsum plasterboard, 0.4-1.0 mm, 7750 kg/m3	Intern. walls & partitions	5,5	2,7%
7	Glass wool insulation, L = 0.034 W/mK, R = 1.47 m2K/W, 50 mm, 2.1 kg/m2, 42.5 kg/m3, 50% recyc. content	Intern. walls & partitions	4,7	2,3%
8	Self-levelling mortar (SLM), 2107.7 kg/m3, 3.01 Mpa, additive: polyfunctional plasticizer	Flooring	4,9	2,4%
9	Epoxy-based reactive resin, aqueous, 1050-1100 kg/m3	Flooring	4	1,9%
10	Medium density fiberboard (MDF), uncoated, 19 mm, 760 kg/m3	Intern. walls & partitions	3,7	1,8%
11	Aluminium composite panels for interior application, 3 mm (panel), 0.3 mm (aluminium layer), 4.24 kg/m2	Façade	3,3	1,6%
12	Water-based paint, for interior application, 1.47 kg/L, 10 - 12 m2/L (single layer)	Intern. walls & partitions	3,1	1,5%
13	Chipboard, hollow core, biogenic CO2 not subtracted, 23-60 mm, 900-2090x600-1200 mm, 272 kg/m3	Mezanine	3,1	1,5%
14	Interior metal door with metal frame, biogenic CO2 not subtracted (for CML), 44.23 kg/m2	Doors and Windows	3	1,5%
15	Straight steel staircase, Larg. 80 cm	Structures and Stairs	2,7	1,3%
16	Steel roller door, 1000x2000 - 12000x8000 mm, installation depth 500 mm, 11 kg/m2	Façade	2,4	1,2%
17	Water-based paint, for interior application, 1.47 kg/L, 10 - 12 m2/L (single layer)	Intern. walls & partitions	2,2	1,1%
18	Luxury vinyl flooring tile, 2.5 mm, 4.3 kg/m2, wear layer: 0.5 mm	Flooring	2,4	1,2%
19	Polyurethane mastics joinery sealants, 0.25-0.32 kg/ml	Flooring	1,8	0,9%
20	Medium density fibreboard (MDF), standard, melamine coated, 18 mm, E0 and E1	Fitting and Furnishing	1,8	0,9%
SUM			206,6	100,0%

The resulting ranked list indicates the individual contribution of these materials that together answers for 73% of all Global warming produced in the A1-A3 stage of the project. Even though it represents the LCA result of a particular project, this ranking confirms those that are the typical environmental offenders in a retail and office renovation project: metal structures, cement derivatives, ceramic floors, plaster products, furniture and display equipment (LMN Architects, 2024).

This list of materials that produce the highest GWP in this retail fit-out – the hotspots – concludes another step of this investigation roadmap (Fig. 87). They are submitted in the next Section (3.3.3) to the application of the 9R framework for Circular fit-out in retail stores (Ayalp & Santoro, 2022) in order to assess the feasibility of integrating these methodologies - Life Cycle Assessment and Circular Design -

to obtain better environmental performance in retail projects. Due to the reasons exposed before, the material elements that belong to the Lighting system were excluded of this analysis.

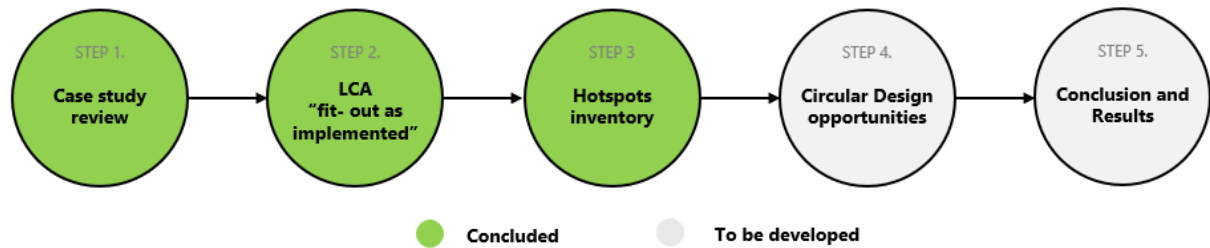


Fig. 87 - Case study roadmap status.

Source: Author

3.3.2.4. LCA PERFORMANCE

In the absence of a benchmark for retail fit-outs, the study adopted the OneClick LCA labelling to classify Renner Re+ Jacarepaguá's performance. This benchmark is composed of the average performance of more than 40 projects of the same type assessed by OneClick globally, which account for embodied impacts relating to all building parts, except building technology and external areas. Based on the sample, the average GWP impact founded is 476 kg CO₂/sqm, and the 70% percentile is 491 kg CO₂/sqm. The performance of the case study "fit-out as implemented" that indicates a very good performance is shown in Fig. 88:

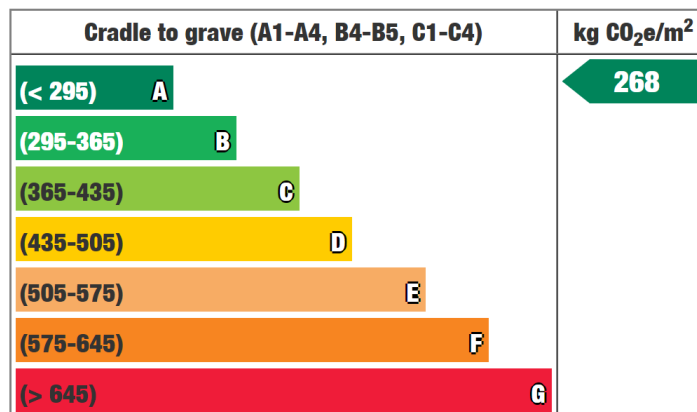


Fig. 88 - OneClick LCA labelling for the case study.

Source: OneClick LCA labelling for Global Retail Buildings (except MEP)

Thus, the Life Cycle Assessment of Lojas Renner Re+ Park Shopping Jacarepaguá confirmed both the sustainability assets of the project compared with similar projects globally, as well as the openness for improvements. As expected, the Cradle-to-Gate (A1-A3) sections are the major contributors to environmental impacts, which reinforces the opportunity in the retail designer's hands to improve the environmental performance of the projects through better design choices. Moreover, the recurring nature of retail fit-out processes, as exposed in the B4-B5 sections, proved to influence strongly the environmental performance of a project even in a not ordinary scenario of renovation (10 years average), as performed by the case study owner. The next section is dedicated to the attempt of connecting the LCA results with Circular Design Strategies to produce sustainable design improvements in the project.

3.3.3. CIRCULAR DESIGN STRATEGIES

As previously mentioned, retail projects are usually in constant evolution. Improvement projects are much more frequent than new concept designs. Aware of this, this research is dedicated to speculating a possible path to improve the environmental performance of the project through the integration of two tools. One highly consolidated and prescribed by Standards - the Life Cycle Assessment (LCA) - and another of an inspirational and exploratory nature - the 9R framework proposed by ARUP.

As a result, it is expected that this work can produce new ideas and design concepts that enable the implementation of a future cycle of improvement and updating of the design of the Renner Re+ Circular Store concept with improvements in its environmental performance. By carrying out this exercise, it is expected to identify a possible project path for future retail designers in charge of similar projects. This situation is likely to recur due to the movement of retail towards a greener agenda.

The challenges and opportunities identified throughout the process will be discussed in the following subsections.

3.3.3.1. METHODOLOGY

This activity explores the feasibility of integrating data resulting from the LCA process with a Circular Design framework, aiming to establish a path for improving retail design projects towards circularity and sustainability.

Based on the results of the "fit-out as implemented" LCA, which considered in its scope only the typical systems of a retail fit-out process (interiors, excluding MEP systems), the list of the 20 largest contributors of GWP was appropriated (**Erro! Fonte de referência não encontrada.**). These materials that present the highest levels of embodied carbon are reconsidered through the lens of Circular Design by applying the 9R framework for retail fit-outs as part of the Circular Retail Fit-outs Guide proposed by ARUP (Ayalp & Santoro, 2022).

To perform this analysis, a spreadsheet was generated based on the analysis criteria proposed by ARUP, serving this as an auditing and assistance tool for the ideation process. The application model for this tool is presented in the Tab. 14, and its effective application in the analysis of each of the 20 most contributing materials to the GWP is documented in the Annexes section. The products of these analyses are presented in the next subsection.

Tab. 14 - Circular Design application tool. Source: Author, adapted from Ayalp & Santoro (2022)

9R STRATEGY FOR CIRCULAR RETAIL FIT-OUT, Application framework template			
FIT-OUT SYSTEM	FOS	Describe the Fit-out System under consideration	
HOTSPOT	HS1	List the 1 st hotspot of this fit-out system	
	HS2	List the 2 nd hotspot of this fit-out system	
	HS3	List the 3 rd hotspot of this fit-out system	
	HS4	List the 4 th hotspot of this fit-out system	
	HS5	List the 5 th hotspot of this fit-out system	
	HS6	List the 6 th hotspot of this fit-out system	
STRATEGY	CRITERIA	IDEATION	
		HS1	HS2 - ...
R0/R1. DEMATERIALIZATION	• Optimise resource effectiveness by reducing the mass or material types in the product; • Avoid overdimensioning; • Adopt stiffening profiles; • Minimise thickness and weight; • Design for compactness; • Design integrated functions products to serve different needs; • Virtualise physical products; • Use digital tools for design, modelling and prototyping.	Reflect and Ideate	Reflect and Ideate
R2. RESPONSIBLE SOURCING	• Avoid materials, additives and surface treatments that are toxic; • Use renewable and bio-based materials; • Use recyclable/reused materials, with recycled content and/or sourced from byproducts/waste streams; • Use regional materials from local suppliers; • Use products/materials with environmental certification (e.g. EPD, C2C); • Promote manufacturing using renewable energy; • Incorporate power-off mechanisms; • Set default status at lower energy consumption.	Reflect and Ideate	Reflect and Ideate
R3. PERFORMANCE PROCUREMENT	• Consider implementing products' leasing for services continuous access over a defined period of time; • Design product/services for sharing use rather than individual ownership; • Integrate methods for used product collection.	Reflect and Ideate	Reflect and Ideate
R4. DESIGN FOR DURABILITY	• High quality and easily repairable materials; • Provide incentives through performance-based contracts that promote the optimal design of the product; • Simulate different scenarios of durability and compare costs; • Use construction techniques that facilitate maintenance and repairs to different parts to enhance product durability; • Standardised components manufactured off-site to higher quality control standards can reduce long-term maintenance requirements.	Reflect and Ideate	Reflect and Ideate
R4. DESIGN FOR REPAIR	• Information and guidelines help achieve proper maintenance and repair; • Modular components and parts standardisation facilitate disassembly and replacement; • Integrate monitoring systems, IoT and big data to identify, locate, track and communicate need of maintenance, repair or replacement; • Regular self-testing, error recognition and notification; • Ensure access to all parts and connections for easy repair and maintenance; • Components should not be integrated to such a degree as to make individual replacement of functional components impossible; • Place quickly worn parts towards exterior.	Reflect and Ideate	Reflect and Ideate

R5. DESIGN FOR ADAPTABILITY & FLEXIBILITY	• Anticipate with consideration of need of the present and changes in requirements in the future (e.g. periodic or frequent reconfiguration); • Adopt innovative approaches that allow the product to adapt to a user's changing needs as time passes; • Design for modularity; • Dry assembly and layering help in change only selected elements.	<i>Reflect and Ideate</i>	<i>Reflect and Ideate</i>
R6. DESIGN FOR REMANUFACTURE	• High potential for disassembly; • Design products to be redeployed as modules; • Kit of parts designed to be reused in same or different environment; • Design high-demand components with standard dimensions and specifications.	<i>Reflect and Ideate</i>	<i>Reflect and Ideate</i>
R7. DESIGN FOR MANUFACTURING & ASSEMBLING	• Minimise number of components/materials and production steps; • Avoid excess cutting and jointing of components/materials; • Optimise shape and dimension according to production constraints to minimise manufacturing waste and scraps; • Eliminate unique parts wherever possible, by preferring standard components; • Decreasing the amount of labour required for assembly; • Make parts multi-functional to reduce complexity; • Facilitate parts handling that does not require special tooling or fixturing for assembly; • Where possible make parts identifiable and symmetric; • Design tolerances to meet process capability.	<i>Reflect and Ideate</i>	<i>Reflect and Ideate</i>
R7. DESIGN FOR MODULARITY	• Increase communication between the design teams working on complex products and systems; • Use standard components where possible; • Reduce number of parts and components enhance modularity; • Design parts as separate, self-contained modules.	<i>Reflect and Ideate</i>	<i>Reflect and Ideate</i>
R8. DESIGN FOR RECYCLABILITY	• Limit the number of material types and composites; • Make use of easy to dismount elements and products; • Limit use of adhesives, dyes, paints and coatings; • Limit or eliminate hazardous materials and contamination; • When optimising product recyclability consider product types and geographies; • Partner with end-of-life resource management companies to integrate the appropriate product features and facilitate end-of-life handling; • Prescribe in procurement contracts that waste should be separated on site to facilitate recycling; • Clearly marked or permanently label products, showing their inherent properties and date of manufacture to enable reuse.	<i>Reflect and Ideate</i>	<i>Reflect and Ideate</i>
R9. DESIGN FOR DISASSEMBLY	• Ensure comprehensive disassembly plan and instruction, illustrating how elements should be deconstructed and recovered • Design for reused number of parts, components and fasteners to speed up disassembly; • Screws are faster to unfasten than nuts and bolts; • Glues should be avoided; • Design compact and lightweight product to be manually handled to allow onsite assembly/disassembly; • Avoid mixed use of incompatible materials and connections if not separable and manipulated as individual parts; • Adopt reversible and compatible joints and connections.	<i>Reflect and Ideate</i>	<i>Reflect and Ideate</i>

3.3.3.2. IDEATION AND QUALIFICATION

This subsection presents the results of the ideation process produced through the application of the methodology described above. Each of the 20 most GWP contributing materials identified in the Renner Re+ Circular Store Jacarepaguá fit-out through the LCA, here called Hotspots, was subjected to scrutiny for opportunities to improve their level of circularity in light of the 09 Strategies that form the 9R framework. For each of the strategies, a list of insights is offered, here called "criteria", which operate as igniters of new ideas and approaches.

The main objective of this analysis is to evaluate the applicability of a tool for positivizing Circular Design strategies - whose character is holistic and ecosystemic -, but based on outputs from the LCA process, - whose results are quantitative and specific. To this end, each hotspot was evaluated individually, and the products of this process are documented in the Annexes section.

However, this process proved to be not very effective, confirming the low adherence of this method for evaluating specific materialities. It became clear that the 09R framework, as a promoter of Circular Design strategies, aims to act on a more complex layer of solutions, in which supply (and value) chains can be rethought and re-proposed. Such openness to complexity finds limitations when applied to a "final product".

For this reason, the analysed materials were grouped according to the fit-out system to which they belong, in an attempt to adapt the use of the tool to a compatible level of analysis. The products of this investigation are discussed below and the grouping of hotspots by fit-out system is presented in the Tab. 15.

Tab. 15 - Hotspots by fit-out system
Source: author, data from OneClick LCA

LCA FIT-OUT AS IMPLEMENTED - GWP most contributing materials by fit-out system				
#	MATERIAL	FIT-OUT SYSTEM	GLOBAL WARMING - CRADLE TO GATE (A1-A3)	
			IMPACTS (ton. CO2e)	CONTRIBUTION (%)
1	Structural steel profiles, generic, 20% recycled content, I, H, U, L, and T	Structures and Stairs	74	35,8%
15	Straight steel staircase, Larg. 80 cm	Structures and Stairs	2,7	1,3%
13	Chipboard, hollow core, biogenic CO2 not subtracted, 23-60 mm,	Mezanine	3,1	1,5%
				38,6%
2	Floor screed mortar, cement screed, 1500 kg/m3, EPD coverage: >	Flooring	40	19,4%
4	Porcelain glazed tile, 22 kg/m2	Flooring	15	7,3%
8	Self-levelling mortar (SLM), 2107.7 kg/m3, 3.01 Mpa, additive:	Flooring	4,9	2,4%
9	Epoxy-based reactive resin, aqueous, 1050-1100 kg/m3	Flooring	4	1,9%
18	Luxury vinyl flooring tile, 2.5 mm, 4.3 kg/m2, wear layer: 0.5 mm	Flooring	2,4	1,2%
19	Polyurethane mastics joinery sealants, 0.25-0.32 kg/ml	Flooring	1,8	0,9%
				33,0%
5	Gypsum plaster board, generic, 6.5-25 mm (0.25-0.98 in), 10.725 kg/m	Internal walls & partitions	10	4,8%
6	Metal framing components for gypsum plasterboard, 0.4-1.0 mm,	Internal walls & partitions	5,5	2,7%
7	Glass wool insulation, L = 0.034 W/mK, R = 1.47 m2K/W, 50 mm, 2.1	Internal walls & partitions	4,7	2,3%
10	Medium density fiberboard (MDF), uncoated, 19 mm, 760 kg/m3	Internal walls & partitions	3,7	1,8%
12	Water-based paint, for interior application, 1.47 kg/L, 10 - 12 m2/L	Internal walls & partitions	3,1	1,5%
17	Water-based paint, for interior application, 1.47 kg/L, 10 - 12 m2/L	Internal walls& partitions	2,2	1,1%
				14,1%
3	Stainless steel long products, 7700-8100 kg/m3	Fitting and Furnishing	19	9,2%
20	Medium density fibreboard (MDF), standard, melamine coated, 18	Fitting and Furnishing	1,8	0,9%
				10,1%
11	Aluminium composite panels for interior application, 3 mm (panel),	Façade	3,3	1,6%
16	Steel roller door, 1000x2000 - 12000x8000 mm, installation depth 500	Façade	2,4	1,2%
14	Interior metal door with metal frame, biogenic CO2 not subtracted	Doors and Windows	3	1,5%
				4,2%

• Structure and Stairs

The first fit-out system analysed is Structures and Stairs, which accounts for 38,6% of all GHG produced among the hotspots group. The main contributor is the steel structure allocated in the mezzanine construction. The solution adopted in the project involves a metal structure designed to meet the specific layout and load requirements of the project, using laminated profiles joined by welding on site.

The application of the 9R framework encouraged the ideation of two promising alternative paths:

i) Wooden mezzanine structure: a hypothesis raised when the original project was conceived, but which was found to be unfeasible due to the toxicity of the treatment products used in Brazil. In a possible resumption of this strategy, with more time available to search for suppliers who treat the wood without using toxic substances, it is believed that such a solution could be viable for adoption. Once this barrier is overcome, it is expected that there will be a likely difficulty in getting the local Fire Department to approve the wooden mezzanine, since such material has no precedent for application in any other shopping center in the country.

ii) Modular metal mezzanine solution: this proposal showed great potential to meet various Circular Design strategies. Thanks to the standardization of components and assembly using screws, the conditions for repair, adaptation and future reuse are enhanced. In this way, criteria related to Design for Durability, Design for Repair, Design for Adaptability & Flexibility, Design for Remanufacture, Design for Manufacture & Assembly, Design for Modularity, and Design for Recyclability are met. The only setback detected concerns a lower productivity of the layout, since the mezzanine design needs to adapt to the geometry of the mezzanine, and not the other way around as is usually the case.

In both cases, such solutions would only be implementable if considered and deeply worked in the Spatial Coordination phase (RIBA stage 03), when the main systems of the project are defined and made compatible.

• **Flooring**

The second fit-out system studied is Flooring. This group presents the Screed as the main GWP offender, followed by the floor coverings (ceramic tile and luxury vinyl tile).

Regarding the Screed, the application of the 9R framework presented no results. This materiality answers for linking slabs with finishes, incorporating electrical installation, and despite some alternatives to reduce its weight (such as the use of polystyrene or lightweight aggregate boards), not too much can be made without losses in resistance. Moreover, no innovative solutions were detected after applying the 9R framework.

Regarding the floor coverings, the best opportunities to activate Circular Design were identified when considering the use of floating floors (not glued), made in wood or vinyl. The non-use of ceramic floors offers a significant reduction of embodied carbon if replaced by any of the previous materials. Furthermore, since it is not adhered to the subfloor, it allows for compliance with several criteria for the application of Circular Design strategies, namely: Design for Durability, Design for Repair, Design for Adaptability & Flexibility, Design for Remanufacture, Design for Manufacturing & Assembling, Design for Recyclability, and Design for Disassembly.

As a side effect, the application of floating floors requires a greater incidence of joints, with an effect on the appearance of the floor. For this reason, the adoption of solutions of this type should be duly studied during the Technical Detailing phase (RIBA stage 04).

• **Walls & Partitions**

The opportunity to improve Circular Design over the hotspots of this group are very limited for budget restrictions. The dry-wall solution for walls and partitions is a low-tech and low-cost

solution that is highly available in any region of Brazil. Such conditions make it harder to adopt any other industrialized wall solution, or even the application of carpentry panels instead of plaster. It is worth remembering that plaster walls and ceilings were drastically reduced in the Renner Re+ project when it was conceived. Showing great effectiveness in the Dematerialization strategy.

Best possibilities for implementing Circular Design strategies lie in adopting wood-frame instead of galvanized steel profile structures. This change would meet the inclusion criteria indicated by several of the 9R Strategies, with emphasis on Responsible Sourcing.

The other hotspots belonging to this group are related to insulation, and wall covering and finishes. The application of the 9R framework to these elements not produced relevant insights, beyond the search for less damaging products available in the market. Hence, minimize the environmental effects of this products demands acting in two stages: in the Concept Design (RIBA stage 02), when the “look and feel” of the space is being discussed and reductions on materiality are easiest implemented; and in the Technical Detailing (RIBA stage 04), when the materials are defined.

• **Fitting & Finishing**

First, it is worth remembering that the Renner Re+ standard display system was completely revised and optimized when the new store model was launched. At that time, the Dematerialization strategy was obstinately pursued and implemented, both in reducing the volume of material used and in reducing variations in display design and finishes applied. In due time, the construction of the equipment was implemented with a view to a platform system that receives universal accessories.

After the consideration under the light of 09R framework, this group proved to be the least favourable to the adoption of a new wave of Circular Design strategies in this new attempt based on responding to hotspots. Some factors contribute to this condition:

- the exclusivity of the displays design.
- the expected load capacity and low tolerance to clearances, which practically imposes metal construction, but inhibits assembly with screws, which would be very enabling for Circular Design strategies.

Moreover, a consideration regarding the replacement of stainless steel with carbon steel seems reasonable. At first glance, the gains seem obvious, since stainless steel eliminates the need for paint finishes or chemical treatment, a fact that also increases the recyclability potential of products. However, the carbon footprint of stainless steel is around 6,15 kg CO₂e/kg, while that of carbon steel is 2,75 kg CO₂e/kg. This difference invites a more in-depth study of this topic, an activity that will not be carried out within the scope of this research.

Thus, it became clear that the potential for activating Circular Design strategies resides mainly in the Concept Design phase (RIBA stage 02), but needs to be sustained throughout development, prototyping and technical detailing (RIBA stages 03 and 04).

• Façade, Doors & Windows

The main hotspot of this group – Stainless Steel long products – is already considered in the previous group. Beyond the considerations made before, in the context of Façade, a replacement of stainless-steel profiles with aluminium or wood profiles could be considered. In both cases, all the benefits captured by the industrialization process would be preserved, and the reduction of the carbon footprint would be very relevant.

The application of the 9R framework to the other hotspots not presented relevant results. In the case of Aluminium composite panel, which is used in the configuration of the main entrance porticos of the stores, the adoption of modular and prefabricated solutions is very difficult, since this element is assigned the role of the final finish in relation to the original geometries of the store's construction elements. This focus on the visual result also inhibits the adoption of assembly/disassembly systems, which would require access to exposed fastening elements (screws).

Finally, the last two elements that contribute to the carbon footprint of this fit-out system are the steel roller shutter and the internal metal doors. In both cases, there is no room for changes in their functionality, nor have any opportunities been identified to comply with Circular Design strategies. Therefore, the potential for reducing environmental impacts appears to lie mainly in the adoption of equivalent solutions not made of steel. Therefore, the most appropriate time for evolution in these specifications is the stage of Technical Detailing (RIBA stage 04).

The results of the 9R framework were quantified and the results are presented below in Fig. 89. These numbers show which fit-out systems are more suitable for improvements based on Circular Design strategies. The **Flooring** solution presented the bigger potential with 19 initiatives (43% of total), followed by **Structure, Mezzanine and Stairs** which accounted 12 initiatives (27% of total). On the other hand, the strategy most promising to be implemented was the **Design for Recyclability (R8)**, summing up 11 opportunities (25%), followed by **Responsible Sourcing (R2)** with 06 initiatives (14%), and **Design for Durability (R4)** and **Design for Manufacturing and Assembly (R7)**, both with 05 possibilities (11% of total, each).

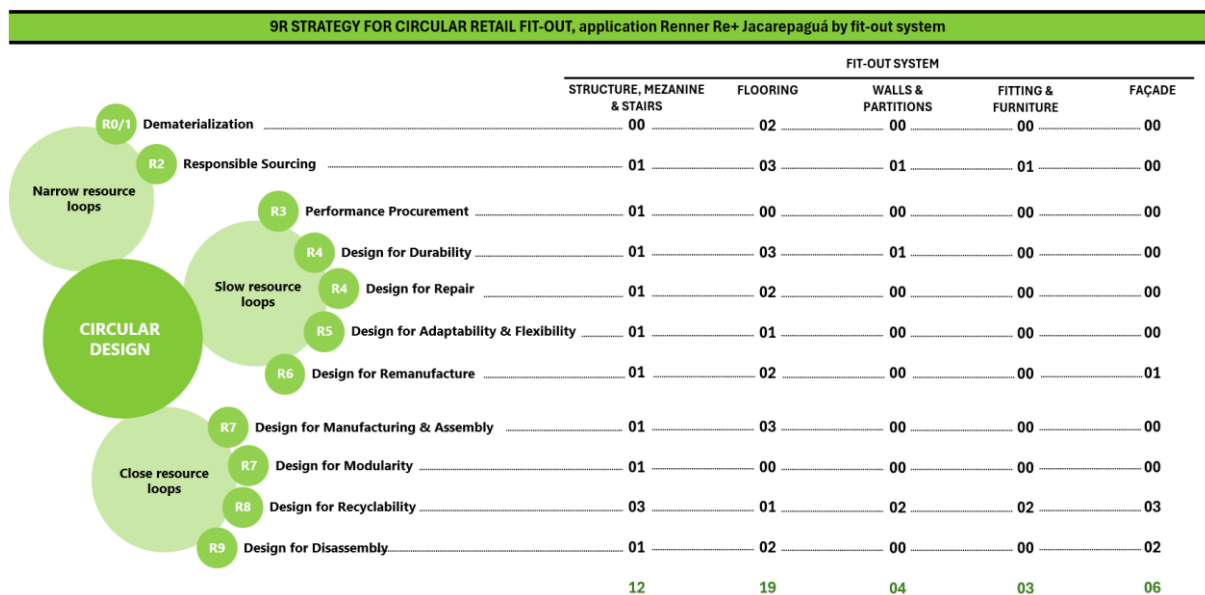


Fig. 89 - Counting Circular Design strategies applied at Renner Re+ Jacarepaguá by fit-out system.
Source: Author, adapted from Ayalp & Santoro (2022)

3.3.3.3. RESULTS

The attempt to integrate Life Cycle Assessment with Circular Design strategies to build sustainable retail project routes proved to be ineffective. The initial hypothesis was that by assuming the materials with the largest carbon footprint in the project as “problems” to be solved through the application of the 9R framework proposed by ARUP, the “answer” would indicate more efficient substitute materials, and this fact could be duly proven by carrying out a comparative LCA. This hypothesis was overturned through the attempt to apply such methods, and the reasons are explained below:

First, it is necessary to recognize the nature and purpose of each tool. **Life Cycle Assessment** is a methodology that aims to quantify the environmental impacts of the materials and flows invested in a project. When applied based on the data produced in the Technical Detailing stage of the project (RIBA stage 4), as in this case study, it can precisely address the impacts in each environmental category analyzed and, also, identify the materialities/flows that cause them. Once the impacts for specific materialities have been addressed, the most likely outcome (considering a project already at such a stage of development) is that a replacement materiality will be specified, based on projects available on the market.

On the other hand, the **9R framework for Circular Design** is an ideation method instrumented based on the evaluation of suggestions (the criteria for each strategy) that foster ecosystemic thinking, the creation of new transactional models oriented towards use (and not possession), and above all the redesign of solutions. For these reasons, it is common for the result of this process to be not “another materiality”, but rather a new idea (or system) to be developed. Or even a product that, if it exists, often does not yet have sufficient scalability to be covered by the Environmental Product Declarations (EPD) or to be inventoried and available in the database of the LCA software suppliers. These factors prevent the creation of a direct cycle of analysis and improvement based on this combined application of LCA with Circular Design. Reaching this point signals the conclusion of one more step in roadmap designed for this investigation, as presented in Fig. 90 below.

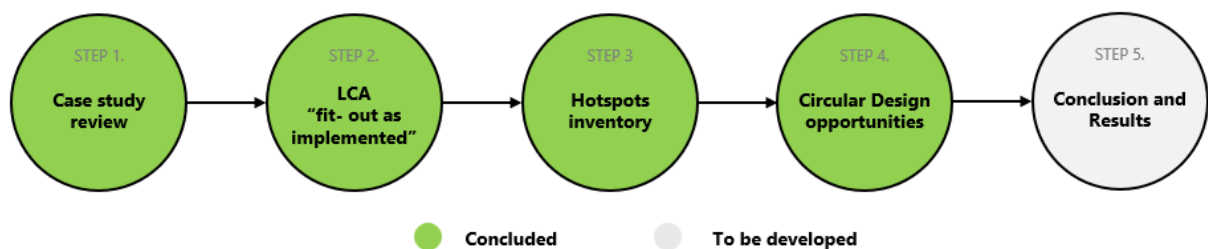


Fig. 90 - Case study roadmap status.

Source: Author

Secondly, and in line with what was previously stated, the timing mismatch of these tools is notable. While LCA gains complexity and precision as the project advances in its Technical Development, Circular Design strategies lose opportunities as the project moves away from the Conceptual phase.

Despite these facts, it is worth noting that even limited by the conditions outlined above, the application of the 9R framework for the ideation of alternatives to the project's environmental hotspots identified by LCA was successful in offering a structured ideation method. These results can be confirmed by the quantity and quality of the ideas presented in subsection 3.3.3.2., and by the comparison between the effectiveness of this approach versus the initial attempt, in the beginning of the project (year 2019),

when the design team worked in a speculative way, not led by a framework. This comparison quantified in number of strategies adopted or potentially adoptable, is presented in Fig. 91:

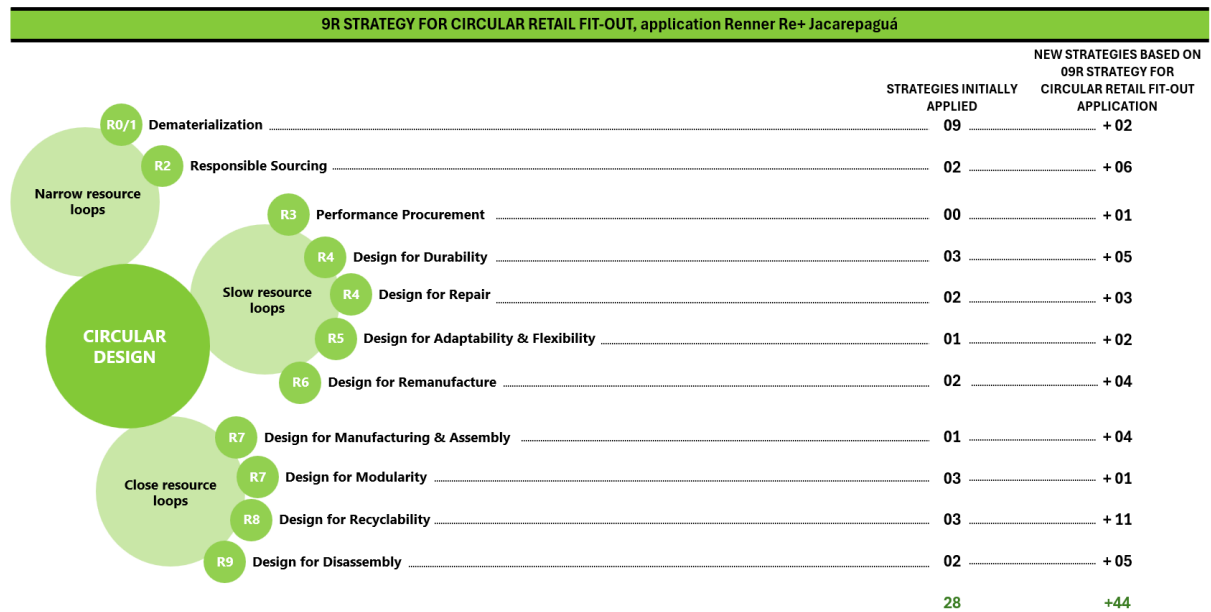


Fig. 91 - Circular Design strategies comparison at Renner Re+ Jacarepaguá Initial Project x 9R Strategies application. Source: Author, adapted from Ayalp & Santoro (2022)

The results showed that those strategies that rely on the development of new supply chains and partnership with other entities – **Responsible Sourcing (R2)** and **Design for Recyclability (R8)** – answered for 38% of the potential Circular Design initiatives. This evidence reinforces the Circular Design need for ecosystems to be implemented. **Design for Durability (R4)**, **Design for Remanufacture (R6)**, **Design for Manufacturing and Assembly (R7)** and **Design for Disassembly (R9)**, those strategies that demand more design development, accounted 17 potential strategies with possibility to be implemented (40% of total). Such initiatives require a high level of openness to design changes and resources availability (time and money), to be enhanced. Resources that tend to be scarce in scenarios of improving established retail design standards.

In conclusion, these findings demonstrate the low effectiveness of the proposed method for improving mature Retail Concept Designs (much more frequent in retail designers' agendas). However, if applied to new projects (rarer situation) with interference from the Concept Design creation stage, the potential for use LCA and Circular Design combined seems to be much greater. Testing this hypothesis is an opportunity for future researchers.

3.3.4. CASE STUDY REVIEW

The development of this case study serves both as the motive and the object of this research. It is the motive because the opportunity to document and bring it to academic discussion, having participated in its realization as a co-author, has always sparked great enthusiasm. It is the object because, with deep knowledge and unrestricted access to the available data, it was possible to assume it as a reliable basis for the experimental activities planned in this research. At this moment, as a critical reflection on the effectiveness of the case study against the research objectives is conducted, it can be

affirmed that all activities carried out have left their legacy of contribution, even when the results produced were not the "desired" ones.

As cited at the beginning of this section, the primary objective of the case study was its own documentation. For this purpose, a narrative was developed, guided by impartiality, but from the perspective of a retail designer who faces the challenge of reconciling technical issues in the realms of architecture and engineering with sustainability objectives, without renouncing the project's goals as a commercial tool. Thus, the narrative sought to address each of these aspects, demonstrating a clear commitment to the "real thing."

The development of a new retail concept design is a unique and rare opportunity, especially when the project includes Sustainability and Circularity objectives in its briefing. However, this novelty comes with a lack of a project model to follow. This was the context at the start of this project in mid-2019, when the theme of Circular Economy still had little presence on the agenda of retailers and architects in Brazil. In this context of discoveries and learning, the commitment to bold performance targets in the environmental certification processes to which the pilot projects were subjected—BREEAM and LEED respectively—was assumed as the main driver for achieving sustainability objectives. Although the principles of Circular Economy and Design were not yet fully tailored for application in retail architecture projects, they were incorporated into the process as ideation tools.

This method proved efficient given the indicators mentioned above. As result, it contributed decisively to the units being certified at the highest levels of each certification system. As process, it guided project development by providing indicators and benchmarks to be pursued within the constraints of time, budget, and supply chain. In this context as one of the certification process requirements, the Life Cycle Assessment (LCA) was applied during the Concept Design phase (RIBA stage 02) to evaluate alternative material specifications with high environmental impact potential. Based on the LCA, specification alternatives were modeled, supported by environmental impact estimates (mainly GWP), cost estimates, supply chain maturity analysis, and project timeline adherence. This approach successfully supported the decision-making process with previously unavailable information. Concurrently, the free interpretation and application of the three principles of Circular Economy in developing the Retail Concept Design (encompassing Architecture and Display System) sparked the application of Circular Design strategies, particularly Design for Dematerialization, Design for Manufacture, Design for Modulation, and Design for Durability.

The definitive validation of the new Retail Concept Design—Renner Re+—regarding its sustainability objectives was achieved with the second LCA, then based on the project developed at the Technical Detailing level (RIBA stage 4). Using these projects, a detailed inventory was conducted, allowing for the assessment of results in all categories analyzed by the tool. These numbers confirmed the superior performance of the project compared to the previously existing store model (Renner JK), which was also subjected to LCA and whose results were taken as the baseline for comparison. The Re+ standard presented a 3% reduction in the category chosen as the main indicator of the project's environmental qualities, the Global Warming Potential. This reduction, though seemingly modest, was considered sufficient by the client given the project's constraints and in the light of the quality and commercial potential of the resulting retail atmosphere. After the project's execution and the inauguration of the two pilot units, the project also confirmed its commercial performance, reflected in revenue and consumer perception positive indicators, leading to the homologation of this store model as the new standard to be replicated across the country, in both new stores and renovation processes.

The resumption of the project in the Experimental Plan of this research aims to advocate for the exploratory dimension of this project. As previously mentioned, the reality of Retail Design practice is more frequently found in improvement projects of implemented Retail Concept Designs than in the conception of new ones. The explanation for this is simple: complete renewal movements are not only

more expensive than targeted processes but also necessitate the renovation of the respective entire chain of stores to accomplish with marketing goals, requiring much more investment, time, and tolerance for the inherent losses of the process (stores closed entirely or partially during renovations). Thus, this return to the project was used not only to identify new opportunities for project improvement (emulating everyday practice) but also to speculate on a possible project path for such challenges, combining LCA results with Circular Design strategies.

For this experiment, mastery of the scope and deep knowledge of the parameters used in conducting the LCA are fundamental. Therefore, a new LCA was performed, here termed "LCA fit-out as implemented". In this new inventory, the scope was restricted to the components of a typical retail fit-out: Internal structures, façades, walls and partitions, wall, floor and ceiling coverings, lighting, and furniture/displays; excepting the building envelope and MEP installation. This scope delimitation aims to hyper-expose the impacts of decisions and choices within the retail designer's control – the typical fit-out scope.

The inventory process (LCI) was supported by the original Bill of Quantities of the project and the Construction Consumption Spreadsheet, which indicated the consumption of water, energy, and fuel during the construction process, as well as quantified and qualified the construction waste generated. These quantities and flows were appropriated by correspondence or similarity to the items in the OneClick LCA database, which was the tool used for conducting the LCA.

Based on the LCA results, several inferences could be made, and part of the research objectives were achieved:

- i) The environmental impacts of the project were duly quantified and qualified.
- ii) Cradle to Gate or Construction Material activities (A1-A3) accounted for more than 60% of impacts in all categories.
- iii) Material Replacement and Refurbishment activities (B4-B5) had significant environmental impact and energy consumption, confirming the negative effect of recurring retail fit-outs.
- iv) Energy Use activities (B6) were also significant, highlighting the importance of the project's overall energy performance, which should be analyzed from the Concept Design stage (RIBA stage 2) and refined/ensured in subsequent stages (RIBA 3 and 4). Consistent with this point, attention should be given to the energy matrix powering the store, always seeking a composition of renewable and low environmental impact energies.
- v) The Global Warming Potential (GWP) category was analyzed in depth to better understand the most environmentally harmful materials used in the project. This list of "hotspots" was analyzed and clustered according to the fit-out systems, forming the basis on which the Circular Design framework application was tested.

Armed with the results of the LCA, the next activity undertaken was the application of the 09R Strategies delineated in the framework for Circular Retail Fit-out proposed by ARUP over the hotspots identified in the LCA. This detailed analysis was conducted through the application of the "igniting questions" provided for each strategy (or criteria, as they are called). The criteria are suggested approaches to the problem which, once implemented, enhance the level of circularity. In this context, this research explored the hypothesis that implementing an enhancement loop (Fig. 92) with the combined application of these tools, as a seed of a method of enhancing current retail design standards toward greener retail design standards.

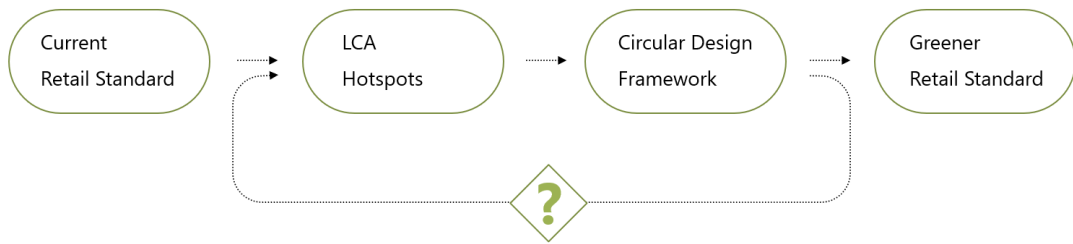


Fig. 92 – Proposed Enhancement Loop
Source: Author

The initial expectation was that the direct application of this method to the LCA hotspots would produce direct responses, culminating in alternative materials that could be re-evaluated using LCA to verify their effectiveness in reducing environmental impact. However, this methodology proved to be unfeasible. While the LCA results (hotspots) are expressed in terms of quantified impacts, the Circular Design strategies prompted by the framework address ideas and systemic solutions. These solutions often involve modeling new supply and value chains. The outcome of this process is usually not a substitute material but rather a new project response/approach to the problem, the environmental impact of which has often not yet been measured. Therefore, it cannot be reintroduced into the LCA for immediate analysis and comparison.

Hence, the idea of creating this improvement loop by using LCA and Circular Design, in the way that we tried here, was partially effective (Fig. 93). Circular thinking and Circular Design lead to solutions and products being available in innovative ways, sometimes with low availability, and/or in a very particular arrangement. On the other hand, LCA deals with hard quantification based on strong databases. Something that is scarce when we are talking about circular products and solutions. For this reason, this loop was considered low effective to improve current retail standards. Circular solutions and products are more prone to be implemented at the beginning of the project, when structural changes in the project are still possible. For this reason, this research suggests that this methodology is more suitable for the development of New Concepts.

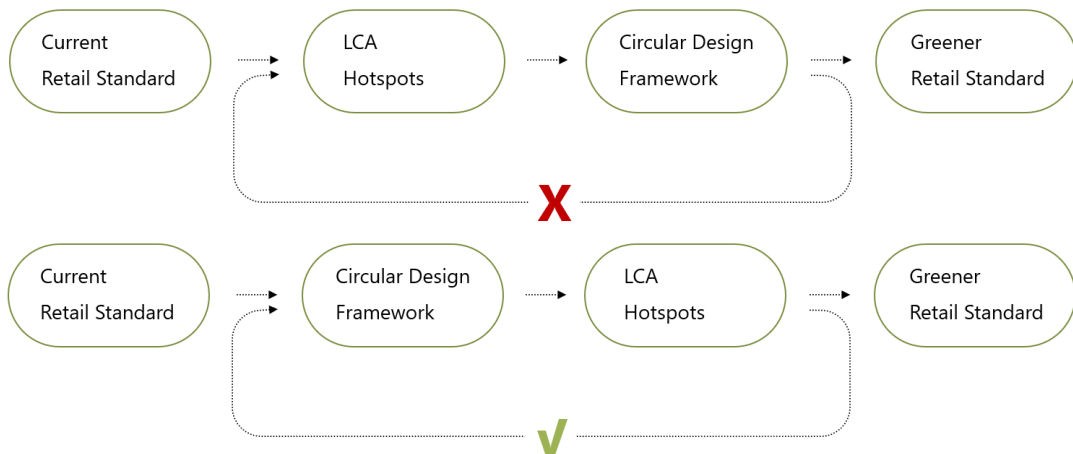


Fig. 93 – Enhancement Loop findings
Source: Author

Despite being initially disappointing when considering the expectations for applying the method to improve store standards without innovating in Concept Design, this finding did not overshadow the potential gains that such a method could produce if applied in the creation of new store models, starting from the Concept phase (RIBA stage 02). This case overview and conclusion conclude the investigation phase of this research as presented in the final vision of the investigation roadmap, presented in the Fig. 94:

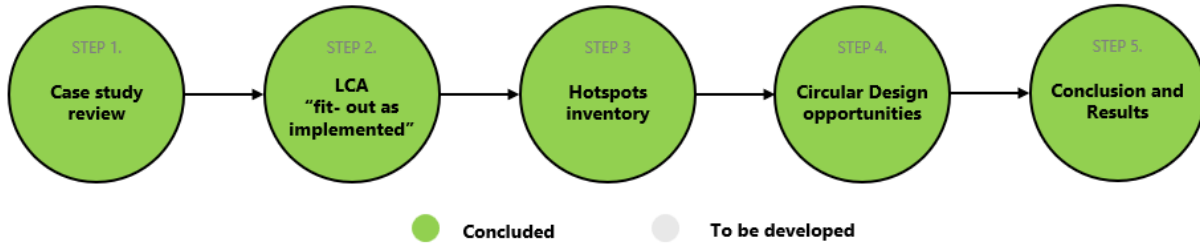


Fig. 94 - Case study roadmap status.
Source: Author

4

CONCLUSIONS

4.1. RESPONSE TO THE PROBLEMATIC

It is projected that approximately 80% of the buildings that will exist in developed nations by 2050 have already been constructed (Prinz & Tirodkar, 2023). Consequently, the carbon emissions associated with their structures, envelopes, and major services such as mechanical, electrical, and plumbing (MEP) systems have largely been emitted. Nonetheless, these extant buildings are expected to undergo multiple interior renovations prior to 2050, encompassing a range of activities from updating furniture, fixtures, equipment and finish materials to substantial revisions in space planning, MEP systems, and comprehensive energy retrofits, including lighting and other major building systems. The recurrent nature of these interior renovations results in a significant carbon impact (Hollyman & Dodkin, 2024).

In contemporary commercial and retail renovation projects, the initial phase typically involves clearing and shelling the space, resulting in the demolition of previous renovations and the consequent disposal of valuable materials that still possess remaining service life into landfills. Moreover, the frequent renovation of spaces driven by commercial and branding pressures exacerbates this situation by discarding materials and equipment, many of which have not yet reached the end of their service life, to landfills. These practices – called fit-outs - leads to the wastage of carbon emissions and its recurrence in retail projects fluctuates in cycles of 3 to 10 years, on average (Forsythe, 2017a).

This research aims to support the belief that transforming this reality requires the application of circular design strategies in retail projects with sustainability objectives. To this end, it **examines a recent case of green and circular retail implemented in Brazil**, capturing the lessons learned and trying to draw potential design pathways for other retail designers facing similar challenges.

This investigation strategy based on a case study proved successful. The extensive access to information from the case allowed for a detailed recording of the project conditions, objectives, challenges, and opportunities. Additionally, the abundance of data facilitated the performance of the Life Cycle Assessment (LCA), whose results enabled the measurement of the environmental impacts of this retail fit-out in many categories and a deep **analysis of embodied carbon and recurring embodied carbon**. These results highlighted the magnitude of these impacts not only at the beginning of the lifecycle but also throughout its recurrence and at the end of life.

Over these results, specifically over the most offensive materialities, a framework specifically designed for **Circular Design in retail fit-out** projects was tested as a tool for achieving more sustainable retail projects, and its effectiveness was partial. The attempt to apply it based on the results

of a **Life Cycle Assessment (LCA)** conducted according to the Technical Detailing (RIBA Stage 4) proved to be quite restrictive given the ecosystemic nature of Circular Design approaches. Adopting such strategies during the Concept Design phase (RIBA Stage 2) holds much greater potential for project improvement.

Finally, considering that one of the primary objectives of this research is to **enhance awareness among retail design teams** about sustainable impacts, it is believed that this objective was achieved through both its successes and failures. By adhering to the reality of professional practice, without utopias or exaggerated idealizations, this research aims to contribute to the evolution of green retail design practices.

4.2. KNOWLEDGE CONTRIBUTION

As mentioned previously, this research is affiliated with efforts to integrate Circular Design strategies into the recurring practice of Retail Design, especially with an emphasis on projects with greater sustainability ambitions. In this sense, we hope that this research will be successful in exposing the challenges, limitations and opportunities in the hands of a retail designer.

Throughout its development, each section of this research has significantly delivered some useful legacy. From the bibliometric analysis, it was possible to identify how recent and little explored the scientific knowledge around this topic is. This suggests ample space for investigation and knowledge production. The theoretical review of the context provided the context in which the practice of retail design is conducted, the particularities of the built environment and the recurrent nature of retail project renovations, as well as the potentialities and procedures to be followed for the implementation of Life Cycle Assessment. From the case study, as developed in subsection 3.3.4, contributions were produced in two areas: documentary, by describing this circular retail case in detail; and experimental, by using this case study as a pilot in an attempt to validate a design method that integrates LCA findings with Circular Design strategies.

In addition, this study is expected to contribute to a greater awareness of the environmental impacts of materials commonly used in retail projects. The selection of building materials directly influences embodied carbon and can also affect construction, operation, maintenance, and end-of-life emissions throughout the design life of a retail fit-out. Interiors, including furniture, can account for over half of a building's embodied carbon over time. Once the carbon investments in the structure and envelope have been made, nearly all remaining embodied carbon emissions will originate from the interiors. Designers must address all these impacts collectively to ensure the reduction of greenhouse gas (GHG) emissions from stores. A thorough understanding of the relationship between the design life of finishes and strategic planning for deconstruction can significantly enhance environmental impact and potentially lower fit-out costs.

Finally, bringing a retail design case to the academic environment, is expected to encourage more researchers to explore this area of knowledge that still has a lot of room for scientific production.

4.3. CONSTRAINTS

Capturing the full scope of materials used in retail interiors is a challenging task due to the large number of unique material types. Furthermore, the complexity of the composition of some solutions, involving multiple materials in a single product, makes it difficult for manufacturers – often small – to provide third-party verified carbon data in a consistent format.

The complexity and lack of data means that many additional material categories, including Furniture, Fittings and Equipment, joinery and lighting, are often omitted from carbon calculations or misrepresented, despite having a surprisingly large emissions impact. In the case of this project, the difficulty of allocating the lighting system was so significant that it was decided to disregard this data.

That said, the main constraint faced throughout this research relates to the appropriation of the materials specified in the project in the Life Cycle Assessment calculation application database. The availability of materials with the Environmental Product Declaration in Brazil is still very limited. Faced with this difficulty, most of the inputs were appropriated due to their technical similarity to products manufactured in other countries, especially in the European Union.

4.4. FUTURE DEVELOPMENTS

In addition to the invitation previously made to invest greater research efforts into the integration of Circular Design strategies into regular retail design practice, some reflections on potential inhibitors of a green retail fit-out agenda are discussed below. Conducting research on these topics can contribute to reversing these realities.

- i) Tenant agreements often include a “restoration” clause that requires the space to be returned to its original state (core and shell), meaning that walls, ceilings, lighting, furniture, and fixtures are removed upon vacating the property. This results in the premature disposal (before their service life is exhausted) of materials that could have their value restored. This condition reaffirms the importance of the Circular thinking and invites future researchers to give greater visibility to this situation.
- ii) The imperative of exclusivity in each retailer's store atmosphere inhibits the greater application of modular and standardized solutions that guarantee a greater number of product/solution usage cycles. Studying the possible gains from adopting such strategies can decisively contribute to a sector transformation.
- iii) Last but not least, much room was identified for developing specific methods and decision-making processes aimed at greener retail design projects throughout the development of this work.

Finally, considering that the future of retail design will be defined by the ever-closer integration of technology, sustainability, and customer experience, studies that integrate these three areas are up-and-coming.

A

ANNEXES

A.1. CORPORATE SUSTAINABILITY REPORT (CSR) REVIEW

CORPORATE SUSTAINABILITY REPORT									
#	COMPANY	RETAIL BRANDS	TURN-OVER*	STORES	HEADQUARTER	TITLE	YEAR	MENTION TO RETAIL BUILDING	MENTION TO RETAIL FIT-OUTS
01	Inditex Group	Zara, Zara Home, Bershka, + 04	17,5	4467	Spain	Inditex Group Annual Report 2022	2022	No mention	No mention
02	H&M Group	H&M, COS, Weekday, Monky, &OtherStories, Arket, Afound, Allin, Singular Society	13,2	2665	Sweden	H&M Group Sustainability Disclosure 2023	2023	- Vision: release more value from existing assets, keep resources and building materials in the economy, and stop them from becoming waste; - Plan for retrofit buildings in progress; - New buildings projected following high standards; - Building process guided by the Circular Built Environment Strategy in deployment (partnership with Ellen MacArtur Foundation); - Case: COS stores reprocessing concrete to be reused in refurbishments	- Vision: 100% of interiors and construction materials be reused and repaired before recycling; - Goal: 100% of recycled or sustainability sourced material by 2030; - Achievements: adoption of circular design strategies; Design all new products for stores, offices and distribution centers to be reusable, repairable or recyclable from 2021; materials traceability measures; - Case: 08 COS stores opened using partially reused interiors; and many stores are using panels made from textile fibers and dust as finishing elements; - Innovation: The internal team is testing on bio-cement made of waste aggregate and microorganisms mixed with water for flooring use.
03	Zalando	Zalando	10,4	on-line + 15 outlets	Germany	Sustainability Progress Report	2023	No mention	No mention

04	JD Sports	JD, Size?, Sports Fashion, Sport Zone, Outdoor +17	11,8	3403	UK	JD Sports Fashion Plc - Annual Report and Accounts 2023	2023	No mention	Action: assets like metal fixtures, office furniture, hangers and mannequins, returned, refurbished and/or reused.
05	Primark	Primark	6,6	362	UK	Primark Sustainability and Ethics Progress Report	2022-23	No mention	No mention
06	LMVH Group	Louis Vuitton, Fendi, Sephora, + 12	6,5	1203	France	2022 Social and Environmental Responsibility Report	2022	- Group is operating a guideline with performance targets for: - store's thermal insulation; - lighting system; - air quality; - interior design; - energy consumption; - water consumption; - time regime of lighting operation in shopping windows.	- Case Maison Chaumet: - Displays variation reduced from 90 to 60 models; - Minimum store life for displays increased to 04 years minimum; - All displays made with 80% recycles steel and aluminum, 100% FSC wood products, and 100% water-based glues.
07	Next	Next	5,4	477	UK	Next Corporate Responsibility Report to January 2023	2023	No mention	No mention
08	C&A	C&A	5,2	1290	Luxemburg	Sustainability Report 2022	2022	No mention	No mention
09	Pepco	Pepco	4,1	3504	Poland	Pepco website	2023	No mention	No mention

* Europe, 2021, in Billion €

Continuation

#	COMPANY	RETAIL BRANDS	MENTION TO ENERGY	MENTION TO EMISSIONS	OTHER RELEVANT DATA
01	Inditex Group	Zara, Zara Home, Bershka, + 04	- Achievement: 100% renewable energy achieved in own facilities (except international offices); - Consumption: 389 kWh / m2 in stores (2022); - Achievement: BMS platform (Inergy) in operation in all stores.	- Carbon trajectory validated by the SBTi (2020); - Goal: Net Zero emissions, Scopes 1, 2 and 3, by 2040; - Goal: 90% reduction Scopes 1 and 2 by 2030; - Emission: 462.662 tonnes Co₂eq (Scope 1+2, 2022); - Emission: 2 Kg Co₂eq per m2 (Scope 1+2, 2022).	03 Main Inditex Group's Strategies: Global Energy Strategy, Global Water Management System, Biodiversity Strategy; - Certifications: 8 LEED Platinum, 25 LEED Gold, 04 BREEAM Certification for own buildings.
02	H&M Group	H&M, COS, Weekday, +7	- Goal: 100% renewable energy in own operations by 2030; - Goal: 25% reduction in electricity used in stores by 2030 (baseline 2016). Goal reached in 2023; - Achievement: 94% of electricity renewable in 2022; - Achievement: 91% of stores with LED lights; - Achievement: 29% reduction in energy intensity in stores; - Achievement: 90% of stores and offices with BMS; - Action: Reducing the number of lighting fixtures; - Action: Upgrading HVAC.	- Carbon trajectory validated by the SBTi; - Goal: Net Zero emissions, Scopes 1, 2 and 3, by 2040; - Goal: 56% reduction Scopes 1 and 2 by 2030; - Emission: 54.805 tonnes Co₂eq (Scope 1+2, 2023); - Emissions: 24% reduction, Scopes 1 and 2 (baseline 2019).	- Adoption of an Internal carbon pricing as a decision tool; - H&M Groups' Circular Innovation Lab: a department for investigation on sustainable materials
03	Zalando	Zalando	- Goal: 100% renewable energy in own operations by 2025; - Consumption: 154.364 MWh (2023).	- Goal: 78% reduction, Scopes 1 and 2 by 2025 (baseline 2017); - Emission: 6.077 tonnes Co₂eq (Scope 1+2, 2023).	

04	JD Sports	JD, Size?, Sports Fashion, Sport Zone, Outdoor +17	• Achievement: 100% renewable energy in Western European own operations; • Achievement: 62% renewable energy worldwide; • Achievement: 40% energy reduction in stores by adopting LED lighting (saving 228t CO₂); • Achievement: 500+ sites with BMS installed; • Achievement: Solar installation in many Stores and Distribution Centers (sparing 1430 t CO₂).	• Goal: 62,7% reduction, Scopes 1 and 2 by 2035 (baseline 2019); • Emission: 52.948 tonnes Co₂eq (Scope 1+2, 2022); • Emission: 31,2 Kg Co₂eq per m2 (Scope 1+2, 2022).	• Average rental lease for stores: 3 years with break options.
05	Primark	Primark	• Achievement: 70% stores powered with renewable or low carbon energy; • Achievement: 141 stores with LED lighting + 110 planned for 2024; • Achievement: Adoption of a BMS (Energy Bureau) in 179 stores.	• Carbon trajectory validated by the SBTi; • Goal: 50% reduction in Carbon Footprint (scopes 1 and 2) by 2030 (baseline 2018/19); • Emission: 97.039 tonnes Co₂eq (Scope 1+2, 2022/23), representing -40% (baseline 2018/19).	
06	LMVH Group	Louis Vuitton, Fendi, Sephora, + 12	• Goal: 100% energy from renewables or low-carbon for sites and stores by 2026; • Goal: 400 kWh/m2 consumption in stores by 2026; 300 kWh/m2 by 2030; • Achievement: 47% energy from renewable; • Achievement: 500 kWh/m2 consumption in stores by 2023; • Consumption: 1.531.180 MWh in total by 2022; • Action: Adoption of a BMS since 2022; • Action: Few sites with photovoltaic panels or geothermal installations; • Action: 77% stores with LED lighting.	• Carbon trajectory validated by the SBTi; • Achievement: 11% reduction GHG Scopes 1 and 2 (baseline 2019); • Goal 50% reduction from sites and stores by 2026; • 329.420 tonnes Co₂eq (Scope 1+2) (2022); • Scopes 1 and 2 accounts 5% of the whole operations.	

07	Next	Next	• Goal: 100% energy from renewables or low-carbon by 2030 (RE100 signatory); • Achievement: 95% energy from renewable; • Action: 55% stores with LED lighting; • Action: reviewing heating and cooling strategy.	• Carbon trajectory validated by the SBTi; • Goal: 55% GHG reduction by 2030 (baseline 2016/17); • Achievement: 47% reduction GHG, Scopes 1 and 2 (baseline 2016/17); • Emission: 86.488 tonnes Co₂eq (Scope 1+2, 2023).	
08	C&A	C&A	• Action: adjustments of working hours and demand-oriented usage for lighting, HVAC, and escalators.	• Carbon trajectory validated by the SBTi (2020); • Goal: 30% reduction across all scopes by 2030; • Goal: 30% reduction GHG emissions for offices, distribution centers, and stores by 2030; • Emissions: 80.120 tonnes Co₂eq (Scope 1+2, 2022). 32% reduction against baseline 2018.	
09	Pepco	Pepco	• Achievement: Almost 100% stores with LED lighting.	• Emission: 101.674 tonnes Co₂eq (Scope 1+2, 2023)	• Declared delayed and inform that the strategies are under development.

A.2. LCA FOR BREEAM REPORT SUMMARY

RNR 491 – JACAREPAGUÁ STORE

RIO DE JANEIRO | BRAZIL

LCA

LIFE CYCLE ASSESSMENT

Date: 22 June 2021

Authors: Joana Giugliani (Lead) and
Michele Morales

Peer Reviewer: Caio Alencar (eTool)

Report Id: 16086 / 16088

Owner: Lojas Renner S.A



EXECUTIVE SUMMARY

This Life Cycle Assessment (LCA) has been completed for several design scenarios for the entire fitout. The author of the study is Joana Giugliani and Michele Morales of bgreen. The Author of the study is Joana Giugliani of bgreen and the critical review has been conducted by Caio Alencar of eTool.

The goal of this study is to profile and improve the environmental performance of the project for a Department Store located at Jacarepaguá Mall, in Rio de Janeiro city, Brazil. The life cycle performance of the project is compared to other designs. The study has been conducted in accordance with ISO 14044 and EN15978 and meets BREEAM requirements for Mat 1, described in the BREEAM International Non-Domestic Refurbishment 2015 Technical Manual. The results represent the total life cycle impact during 20-year service life according to BS EN 15978:2011 for the proposed design.

The main purpose of the study is to develop informed choices between alternative design options that demonstrate environmental improvement opportunities. The initial analysis consists of estimating the design specifications and understanding how 6 (six) different design options can influence environmental performance of the retail project.

During design stages (RIBA 2 to RIBA 4), the LCA study was conducted to assist design teams on decision making, being, in this sense, an important tool to achieve sustainability goals, taking into account all efforts to maintain the technical and economic feasibility of the project.

PRELIMINARY STUDY

Based on the sustainability goals and with the purpose of reducing the potential environmental impacts generated in the production process of a store, 06 (six) study scenarios were developed, aiming to understand the environmental profile of each proposed scenario, as shown in Table 1, below.

With the result of the preliminary LCA study (RIBA Stage 2) and subsequent debates that focused on the feasibility of implementing each solution, Scenario 3 was selected for deployment. For scenario 3, the LCA study was refined (RIBA Stage 4) and its comparison with the baseline project will be presented throughout this report.

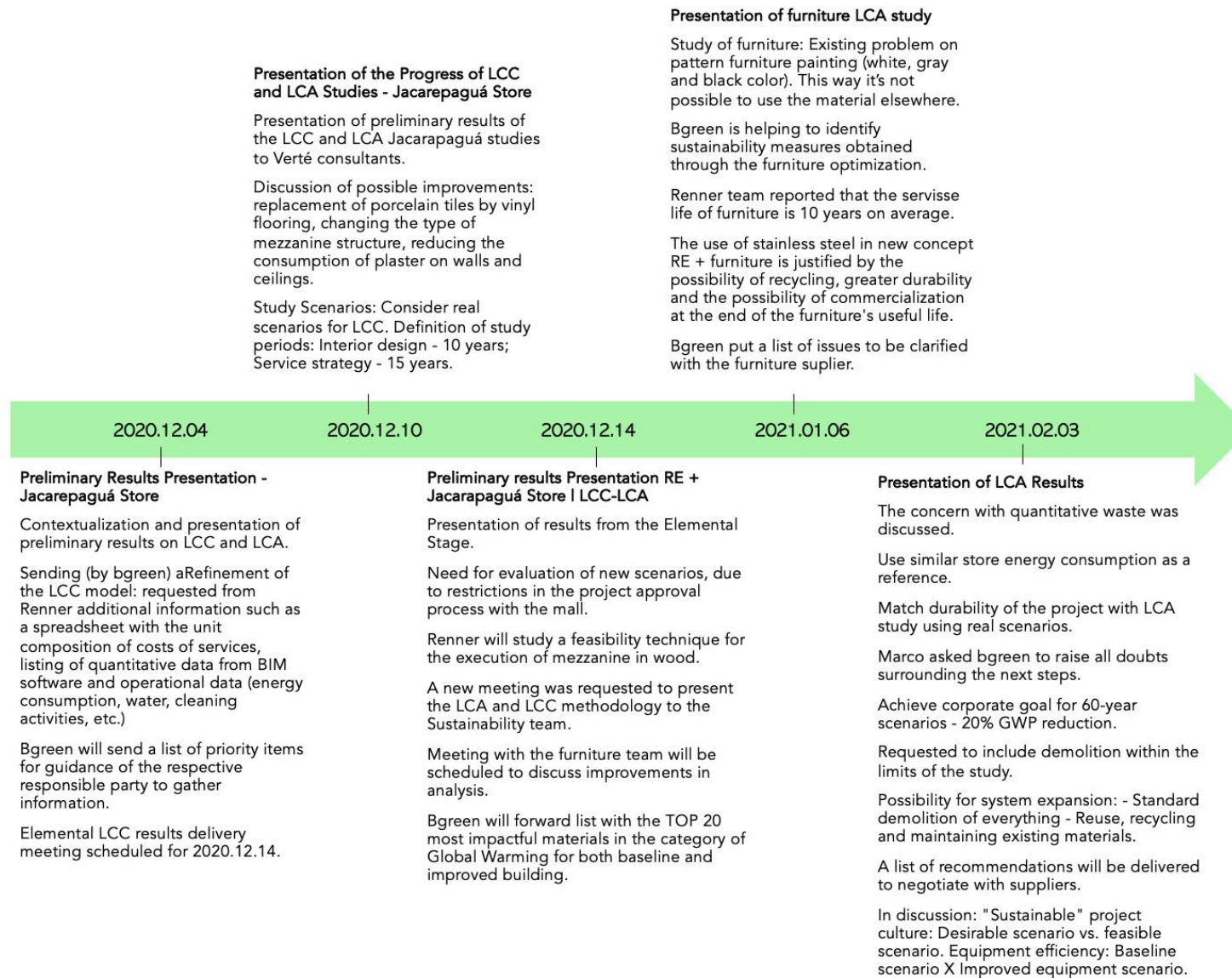
The discussion about the environmental profile of the scenarios was marked by meetings with the teams involved and managers, bringing rich discussions, which contributed strongly to the decision-making process, as shown in a timeline in Figure 1.

In the preliminary study the estimated design life is 20 years which has been adopted for the LCA study period.

2. Table 1 – Six different scenarios were evaluated to help decision making

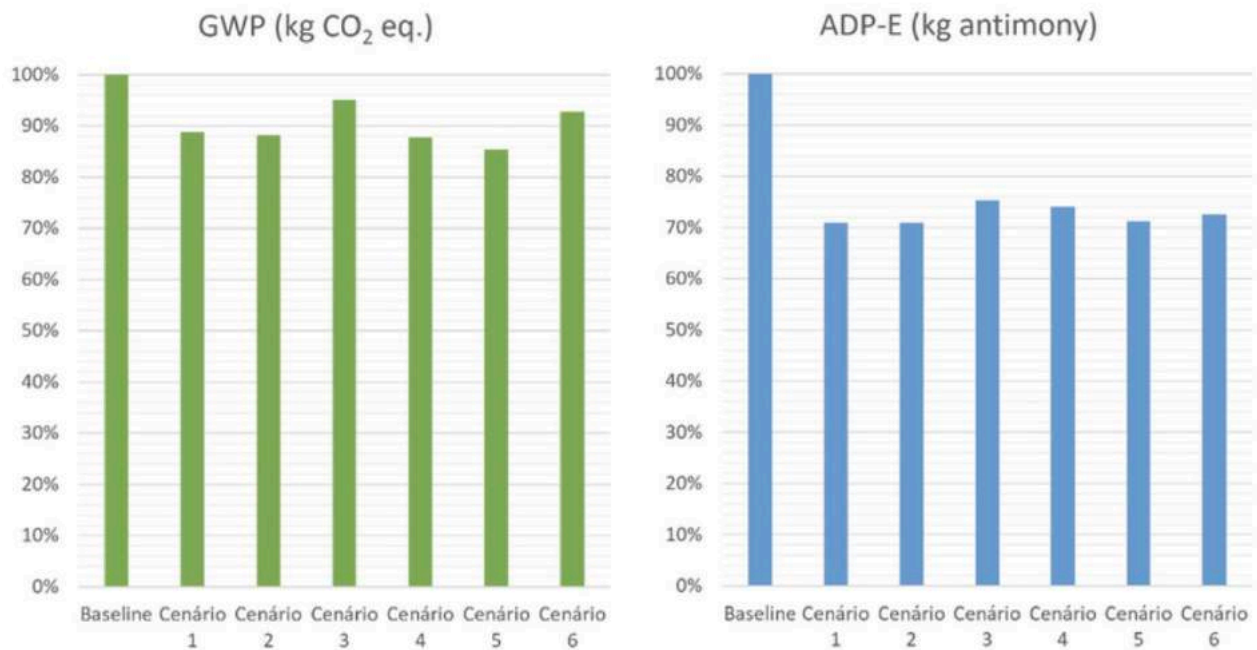
SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5	SCENARIO 6
Reduction of ceiling lining plasterboard system	Reduction of ceiling lining plasterboard	Reduction of ceiling lining plasterboard	Reduction of ceiling lining plasterboard	Reduction of ceiling lining plasterboard	Reduction of ceiling lining plasterboard
Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system	Reduction of internal wall lining plasterboard 16mm system
Change of the structure of the metal mezzanine by wood	Change of the structure of the metal mezzanine by wood	Use of Steel Mezzanine	Change of the structure of the metal mezzanine by wood	Change of the structure of the metal mezzanine by wood	Use of Steel Mezzanine
Change of porcelain flooring by vinyl flooring	Change of porcelain flooring by vinyl flooring	Use of Porcelain tiles	Use of Porcelain tiles	Use of Porcelain tiles	Use of Porcelain tiles
Cement type: CPII	Optimization of the concrete mix of concrete slab on grade	Optimization of the concrete mix of concrete slab on grade	Optimization of the concrete mix of concrete slab on grade	Optimization of the concrete mix of concrete slab on grade	Optimization of the concrete mix of concrete slab on grade
Cement type: CPII	Optimization of the mortar mix_concrete slab	Optimization of the mortar mix_concrete slab	Optimization of the mortar mix_concrete slab	Optimization of the mortar mix_concrete slab	Optimization of the mortar mix_concrete slab
Improvements and changes in furniture	Improvements and changes in furniture	Improvements and changes in furniture	Improvements and changes in furniture	Improvements and changes in furniture	Improvements and changes in furniture
Use of Steelframe for partitions	Use of Steelframe for partitions	Use of Steelframe for partitions	Use of Steelframe for partitions	Change of the wall frame from steel to wood	Change of the wall frame from steel to wood

3. Figure 1 - Timeline on decision making process.



In Figure 2, the results are shown for each proposed scenario are presented, considering the Global Warming Potential indicator. Table 2 through Table 7 presents the summary of results are presented, considering the Improved design savings against the baseline.

4. Figure 2 - Participation in impacts of each scenario evaluated, considering Global Warming Potential (GWP) and Abiotic Depletion Potential – Elements (ADPE).



5. Table 2 - Scenario 1 (SC1): Summary of results considering Improved design savings against baseline.

Characterised Impacts Per m2 Gross Floor Area		Baseline	Improved Design	Improved Design Savings Against Baseline
Environmental Impacts				
Global Warming Potential, GWP	kg CO ₂ eq	560	500	11%
Ozone Depletion Potential, ODP	kg CFC-11 eq	6.10e-5	5.90e-5	3%
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	5.2	4.6	12%
Eutrophication potential, EP	kg PO ₄ eq	2	1.8	10%
Photochemical Ozone Creation Potential, POCP	kg ethylene	0.37	0.35	5%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	0.028	0.02	29%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	8300	8000	4%

6. Table 3 - Scenario 2 (SC2): Summary of results considering Improved design savings against baseline.

Characterised Impacts Per m2 Gross Floor Area		Baseline	Improved Design	Improved Design Savings Against Baseline
Environmental Impacts				
Global Warming Potential, GWP	kg CO ₂ eq	560	490	12%
Ozone Depletion Potential, ODP	kg CFC-11 eq	6.10e-5	5.80e-5	5%
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	5.2	4.6	12%
Eutrophication potential, EP	kg PO ₄ eq	2	1.8	10%
Photochemical Ozone Creation Potential, POCP	kg ethylene	0.37	0.34	8%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	0.028	0.02	29%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	8300	7900	5%

7. Table 4 - Scenario 3 (SC3 - selected option): Summary of results considering Improved design savings against baseline.

Characterised Impacts Per m2 Usable Floor Area		Baseline	Improved Design	Improved Design Savings Against Baseline
Environmental Impacts				
Global Warming Potential, GWP	kg CO ₂ eq	1.50e+6	1.40e+6	7%
Ozone Depletion Potential, ODP	kg CFC-11 eq	0.16	0.15	6%
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	13000	12000	8%
Eutrophication potential, EP	kg PO ₄ eq	5300	4900	8%
Photochemical Ozone Creation Potential, POCP	kg ethylene	960	900	6%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	72	54	25%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	2.20e+7	2.10e+7	5%

8. Table 5 - Scenario 4 (SC4): Summary of results considering Improved design savings against baseline.

Characterised Impacts Per m2 Gross Floor Area		Baseline	Improved Design	Improved Design Savings Against Baseline
Environmental Impacts				
Global Warming Potential, GWP	kg CO ₂ eq	560	490	12%
Ozone Depletion Potential, ODP	kg CFC-11 eq	6.10e-5	5.90e-5	3%
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	5.2	4.6	12%
Eutrophication potential, EP	kg PO ₄ eq	2	1.8	10%
Photochemical Ozone Creation Potential, POCP	kg ethylene	0.37	0.33	11%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	0.028	0.02	29%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	8300	7800	6%

10.

11. Table 6 - Scenario 5 (SC5): Summary of results considering Improved design savings against baseline.

Characterised Impacts Per m2 Gross Floor Area		Baseline	Improved Design	Improved Design Savings Against Baseline
Environmental Impacts				
Global Warming Potential, GWP	kg CO ₂ eq	560	480	14%
Ozone Depletion Potential, ODP	kg CFC-11 eq	6.10e-5	5.90e-5	3%
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	5.2	4.6	12%
Eutrophication potential, EP	kg PO ₄ eq	2	1.8	10%
Photochemical Ozone Creation Potential, POCP	kg ethylene	0.37	0.33	11%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	0.028	0.02	29%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	8300	7700	7%

12. Table 7 - Scenario 6 (SC6): Summary of results considering Improved design savings against baseline.

Characterised Impacts Per m2 Gross Floor Area		Baseline	Improved Design	Improved Design Savings Against Baseline
Environmental Impacts				
Global Warming Potential, GWP	kg CO ₂ eq	560	520	7%
Ozone Depletion Potential, ODP	kg CFC-11 eq	6.10e-5	5.90e-5	3%
Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	5.2	4.6	12%
Eutrophication potential, EP	kg PO ₄ eq	2	1.9	5%
Photochemical Ozone Creation Potential, POCP	kg ethylene	0.37	0.34	8%
Abiotic Depletion Potential - Elements, ADPE	kg antimony	0.028	0.02	29%
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	8300	7900	5%

Although scenarios of better environmental performance were evaluated, the teams were faced with obstacles. Within the deadline stipulated for the project, it was not identified, in the first analysis, a qualified supplier who would give up using toxic preservatives for the treatment of wood to be used in the mezzanine structure. Unfortunately, in the Brazilian market the most common preservative is CCA (Chromium, Cadmium Arsenium), for which evidence demonstrates potential toxicity associated with the production process, touch during use, as well as environmental risks in disposal after the product's shelf life. Therefore, the choice for the metallic mezzanine was made for this specific reason.

The software eToolLCD, which is compliant for the BREEAM International Mat 01 credit by BRE, was used for the project LCA modelling. eToolLCD uses third party background processes aggregated as mid-point indicators and stores in several libraries within the software which are coupled with algorithms and user inputs to output the environmental impact assessment. Also, as recommended by the BRE, the Impact Database was used for dataset background inputs.

From the analysis undertaken it is confirmed that 1 exemplary credit can be awarded for the BREEAM International 2015 assessment as shown in the attached document “BREEAM_International_RFO_2015_Mat01_Calculator”.

Baseline changes for the selected scenario SC3, which impacted both positively and negatively, are listed below and will be detailed in item 8.

1. **Reduce Material Use:** Ceiling framing (steel grid) reduction > from 2741.5 to 1079.3 kg of steel;
2. **Reduce Material Use:** Ceiling lining plasterboard reduction > from 1293.15 to 509.1 m2 of plasterboard, skim plaster finish and paint.
3. **Reduce Material Use:** internal wall lining plasterboard reduction > from 955.4 to 566.88 m2 of plasterboard, skim plaster finish and paint.
4. **Store façade changes:** glass reduction > from 73.98 m2 to 37.39 m2
5. **Store façade changes:** increased door steel roller door area > from 20.35 to 45.1275 m2
6. **Store façade changes:** Increased Aluminum Composite Material > from 200.79 to 208.75 m2
7. **Store façade changes:** Inclusion of Stainless steel > from 0 to 676.16 m2
8. **Store façade changes:** reduction of MDF > from 164.89 to 8.49 m2
9. **Store façade changes:** increased structural steel framing > from 1361.95 to 2095.32
10. **Store façade changes:** plasterboard removal > from 100 to 0 m2
11. **Furniture improvements** > changing type and quantities.
12. **Ceiling improvements:** Application of cellulose fiber on the ceiling > from 0 to 76.51 m3 of application of cellulose fiber.
13. **Ceiling improvements:** Increased PVA latex painting > from 1284.1 to 2550.55 m2
14. **Partial replacement of clinker to fly ash:** optimization of mixtures of concrete and cement mortar.

In summary, assessment results for the baseline and the selected improved design SC3 for all environmental impacts considered under the BS EN 15978:2011 are presented in Table 8 and Table 10 below, considering a 20 years study period and in Table 9 and Table 11 for a 60 years study period.

13. Table 8 - Summary of results considering the selected scenario SC3 for a **20 years** study period.

Characterised Impacts Per m2 Gross Floor Area		Business as Usual	Improved Design	Improved Design Savings Against Business as Usual
Environmental Impacts				
 Global Warming Potential, GWP	kg CO ₂ eq	330	320	3%
 Ozone Depletion Potential, ODP	kg CFC-11 eq	4.10e-5	4.00e-5	2%
 Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	2.9	2.9	0%
 Eutrophication potential, EP	kg PO ₄ eq	1.5	1.5	0%
 Photochemical Ozone Creation Potential, POCP	kg ethylene	0.27	0.27	0%
 Abiotic Depletion Potential - Elements, ADPE	kg antimony	0.012	0.012	0%
 Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	4100	4000	2%

14. Table 9 - Summary of results considering the selected scenario SC3 for a 60 years study period.

Characterised Impacts Per m2 Gross Floor Area		Business as Usual	Improved Design	Improved Design Savings Against Business as Usual
Environmental Impacts				
 Global Warming Potential, GWP	kg CO ₂ eq	720	690	4%
 Ozone Depletion Potential, ODP	kg CFC-11 eq	9.00e-5	8.70e-5	3%
 Acidification Potential for Soil and Water, AP	kg SO ₂ eq.	6.3	6.2	2%
 Eutrophication potential, EP	kg PO ₄ eq	3.2	3.1	3%
 Photochemical Ozone Creation Potential, POCP	kg ethylene	0.57	0.54	5%
 Abiotic Depletion Potential - Elements, ADPE	kg antimony	0.025	0.025	0%
 Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	8900	8500	4%

For the 20 years study period, the Improved Design shows an expected performance degradation against Business as Usual for 4 of the 7 environmental indicators. For the 60 years study period, The Improved Design shows an expected performance improvement against Business as Usual for 6 of the 7 environmental indicators.

The following low impact strategies are included in the selected Improved Design:

15. Table 10 - Low impact strategies showing Improved design savings against baseline design for 20 years study period.

Design Strategy Performance	GWP	ODP	AP	EP	POCP	ADPE	ADPF
Reduce Material Use: 03.02.007 ceiling framing (steel grid) reduction	0.52%	0.28%	0.96%	0.58%	0.61%	3.33%	0.56%
Reduce Material Use: 18.042 ceiling lining plasterboard reduction	1.03%	1.04%	1.12%	0.83%	1.20%	0.21%	1.44%
Reduce Material Use: 18.014 18.015 internal wall lining plasterboard reduction	0.44%	0.38%	0.39%	0.25%	0.39%	0.06%	0.54%
Store façade changes: 18.073 glass (toughened)	0.19%	0.19%	0.18%	0.05%	0.13%	0.03%	0.19%
Store façade changes: 18.023 18.024 door steel roller door	-0.09%	-0.09%	-0.07%	-0.06%	-0.11%	-0.03%	-0.10%
Store façade changes: 18.069 18.070 Aluminum Composite Material	-0.23%	-0.09%	-0.15%	-0.09%	-0.19%	-0.19%	-0.23%
Store façade changes: 18.071 18.072 Stainless steel	-0.40%	-0.19%	-0.28%	-0.16%	-0.35%	-0.34%	-0.42%
Store façade changes: 18.079 reduction of MDF	0.16%	0.28%	0.21%	0.24%	0.40%	0.08%	0.41%
Store façade changes: 03.02.005 façade steel framing	-0.33%	-0.19%	-0.18%	-0.23%	-0.41%	-0.13%	-0.34%
Store façade changes: plasterboard removal	0.26%	0.19%	0.30%	0.19%	0.26%	0.44%	0.32%
Furniture improvements	-0.04%	0.47%	-0.01%	0.86%	0.75%	-0.23%	-0.03%
Ceiling improvements: 18.048 application of cellulose fiber on the ceiling	-0.08%	-0.09%	-0.09%	-0.04%	-0.08%	-0.71%	-0.13%
Ceiling improvements: 18.054 PVA latex painting	1.48%	1.52%	1.35%	1.15%	1.58%	-0.30%	1.65%
Partial replacement of clinker to fly ash: optimization of mixtures of concrete and cement mortar	1.57%	0.38%	0.35%	0.17%	0.35%	0.01%	0.60%

17. Table 11 - Low impact strategies showing Improved design savings against baseline design for 60 years study period.

Design Strategy Performance	GWP	ODP	AP	EP	POCP	ADPE	ADPF
Reduce Material Use: 03.02.007 ceiling framing (steel grid) reduction	0.24%	0.13%	0.44%	0.27%	0.29%	1.60%	0.26%
Reduce Material Use: 18.042 ceiling lining plasterboard reduction	1.25%	1.34%	1.42%	1.11%	1.60%	0.29%	1.79%
Reduce Material Use: 18.014 18.015 internal wall lining plasterboard reduction	0.47%	0.43%	0.46%	0.32%	0.49%	0.08%	0.61%
Store façade changes: 18.073 glass (toughened)	0.17%	0.13%	0.17%	0.04%	0.13%	0.03%	0.18%
Store façade changes: 18.023 18.024 door steel roller door	-0.12%	-0.09%	-0.09%	-0.08%	-0.16%	-0.04%	-0.13%
Store façade changes: 18.069 18.070 Aluminum Composite Material	-0.21%	-0.09%	-0.14%	-0.08%	-0.18%	-0.18%	-0.21%
Store façade changes: 18.071 18.072 Stainless steel	0.18%	-0.09%	-0.13%	-0.07%	-0.16%	-0.16%	-0.19%
Store façade changes: 18.079 reduction of MDF	0.21%	0.39%	0.27%	0.32%	0.54%	0.11%	0.53%
Store façade changes: 03.02.005 façade steel framing	-0.30%	-0.17%	-0.17%	-0.22%	-0.39%	-0.13%	-0.31%
Store façade changes: plasterboard removal	0.28%	0.22%	0.33%	0.22%	0.31%	0.43%	0.35%
Furniture improvements	3.19%	2.67%	2.22%	2.65%	4.18%	-0.20%	3.80%
Ceiling improvements: 18.048 application of cellulose fiber on the ceiling	-0.04%	-0.04%	-0.04%	-0.02%	-0.04%	-0.34%	-0.06%
Ceiling improvements: 18.054 PVA latex painting	1.48%	1.52%	1.35%	1.15%	1.58%	-0.43%	1.65%
Partial replacement of clinker to fly ash: optimization of mixtures of concrete and cement mortar	0.69%	0.17%	0.16%	0.08%	0.16%	0.00%	0.28%
Remove 18.056 Cement mortar 1:4 e=2cm (1m2)	0.05%	0%	0.01%	0.01%	0.01%	0.00%	0.02%

A.3. BILL OF QUANTITIES RENNER RE+ CIRCULAR STORE JACAREPAGUÁ



CAMICADO

YOU COM

ASHUA

Obra: RNR - 00491 - SHOPPING JACAREPAGUÁ

Região: SUDESTE

Cidade: Rio de Janeiro

Tipo: Projetos de Inauguração

Inauguração Lojas Renner

Construtora:

Legenda:

Entrada de dados de valores e observações

Entrada de dados de quantidade e Faturamento Direto (FD)

Informar com "X" se o item é devido Certificação ou RE+

Para Itens de Fachada RE+, orçar em Omissos linhas específicas

* NÃO ESQUECER: Limpar filtros após finalizar o orçamento

Valor Total		-
Valor Faturamento Direto	sem dados	-
Valor Construtora	sem dados	-
CUB Total		-
% BDI sobre Fat Construtora	sem dados	0,00%
% BDI sobre Faturamento Direto		0,00%
Construtora		0

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID		Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1	1	01	01.01		01	DESPESAS INDIRETAS	DESPESAS INDIRETAS				RN	YC	CM							-	-		-	-		
2	2	01	01.01		01.01	DESPESAS INDIRETAS	Serviços Preliminares				RN	YC	CM							-	-		-	-		
3	3	01	01.01		01.01.01	DESPESAS INDIRETAS	Demolições e Tratamentos				RN	YC	CM							-	-		-	-		
4	4	01	01.01	01.01.01.001	DESPESAS INDIRETAS	Demolição contrapiso de concreto simples	m³				RN	YC	CM						-	-	-			-		
5	4	01	01.01	01.01.01.002	DESPESAS INDIRETAS	Demolição de alvenaria	m³				RN	YC	CM						-	-	-			-		
6	4	01	01.01	01.01.01.003	DESPESAS INDIRETAS	Demolição de alvenaria de tijolos maciços	m³				RN	YC	CM						-	-	-			-		
7	4	01	01.01	01.01.01.004	DESPESAS INDIRETAS	Demolição de alvenaria de pedras	m³				RN	YC	CM						-	-	-			-		
8	4	01	01.01	01.01.01.005	DESPESAS INDIRETAS	Demolição de estrutura de madeira de telhado	m²				RN	YC	CM						-	-	-			-		
9	4	01	01.01	01.01.01.006	DESPESAS INDIRETAS	Demolição de forro de gesso	m²				RN	YC	CM						-	-	-			-		
10	4	01	01.01	01.01.01.007	DESPESAS INDIRETAS	Demolição de forro mineral	m²				RN	YC	CM						-	-	-			-		
11	4	01	01.01	01.01.01.008	DESPESAS INDIRETAS	Demolição de forro de lambri	m²				RN	YC	CM						-	-	-			-		
12	4	01	01.01	01.01.01.009	DESPESAS INDIRETAS	Demolição de pisos	m²				RN	YC	CM						-	-	-			-		
13	4	01	01.01	01.01.01.010	DESPESAS INDIRETAS	Tratamento abrasivo sobre piso existente para assentamento de piso novo	m²				RN	YC	CM						-	-	-			-		
14	4	01	01.01	01.01.01.011	DESPESAS INDIRETAS	Demolição de revestimento com argamassa	m²				RN	YC	CM						-	-	-			-		
15	4	01	01.01	01.01.01.012	DESPESAS INDIRETAS	Demolição de revestimento de azulejos	m²				RN	YC	CM						-	-	-			-		
16	4	01	01.01	01.01.01.013	DESPESAS INDIRETAS	Demolição de revestimento de madeira	m²				RN	YC	CM						-	-	-			-		
17	4	01	01.01	01.01.01.014	DESPESAS INDIRETAS	Demolição manual de concreto armado	m³				RN	YC	CM						-	-	-			-		
18	4	01	01.01	01.01.01.015	DESPESAS INDIRETAS	Demolição mecânica de concreto armado (somente mão de obra - material considerado no item 1.3)	m³				RN	YC	CM						-	-	-			-		
19	4	01	01.01	01.01.01.016	DESPESAS INDIRETAS	Demolição de cobertura com telhas metálicas	m²				RN	YC	CM						-	-	-			-		
20	4	01	01.01	01.01.01.017	DESPESAS INDIRETAS	Demolição de cobertura com telhas cerâmicas	m²				RN	YC	CM						-	-	-			-		
21	4	01	01.01	01.01.01.018	DESPESAS INDIRETAS	Demolição de cobertura com telhas de fibrocimento	m²				RN	YC	CM						-	-	-			-		
22	4	01	01.01	01.01.01.019	DESPESAS INDIRETAS	Destinação de demolição a aterro industrial certificado	m³				RN	YC	CM						-	-	-			-		
23	3	01	01.01		01.01.03	DESPESAS INDIRETAS	Remoções				RN	YC	CM							-	-	-			-	
24	4	01	01.01	01.01.02.001	DESPESAS INDIRETAS	Remoção de carpete e raspagem	m²				RN	YC	CM						-	-	-			-		
25	4	01	01.01	01.01.02.002	DESPESAS INDIRETAS	Remoção e raspagem de pintura	m²				RN	YC	CM						-	-	-			-		
26	4	01	01.01	01.01.02.003	DESPESAS INDIRETAS	Remoção de esquadrias	m²				RN	YC	CM						-	-	-			-		
27	4	01	01.01	01.01.02.004	DESPESAS INDIRETAS	Remoção de aparelhos sanitários	unid				RN	YC	CM						-	-	-			-		
28	4	01	01.01	01.01.02.005	DESPESAS INDIRETAS	Remoção de luminárias	unid				RN	YC	CM						-	-	-			-		
29	4	01	01.01	01.01.02.006	DESPESAS INDIRETAS	Remoção de tubulação em geral	m				RN	YC	CM						-	-	-			-		
30	4	01	01.01	01.01.02.007	DESPESAS INDIRETAS	Remoção de dutos de climatização (por m2 de área construída)	m²				RN	YC	CM						-	-	-			-		
31	4	01	01.01	01.01.02.008	DESPESAS INDIRETAS	Remoção de aparelhos de climatização - Resfriador de líquido/Chiller	unid				RN	YC	CM						-	-	-			-		
32	4	01	01.01	01.01.02.009	DESPESAS INDIRETAS	Remoção de aparelhos de climatização - Torre de resfriamento	unid				RN	YC	CM						-	-	-			-		
33	4	01	01.01	01.01.02.010	DESPESAS INDIRETAS	Remoção de aparelhos de climatização - Bombas	unid				RN	YC	CM						-	-	-			-		
34	4	01	01.01	01.01.02.011	DESPESAS INDIRETAS	Remoção de aparelhos de climatização - FanCoils	unid				RN	YC	CM						-	-	-			-		
35	4	01	01.01	01.01.02.012	DESPESAS INDIRETAS	Remoção de aparelhos de climatização - Exaustores	unid				RN	YC	CM						-	-	-			-		
36	4	01	01.01	01.01.02.013	DESPESAS INDIRETAS	Remoção de aparelhos de climatização - Ventiladores	unid				RN	YC	CM						-	-	-			-		
37	4	01	01.01	01.01.02.014	DESPESAS INDIRETAS	Remoção de escada rolante	unid				RN	YC	CM						-	-	-			-		
38	4	01	01.01	01.01.02.015	DESPESAS INDIRETAS	Remoção de elevador	unid				RN	YC	CM						-	-	-			-		
39	4	01	01.01	01.01.02.016	DESPESAS INDIRETAS	Remoção de montacarga	unid				RN	YC	CM						-	-	-			-		
40	4	01	01.01	01.01.02.017	DESPESAS INDIRETAS	Remoção de meio fio de concreto	m				RN	YC	CM						-	-	-			-		
41	4	01	01.01	01.01.02.018	DESPESAS INDIRETAS	Destinação de materiais removidos a aterro industrial certificado	m³				RN	YC	CM						-	-	-			-		
42	3	01	01.01		01.01.03	DESPESAS INDIRETAS	Desmontagens				RN	YC	CM							-	-	-			-	
43	4	01	01.01	01.01.03.001	DESPESAS INDIRETAS	Desmontagem de estrutura metálica	m²				RN	YC	CM						-	-	-			-		
44	4	01	01.01	01.01.03.002	DESPESAS INDIRETAS	Desmontagem de divisórias leves	m²				RN	YC	CM						-	-	-			-		
45	3	01	01.01		01.01.04	DESPESAS INDIRETAS	Seguros, licenças e taxas				RN	YC	CM							-	-	-			-	
46	4	01	01.01	01.01.04.001	DESPESAS INDIRETAS	Seguro de Responsabilidade Social (em função da área construída)	m²				RN	YC	CM						-	-	-			-		
47	4	01	01.01	01.01.04.002	DESPESAS INDIRETAS	Seguro Garantia (em função da área construída)	m²				RN	YC	CM						-	-	-			-		
48	4	01	01.01	01.01.04.003	DESPESAS INDIRETAS	CREA - ART de execução	conj				RN	YC	CM						-	-	-			-		
49	4	01	01.01	01.01.04.004	DESPESAS INDIRETAS	CAU - RRT de execução	conj				RN	YC	CM						-	-	-			-		
50	4	01	01.01	01.01.04.005	DESPESAS INDIRETAS	Habite-se (em função da área construída)	m²				RN	YC	CM						-	-	-			-		
51	2	01	01.02		01.02	DESPESAS INDIRETAS	Instalações provisórias				RN	YC	CM							-	-	-			-	
52	3	01	01.02		01.02.01	DESPESAS INDIRETAS	Instalações provisórias de canteiro de obra				RN	YC	CM							-	-	-			-	
53	4	01	01.02	01.02.01.001	DESPESAS INDIRETAS	Tapume simples de compensado, altura 2,20m	m				RN	YC	CM						-	-	-			-		
54	4	01	01.02	01.02.01.002	DESPESAS INDIRETAS	Tapume em divisória leve - placas tipo Eucatex	m²				RN	YC	CM						-	-	-			-		
55	4	01	01.02	01.02.01.003	DESPESAS INDIRETAS	Adesivagem de tapume padrão Renner	m²				RN	YC	CM						-	-	-			-		
56	4	01	01.02	01.02.01.004	DESPESAS INDIRETAS	Cerca arame galvanizado 8 fios, altura 1,60m	m				RN	YC	CM						-	-	-			-		
57	4	01	01.02	01.02.01.005	DESPESAS INDIRETAS	Container para escritório	mês				RN	YC	CM						-	-	-			-		
58	4	01	01.02	01.02.01.006	DESPESAS INDIRETAS	Container para depósito	mês				RN	YC	CM						-	-	-			-		
59	4	01	01.02	01.02.01.007	DESPESAS INDIRETAS	Container para vestiários / sanitários	mês				RN	YC	CM						-	-	-			-		
60	4	01	01.02	01.02.01.008	DESPESAS INDIRETAS	Container para refeitório	mês				RN	YC	CM						-	-	-			-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
61	4	01	01.02	01.02.01.009	DESPESAS INDIRETAS	Canteiro de obras - escritório, depósitos, bancadas, refeitório, vestiário e unidade sanitária de obra em tapume OSB - incluindo cobertura em telha fibrocimento 5mm, mobiliários e equipamentos	m²			RN	YC	CM						-	-	-			-	-	
62	4	01	01.02	01.02.01.010	DESPESAS INDIRETAS	Entrada provisória de energia	ponto			RN	YC	CM						-	-	-			-	-	
63	4	01	01.02	01.02.01.011	DESPESAS INDIRETAS	Ligação provisória de água e esgoto	ponto			RN	YC	CM						-	-	-			-	-	
64	4	01	01.02	01.02.01.012	DESPESAS INDIRETAS	Posteação para instalação de luz	unid			RN	YC	CM						-	-	-			-	-	
65	4	01	01.02	01.02.01.013	DESPESAS INDIRETAS	Placa de obra pintada e fixada	m²			RN	YC	CM						-	-	-			-	-	
66	4	01	01.02	01.02.01.014	DESPESAS INDIRETAS	Extintor PQS 6kg para canteiro	unid			RN	YC	CM						-	-	-			-	-	
67	4	01	01.02	01.02.01.015	DESPESAS INDIRETAS	Extintor de água 10Kg para canteiro	unid			RN	YC	CM						-	-	-			-	-	
68	4	01	01.02	01.02.01.016	DESPESAS INDIRETAS	Banheiro químico (locação mensal incluindo 2 higienizações semanais)	mês			RN	YC	CM						-	-	-			-	-	
69	3	01	01.02	01.02.02	DESPESAS INDIRETAS	Equipamentos de uso e segurança				RN	YC	CM						-	-	-			-	-	
70	4	01	01.02	01.02.02.001	DESPESAS INDIRETAS	Bandeja salva-vidas de madeira	m			RN	YC	CM						-	-	-			-	-	
71	4	01	01.02	01.02.02.002	DESPESAS INDIRETAS	Equipamentos individuais de segurança (EPI's)	unid			RN	YC	CM						-	-	-			-	-	
72	4	01	01.02	01.02.02.003	DESPESAS INDIRETAS	Guincho para transporte vertical de materiais - locação	mês			RN	YC	CM						-	-	-			-	-	
73	4	01	01.02	01.02.02.004	DESPESAS INDIRETAS	Linha de Vida	m			RN	YC	CM						-	-	-			-	-	
74	2	01	01.03	01.03	DESPESAS INDIRETAS	Maquinas e ferramentas				RN	YC	CM						-	-	-			-	-	
75	3	01	01.03	01.03.001	DESPESAS INDIRETAS	Andaime metálico - locação	m²/mês			RN	YC	CM						-	-	-			-	-	
76	3	01	01.03	01.03.002	DESPESAS INDIRETAS	Plataforma elevatório hidráulica - locação	mês			RN	YC	CM						-	-	-			-	-	
77	3	01	01.03	01.03.003	DESPESAS INDIRETAS	Compressor de ar 175pcm - locação	mês			RN	YC	CM						-	-	-			-	-	
78	3	01	01.03	01.03.004	DESPESAS INDIRETAS	Martelete pneumático - locação	mês			RN	YC	CM						-	-	-			-	-	
79	3	01	01.03	01.03.005	DESPESAS INDIRETAS	Argamassadeira - locação	mês			RN	YC	CM						-	-	-			-	-	
80	3	01	01.03	01.03.006	DESPESAS INDIRETAS	Serra circular - locação	mês			RN	YC	CM						-	-	-			-	-	
81	3	01	01.03	01.03.007	DESPESAS INDIRETAS	Polcorte - locação	mês			RN	YC	CM						-	-	-			-	-	
82	3	01	01.03	01.03.008	DESPESAS INDIRETAS	Vibrador e mangote - locação	mês			RN	YC	CM						-	-	-			-	-	
83	2	01	01.04	01.04	DESPESAS INDIRETAS	Administração da obra e despesas gerais				RN	YC	CM						-	-	-			-	-	
84	3	01	01.04	01.04.01	DESPESAS INDIRETAS	Equipe técnica e administrativa da obra				RN	YC	CM						-	-	-			-	-	
85	4	01	01.04	01.04.01.001	DESPESAS INDIRETAS	Gerente de Obras	mês			RN	YC	CM						-	-	-			-	-	
86	4	01	01.04	01.04.01.002	DESPESAS INDIRETAS	Mestre de Obras	mês			RN	YC	CM						-	-	-			-	-	
87	4	01	01.04	01.04.01.003	DESPESAS INDIRETAS	Estagiário de Engenharia	mês			RN	YC	CM						-	-	-			-	-	
88	4	01	01.04	01.04.01.004	DESPESAS INDIRETAS	Encarregado de Obra - 1 encarregado para cada disciplina (Civil / Hidráulica / Elétrica / Som / Segurança / PPCI / Climatização)	mês			RN	YC	CM						-	-	-			-	-	
89	4	01	01.04	01.04.01.005	DESPESAS INDIRETAS	Técnico em Segurança do Trabalho	quinz			RN	YC	CM						-	-	-			-	-	
90	4	01	01.04	01.04.01.006	DESPESAS INDIRETAS	Administrativo	mês			RN	YC	CM						-	-	-			-	-	
91	4	01	01.04	01.04.01.007	DESPESAS INDIRETAS	Almoxarife	mês			RN	YC	CM						-	-	-			-	-	
92	4	01	01.04	01.04.01.008	DESPESAS INDIRETAS	Vigia diurno/noturno	mês			RN	YC	CM						-	-	-			-	-	
93	4	01	01.04	01.04.01.009	DESPESAS INDIRETAS	Engenheiro - residente de obra	mês			RN	YC	CM						-	-	-			-	-	
94	3	01	01.04	01.04.02	DESPESAS INDIRETAS	Consumos				RN	YC	CM						-	-	-			-	-	
95	4	01	01.04	01.04.02.001	DESPESAS INDIRETAS	Consumo de água	mês			RN	YC	CM						-	-	-			-	-	
96	4	01	01.04	01.04.02.002	DESPESAS INDIRETAS	Consumo de energia	mês			RN	YC	CM						-	-	-			-	-	
97	4	01	01.04	01.04.02.003	DESPESAS INDIRETAS	Cópias de projetos	m²			RN	YC	CM						-	-	-			-	-	
98	4	01	01.04	01.04.02.004	DESPESAS INDIRETAS	Material de expediente	mês			RN	YC	CM						-	-	-			-	-	
99	4	01	01.04	01.04.02.005	DESPESAS INDIRETAS	Moradia e viagens - considerar para todas as disciplinas (Civil / Hidráulica / Elétrica / Som / Segurança / PPCI / Climatização)	mês			RN	YC	CM						-	-	-			-	-	
100	4	01	01.04	01.04.02.006	DESPESAS INDIRETAS	Vale Transporte para funcionários - 2 unid/dia	unid			RN	YC	CM						-	-	-			-	-	
101	4	01	01.04	01.04.02.007	DESPESAS INDIRETAS	Alimentação - equipe de produção	unid			RN	YC	CM						-	-	-			-	-	
102	4	01	01.04	01.04.02.008	DESPESAS INDIRETAS	Alimentação - equipe administrativa	unid			RN	YC	CM						-	-	-			-	-	
103	2	01	01.05	01.05	DESPESAS INDIRETAS	Limpeza / Entulhos				RN	YC	CM						-	-	-			-	-	
104	3	01	01.05	01.05.001	DESPESAS INDIRETAS	Limpeza do terreno	m²			RN	YC	CM						-	-	-			-	-	
105	3	01	01.05	01.05.002	DESPESAS INDIRETAS	Limpeza e transporte permanentes da obra	mês			RN	YC	CM						-	-	-			-	-	
106	3	01	01.05	01.05.003	DESPESAS INDIRETAS	Limpeza de forro	m²			RN	YC	CM						-	-	-			-	-	
107	3	01	01.05	01.05.004	DESPESAS INDIRETAS	Limpeza cerâmica paredes	m²			RN	YC	CM						-	-	-			-	-	
108	3	01	01.05	01.05.005	DESPESAS INDIRETAS	Limpeza de louças e aparelhos sanitários	unid			RN	YC	CM						-	-	-			-	-	
109	3	01	01.05	01.05.006	DESPESAS INDIRETAS	Limpeza luminárias	unid			RN	YC	CM						-	-	-			-	-	
110	3	01	01.05	01.05.007	DESPESAS INDIRETAS	Caçamba de entulhos - 4m³ - locação	unid			RN	YC	CM						-	-	-			-	-	
111	3	01	01.05	01.05.008	DESPESAS INDIRETAS	Caçamba de entulhos - 5m³ - locação	unid			RN	YC	CM						-	-	-			-	-	
112	3	01	01.05	01.05.009	DESPESAS INDIRETAS	Caçamba de entulhos - 7m³ - locação	unid			RN	YC	CM						-	-	-			-	-	
113	2	01	01.06	01.06	DESPESAS INDIRETAS	Trabalhos em terra				RN	YC	CM						-	-	-			-	-	
114	3	01	01.06	01.06.001	DESPESAS INDIRETAS	Limpeza, raspagem e supressão vegetal do terreno	m²			RN	YC	CM						-	-	-			-	-	
115	3	01	01.06	01.06.002	DESPESAS INDIRETAS	Locação de obra por m² construído	m²			RN	YC	CM						-	-	-			-	-	
116	3	01	01.06	01.06.003	DESPESAS INDIRETAS	Escavação manual de solo de 1ª até 1,50m	m³			RN	YC	CM						-	-	-			-	-	
117	3	01	01.06	01.06.004	DESPESAS INDIRETAS	Compactação manual de fundo de vala	m²			RN	YC	CM						-	-	-			-	-	
118	3	01	01.06	01.06.005	DESPESAS INDIRETAS	Lastro de brita graduada	m³			RN	YC	CM						-	-	-			-	-	
119	3	01	01.06	01.06.006	DESPESAS INDIRETAS	Reaterro manual de valas com material local - inclusive compactação manual	m³			RN	YC	CM						-	-	-			-	-	
120	3	01	01.06	01.06.007	DESPESAS INDIRETAS	Aterro molhado e apiloado manualmente	m³			RN	YC	CM						-	-	-			-	-	
121	3	01	01.06	01.06.008	DESPESAS INDIRETAS	Reaterro mecânico com material importado	m³			RN	YC	CM						-	-	-			-	-	
122	3	01	01.06	01.06.009	DESPESAS INDIRETAS	Nivelamento e compactação manual de aterro	m²			RN	YC	CM						-	-	-			-	-	
123	3	01	01.06	01.06.010	DESPESAS INDIRETAS	Carga, descarga e transporte de materiais com caminhão - até 50km	m³			RN	YC	CM						-	-	-			-	-	
124	3	01	01.06	01.06.011	DESPESAS INDIRETAS	Carga, descarga e transporte de materiais com caminhão - acima de 50km	m³			RN	YC	CM						-	-	-			-	-	
125	2	01	01.07	01.07	DESPESAS INDIRETAS	Diversos				RN	YC	CM						-	-	-			-	-	
126	3	01	01.07	01.07.001	DESPESAS INDIRETAS	Lona preta - usos diversos	m²			RN	YC	CM						-	-	-			-	-	
127	3	01	01.07	01.07.002	DESPESAS INDIRETAS	Laudo de lindeiros (vizinhança)	m²			RN	YC	CM						-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
128	3	01	01.07	01.07.003	DESPESAS INDIRETAS	"As Built" em caderno A3 completo e desenhos complementares para todas as disciplinas (em função da área construída)	m²			RN				2.577,25				-	-	-			-	-		
129	1	02	02.01	02	CIVIL	INFRAESTRUTURA				RN	YC	CM							-	-	-			-	-	
130	2	02	02.01	02.01	CIVIL	Fundações, blocos e vigas baldrames				RN	YC	CM							-	-	-			-	-	
131	3	02	02.01	02.01.001	CIVIL	Concreto armado Fck 15MPa - armação, formas e lançamento - taxas aplicadas: 10-12m³/m³ de formas, 80-100kg/m³ de aço - considerando 25% de perda de concreto	m³			RN								-	-	-			-	-		
132	3	02	02.01	02.01.002	CIVIL	Concreto armado Fck 20MPa - armação, formas e lançamento - taxas aplicadas: 10-12m³/m³ de formas, 80-100kg/m³ de aço - considerando 25% de perda de concreto	m³			RN								-	-	-			-	-		
133	3	02	02.01	02.01.003	CIVIL	Concreto armado Fck 25MPa - armação, formas e lançamento - taxas aplicadas: 10-12m³/m³ de formas, 80-100kg/m³ de aço - considerando 25% de perda de concreto	m³			RN								-	-	-			-	-		
134	3	02	02.01	02.01.004	CIVIL	Concreto armado Fck 30MPa - armação, formas e lançamento - taxas aplicadas: 10-12m³/m³ de formas, 80-100kg/m³ de aço - considerando 25% de perda de concreto	m³			RN								-	-	-			-	-		
135	3	02	02.01	02.01.005	CIVIL	Mobilização de mão de obra e equipamentos para execução de estacas hélice contínua	unid			RN								-	-	-			-	-		
136	3	02	02.01	02.01.006	CIVIL	Escavação de tubulão a céu aberto	m³			RN								-	-	-			-	-		
137	3	02	02.01	02.01.007	CIVIL	Mobilização de mão de obra e equipamentos para execução de estacas raiz	unid			RN								-	-	-			-	-		
138	3	02	02.01	02.01.008	CIVIL	Estaca raiz DN 120mm - incluindo perfuração em solo, argamassa de cimento e areia e aço - taxa aplicada: 10-15kg/m³	m			RN								-	-	-			-	-		
139	3	02	02.01	02.01.009	CIVIL	Estaca raiz DN 150mm - incluindo perfuração em solo, argamassa de cimento e areia e aço - taxa aplicada: 10-15kg/m³	m			RN								-	-	-			-	-		
140	3	02	02.01	02.01.010	CIVIL	Estaca raiz DN 160mm - incluindo perfuração em solo, argamassa de cimento e areia e aço - taxa aplicada: 10-15kg/m³	m			RN								-	-	-			-	-		
141	3	02	02.01	02.01.011	CIVIL	Estaca raiz DN 200mm - incluindo perfuração em solo, argamassa de cimento e areia e aço - taxa aplicada: 15-20kg/m³	m			RN								-	-	-			-	-		
142	3	02	02.01	02.01.012	CIVIL	Estaca raiz DN 250mm - incluindo perfuração em solo, argamassa de cimento e areia e aço - taxa aplicada: 15-20kg/m³	m			RN								-	-	-			-	-		
143	3	02	02.01	02.01.013	CIVIL	Estaca raiz DN 310mm - incluindo perfuração em solo, argamassa de cimento e areia e aço - taxa aplicada: 15-20kg/m³	m			RN								-	-	-			-	-		
144	3	02	02.01	02.01.014	CIVIL	Estaca raiz DN 400mm - incluindo perfuração em solo, argamassa de cimento e areia e aço - taxa aplicada: 15-20kg/m³	m			RN								-	-	-			-	-		
145	3	02	02.01	02.01.015	CIVIL	Mobilização de mão de obra e equipamentos para execução de estacas metálicas	unid			RN								-	-	-			-	-		
146	3	02	02.01	02.01.016	CIVIL	Estaca metálica, perfil TR 26	m			RN								-	-	-			-	-		
147	3	02	02.01	02.01.017	CIVIL	Estaca metálica, perfil TR 32	m			RN								-	-	-			-	-		
148	3	02	02.01	02.01.018	CIVIL	Estaca metálica, perfil TR 37	m			RN								-	-	-			-	-		
149	3	02	02.01	02.01.019	CIVIL	Estaca metálica, perfil TR 45	m			RN								-	-	-			-	-		
150	3	02	02.01	02.01.020	CIVIL	Lastro de concreto magro Fck 10MPa - preparo e lançamento	m³			RN								-	-	-			-	-		
151	3	02	02.01	02.01.021	CIVIL	Corte de cabeça de estaca / arrasamento de estaca	unid			RN								-	-	-			-	-		
152	3	02	02.01	02.01.022	CIVIL	Transporte de material de 1ª categoria (bota-fora) - carga/descarga/espalhamento - dmt 5 Km	m³			RN								-	-	-			-	-		
153	3	02	02.01	02.01.023	CIVIL	Furação estaca hélice contínua DN30cm	m			RN								-	-	-			-	-		
154	3	02	02.01	02.01.024	CIVIL	Furação estaca hélice contínua DN40cm	m			RN								-	-	-			-	-		
155	3	02	02.01	02.01.025	CIVIL	Furação estaca hélice contínua DN50cm	m			RN								-	-	-			-	-		
156	3	02	02.01	02.01.026	CIVIL	Furação estaca hélice contínua DN60cm	m			RN								-	-	-			-	-		
157	3	02	02.01	02.01.027	CIVIL	Furação estaca hélice contínua DN70cm	m			RN								-	-	-			-	-		
158	3	02	02.01	02.01.028	CIVIL	Furação estaca hélice contínua DN80cm	m			RN								-	-	-			-	-		
159	3	02	02.01	02.01.029	CIVIL	Furação estaca hélice contínua DN90cm	m			RN								-	-	-			-	-		
160	3	02	02.01	02.01.030	CIVIL	Furação estaca hélice contínua DN100cm	m			RN								-	-	-			-	-		
161	3	02	02.01	02.01.031	CIVIL	Mobilização de mão de obra e equipamentos para execução de estacas rotativas	unid			RN								-	-	-			-	-		
162	3	02	02.01	02.01.032	CIVIL	Furação de estaca escavada DN30cm	m			RN								-	-	-			-	-		
163	3	02	02.01	02.01.033	CIVIL	Furação de estaca escavada DN40cm	m			RN								-	-	-			-	-		
164	3	02	02.01	02.01.034	CIVIL	Furação de estaca escavada DN50cm	m			RN								-	-	-			-	-		
165	3	02	02.01	02.01.035	CIVIL	Furação de estaca escavada DN60cm	m			RN								-	-	-			-	-		
166	3	02	02.01	02.01.036	CIVIL	Furação de estaca escavada DN70cm	m			RN								-	-	-			-	-		
167	3	02	02.01	02.01.037	CIVIL	Furação de estaca escavada DN80cm	m			RN								-	-	-			-	-		
168	3	02	02.01	02.01.038	CIVIL	Furação de estaca escavada DN90cm	m			RN								-	-	-			-	-		
169	3	02	02.01	02.01.039	CIVIL	Furação de estaca escavada DN100cm	m			RN								-	-	-			-	-		
170	3	02	02.01	02.01.040	CIVIL	Furação de estaca escavada DN110cm	m			RN								-	-	-			-	-		
171	3	02	02.01	02.01.041	CIVIL	Furação de estaca escavada DN120cm	m			RN								-	-	-			-	-		
172	3	02	02.01	02.01.042	CIVIL	Furação de estaca escavada DN130cm	m			RN								-	-	-			-	-		
173	3	02	02.01	02.01.043	CIVIL	Furação de estaca escavada DN140cm	m			RN								-	-	-			-	-		
174	3	02	02.01	02.01.044	CIVIL	Furação de estaca escavada DN150cm	m			RN								-	-	-			-	-		
175	3	02	02.01	02.01.045	CIVIL	Mobilização de mão de obra e equipamentos para execução de estacas pré-moldadas	unid			RN								-	-	-			-	-		
176	3	02	02.01	02.01.046	CIVIL	Cravação de estacas pré-moldadas 16x16	m			RN								-	-	-			-	-		
177	3	02	02.01	02.01.047	CIVIL	Cravação de estacas pré-moldadas 18x18	m			RN								-	-	-			-	-		
178	3	02	02.01	02.01.048	CIVIL	Cravação de estacas pré-moldadas 20x20	m			RN								-	-	-			-	-		
179	3	02	02.01	02.01.049	CIVIL	Cravação de estacas pré-moldadas 23x23	m			RN								-	-	-			-	-		
180	3	02	02.01	02.01.050	CIVIL	Cravação de estacas pré-moldadas 26x26	m			RN								-	-	-			-	-		
181	3	02	02.01	02.01.051	CIVIL	Cravação de estacas pré-moldadas 30x30	m			RN								-	-	-			-	-		
182	3	02	02.01	02.01.052	CIVIL	Cravação de estacas pré-moldadas 35x35	m			RN								-	-	-			-	-		
183	3	02	02.01	02.01.053	CIVIL	Mobilização de mão de obra e equipamentos para execução de estacas Franki	unid			RN								-	-	-			-	-		
184	3	02	02.01	02.01.054	CIVIL	Execução da estaca Franki DN35 cm	m			RN								-	-	-			-	-		
185	3	02	02.01	02.01.055	CIVIL	Execução da estaca Franki DN40 cm	m			RN								-	-	-			-	-		
186	3	02	02.01	02.01.056	CIVIL	Execução da estaca Franki DN45 cm	m			RN								-	-	-			-	-		
187	3	02	02.01	02.01.057	CIVIL	Execução da estaca Franki DN52 cm	m			RN								-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
188	3	02	02.01	02.01.058	CIVIL	Execução da estaca Franki DN60 cm	m			RN								-	-	-			-	-	
189	1	03	03.01	03	CIVIL	SUPRAESTRUTURA				RN	YC	CM						-	-	-			-	-	
190	2	03	03.01	03.01	CIVIL	Supraestrutura de concreto				RN	YC	CM						-	-	-			-	-	
191	3	03	03.01	03.01.001	CIVIL	Concreto armado Fck 20MPa - armação, formas e lançamento - taxas aplicadas: 10-12m³/m³ de formas, 100-120kg/m³ de aço - considerando 15% de perda de concreto	m³			RN								-	-	-			-	-	
192	3	03	03.01	03.01.002	CIVIL	Concreto armado Fck 25MPa - armação, formas e lançamento - taxas aplicadas: 10-12m³/m³ de formas, 100-120kg/m³ de aço - considerando 15% de perda de concreto	m³			RN								-	-	-			-	-	
193	3	03	03.01	03.01.003	CIVIL	Concreto armado Fck 30MPa - armação, formas e lançamento - taxas aplicadas: 10-12m³/m³ de formas, 100-120kg/m³ de aço - considerando 15% de perda de concreto	m³			RN								-	-	-			-	-	
194	3	03	03.01	03.01.004	CIVIL	Verga em concreto pré-moldado	m			RN								-	-	-			-	-	
195	3	03	03.01	03.01.005	CIVIL	Contraverga em concreto pré-moldado	m			RN								-	-	-			-	-	
196	3	03	03.01	03.01.006	CIVIL	Base de concreto para equipamentos	m³			RN				2,94				-	-	-			-	-	
197	3	03	03.01	03.01.007	CIVIL	Laje treliçada pré-fabricada com enchimento EPS, esp. 12cm - não inclui capeamento	m²			RN								-	-	-			-	-	
198	3	03	03.01	03.01.008	CIVIL	Laje pré-fabricada com vigotas de concreto e tabelas cerâmicas - esp. 12cm - não inclui capeamento	m²			RN								-	-	-			-	-	
199	3	03	03.01	03.01.009	CIVIL	Laje pré-fabricada com vigotas de concreto e tabelas cerâmicas - esp. 15cm - não inclui capeamento	m²			RN								-	-	-			-	-	
200	3	03	03.01	03.01.010	CIVIL	Capeamento de laje pré-fabricada com concreto Fck 20MPa e malha 4.2mm	m²			RN								-	-	-			-	-	
201	3	03	03.01	03.01.011	CIVIL	Furação estrutura de concreto - diâmetros variados	unid			RN								-	-	-			-	-	
202	3	03	03.01	03.01.012	CIVIL	Reforço Estrutural com Manta de Fibra de Carbono (MFC)	m²			RN								-	-	-			-	-	
203	3	03	03.01	03.01.013	CIVIL	Reforço Estrutural utilizando Microconcreto Projetado	m²			RN								-	-	-			-	-	
204	3	03	03.01	03.01.014	CIVIL	Reforço Estrutural utilizando Chapa de Aço	m²			RN								-	-	-			-	-	
205	3	03	03.01	03.01.015	CIVIL	Reforço Estrutural utilizando Perfil Metálico	m²			RN								-	-	-			-	-	
206	3	03	03.01	03.01.016	CIVIL	Reforço de Lajes com Tela Eletro-Soldada	m²			RN								-	-	-			-	-	
207	3	03	03.01	03.01.017	CIVIL	Serviço em laje pré tensionadas com cortes de cordoalha e demais	m³			RN								-	-	-			-	-	
208	2	03	03.02	03.02	CIVIL	Estruturas metálicas				RN	YC	CM						-	-	-			-	-	
209	3	03	03.02	03.02.001	CIVIL	Escada metálica fixa - estrutura de aço e chapas metálicas - inclusive acessórios	kg			RN				859,85				-	-	-			-	-	
210	3	03	03.02	03.02.002	CIVIL	Estrutura metálica para apoio das escadas rolantes - inclusive montagem e acessórios	kg			RN								-	-	-			-	-	
211	3	03	03.02	03.02.003	CIVIL	Estrutura metálica de sustentação de paredes isoladas no Salão de Vendas - inclusive montagem e acessórios	kg			RN								-	-	-			-	-	
212	3	03	03.02	03.02.004	CIVIL	Estrutura metálica para equipamentos de movimentação vertical / elevadores - inclusive montagem e acessórios	kg			RN								-	-	-			-	-	
213	3	03	03.02	03.02.005	CIVIL	Estrutura metálica para pórtico (fachada) - inclusive montagem e acessórios	kg			RN				2.095,32				-	-	-			-	-	
214	3	03	03.02	03.02.006	CIVIL	Estrutura metálica para cobertura da Área Técnica - inclusive montagem e acessórios	kg			RN				1.772,17				-	-	-			-	-	
215	3	03	03.02	03.02.007	CIVIL	Malha metálica para sustentação de forros composta por perfis de aço laminado e pendurais metálicos - inclusive acessórios	m²			RN								-	-	-			-	-	
216	3	03	03.02	03.02.008	CIVIL	Estrutura metálica para mezanino - vigas, colunas e demais componentes - inclusive acessórios	kg			RN	YC	CM		24.835,81				-	-	-			-	-	
217	3	03	03.02	03.02.009	CIVIL	Escada metálica fixa - incluindo estrutura metálica de pilares e contraventamentos de sustentação da escada (acabamento em pintura esmalte preto fosco), fechamento lateral da escada metálica em chapa xadrez, pisada da escada metálica em chapa xadrez acabamento ao natural e espelho com pintura preta	kg				YC							-	-	-			-	-	
218	3	03	03.02	03.02.010	CIVIL	Escada metálica fixa - incluindo estrutura metálica de pilares e contraventamentos de sustentação da escada, degrau em chapa xadrez 6,35mm dobrada em pintura esmalte em cinza claro, faixa de sinalização visual para degraus e espelhos	kg				YC							-	-	-			-	-	
219	3	03	03.02	03.02.011	CIVIL	Tratamento da Escada Metálica fixa existente- Piso da escada metálica em chapa xadrez com pintura cinza claro	m²				YC							-	-	-			-	-	
220	3	03	03.02	03.02.012	CIVIL	Escada metálica fixa - BASE: 28cm, ALTURA: 18cm - incluindo Piso em Chapa Corrugada Xadrez 6,35mm com pintura esmalte cor cinza Nevoeiro Ref. C160 com aplicação de fita cor amarela nos degraus e estrutura de fixação	unid					CM						-	-	-			-	-	
221	3	03	03.02	03.02.013	CIVIL	Escada metálica fixa - BASE: 28cm, ALTURA: 18cm - incluindo Piso em Chapa Corrugada Xadrez 6,35mm com pintura esmalte cor cinza Nevoeiro Ref. C160 com aplicação de fita cor amarela nos degraus, fechamento em tela de aço galvanizado 50x50mm com pintura esmalte acetinado Suvini Cinza Nevoeiro Ref. C160 e estrutura de fixação	unid					CM						-	-	-			-	-	
222	3	03	03.02	03.02.014	CIVIL	Escada metálica marinho - inclusive acessórios	m			RN	YC							-	-	-			-	-	
223	2	03	03.03	03.03	CIVIL	Estruturas mistas				RN	YC	CM						-	-	-			-	-	
224	3	03	03.03	03.03.001	CIVIL	Laje Steel Deck	m²			RN								-	-	-			-	-	
225	1	04	04.01	04	CIVIL	PAREDES E PAINÉIS				RN	YC	CM						-	-	-			-	-	
226	2	04	04.01	04.01	CIVIL	Alvenarias				RN	YC	CM						-	-	-			-	-	
227	3	04	04.01	01.01.01	CIVIL	Alvenarias de blocos de concreto				RN	YC	CM						-	-	-			-	-	
228	4	04	04.01	04.01.01.001	CIVIL	Alvenaria em bloco de concreto celular autoclavado, assentada com argamassa pré-fabricada - esp. 12,5cm	m³			RN				47,12				-	-	-			-	-	
229	4	04	04.01	04.01.01.002	CIVIL	Alvenaria em bloco de concreto celular autoclavado, assentada com argamassa pré-fabricada - esp. 20cm	m³			RN								-	-	-			-	-	
230	4	04	04.01	04.01.01.003	CIVIL	Alvenaria em bloco de concreto vazado, assentada com argamassa 1:3:12 - esp. 14cm	m³			RN								-	-	-			-	-	
231	4	04	04.01	04.01.01.004	CIVIL	Alvenaria em bloco de concreto vazado, assentada com argamassa 1:3:12 - esp. 19cm	m³			RN								-	-	-			-	-	
232	4	04	04.01	04.01.01.005	CIVIL	Alvenaria em bloco de concreto vazado, assentada com argamassa 1:3:12 - esp. 10cm	m³			RN								-	-	-			-	-	
233	3	04	04.01	04.01.02	CIVIL	Alvenarias de bloco cerâmico				RN								-	-	-			-	-	
234	4	04	04.01	04.01.02.001	CIVIL	Alvenaria em tijolo maciço, assentada com argamassa pré-fabricada - esp. 10cm	m²			RN								-	-	-			-	-	
235	4	04	04.01	04.01.02.002	CIVIL	Alvenaria em tijolo maciço, assentada com argamassa pré-fabricada - esp. 15cm	m²			RN								-	-	-			-	-	
236	4	04	04.01	04.01.02.003	CIVIL	Alvenaria em tijolo maciço, assentada com argamassa pré-fabricada - esp. 15cm e alt. 10cm para paredes de gesso RU	m			RN								-	-	-			-	-	
237	4	04	04.01	04.01.02.004	CIVIL	Alvenaria de bloco ceramico, assentado com argamassa pré-fabricada	m³			RN								-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID		Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
238	2	04	04.02	04.02	CIVIL	Divisórias					RN	YC	CM							-	-	-	-	-	-	
239	3	04	04.02	04.02.01	CIVIL	Paredes de gesso acartonado - dry wall					RN	YC	CM							-	-	-	-	-	-	
240	4	04	04.02	04.02.01.001	CIVIL	Divisória em gesso acartonado dry wall simples, esp. 7,5cm	m²				RN				396,36				-	-	-			-	-	
241	4	04	04.02	04.02.01.002	CIVIL	Divisória em gesso acartonado dry wall simples, esp. 10cm	m²				RN								-	-	-			-	-	
242	4	04	04.02	04.02.01.003	CIVIL	Divisória em gesso acartonado dry wall simples, esp. 15cm	m²				RN								-	-	-			-	-	
243	4	04	04.02	04.02.01.004	CIVIL	Divisória em gesso acartonado dry wall dupla, esp. 7,5cm	m²				RN				201,06				-	-	-			-	-	
244	4	04	04.02	04.02.01.005	CIVIL	Divisória em gesso acartonado dry wall dupla, esp. 10cm	m²				RN				203,24				-	-	-			-	-	
245	4	04	04.02	04.02.01.006	CIVIL	Divisória em gesso acartonado dry wall dupla, esp. 15cm	m²				RN								-	-	-			-	-	
246	4	04	04.02	04.02.01.007	CIVIL	Divisória em gesso acartonado dry wall simples resistente a umidade (placas RU), esp. 7,5cm	m²				RN								-	-	-			-	-	
247	4	04	04.02	04.02.01.008	CIVIL	Divisória em gesso acartonado dry wall dupla resistente a umidade (placas RU), esp. 7,5cm	m²				RN				10,45				-	-	-			-	-	
248	4	04	04.02	04.02.01.009	CIVIL	Divisória em gesso acartonado dry wall simples resistente a umidade (placas RU), esp. 10cm	m²				RN								-	-	-			-	-	
249	4	04	04.02	04.02.01.010	CIVIL	Divisória em gesso acartonado dry wall duplas resistente a umidade (placas RU), esp. 10cm	m²				RN				43,62				-	-	-			-	-	
250	4	04	04.02	04.02.01.011	CIVIL	Divisória em gesso acartonado dry wall simples resistente a umidade (placas RU), esp. 15cm	m²				RN								-	-	-			-	-	
251	4	04	04.02	04.02.01.012	CIVIL	Divisória em gesso acartonado dry wall dupla resistente a umidade (placas RU), esp. 15cm	m²				RN								-	-	-			-	-	
252	4	04	04.02	04.02.01.013	CIVIL	Divisória em gesso acartonado dry wall simples resistente a fogo (placas RF), esp. 7,5cm	m²				RN								-	-	-			-	-	
253	4	04	04.02	04.02.01.014	CIVIL	Divisória em gesso acartonado dry wall dupla resistente a fogo (placas RF), esp. 7,5cm	m²				RN								-	-	-			-	-	
254	4	04	04.02	04.02.01.015	CIVIL	Divisória em gesso acartonado dry wall simples resistente a fogo (placas RF), esp. 10cm	m²				RN								-	-	-			-	-	
255	4	04	04.02	04.02.01.016	CIVIL	Divisória em gesso acartonado dry wall simples dupla a fogo (placas RF), esp. 10cm	m²				RN								-	-	-			-	-	
256	4	04	04.02	04.02.01.017	CIVIL	Divisória em gesso acartonado dry wall resistente a fogo simples (placas RF), esp. 15cm	m²				RN								-	-	-			-	-	
257	4	04	04.02	04.02.01.018	CIVIL	Divisória em gesso acartonado dry wall resistente a fogo dupla (placas RF), esp. 15cm	m²				RN								-	-	-			-	-	
258	4	04	04.02	04.02.01.019	CIVIL	Cantoneira de arremate para paredes de gesso	m				RN								-	-	-			-	-	
259	4	04	04.02	04.02.01.020	CIVIL	Divisória em gesso acartonado dry wall simples, esp. 12,5cm	m²						CM						-	-	-			-	-	
260	4	04	04.02	04.02.01.021	CIVIL	Preenchimento de parede de gesso com lâ de rocha	m²				RN		CM						-	-	-			-	-	
261	4	04	04.02	04.02.01.022	CIVIL	Preenchimento de parede de gesso com lâ de vidro	m²				RN	YC							-	-	-			-	-	
262	4	04	04.02	04.02.01.023	CIVIL	Reforços estruturais para paredes de gesso	m²				RN	YC							-	-	-			-	-	
263	4	04	04.02	04.02.01.024	CIVIL	Divisória em gesso acartonado dry wall simples resistente a umidade (placas RU), esp. 12,5cm	m²						CM						-	-	-			-	-	
264	3	04	04.02	04.02.02	CIVIL	Divisórias leves					RN	YC	CM							-	-	-	-	-	-	
265	4	04	04.02	04.02.02.001	CIVIL	Divisória MDF com revestimento melamínico, cor branca	m²				RN								-	-	-			-	-	
266	4	04	04.02	04.02.02.002	CIVIL	Divisória MDF com revestimento melamínico, cor branca	m²				RN								-	-	-			-	-	
267	4	04	04.02	04.02.02.003	CIVIL	Divisória MDF com revestimento melamínico, cor preta	m²				RN								-	-	-			-	-	
268	4	04	04.02	04.02.02.004	CIVIL	Divisória MDF com revestimento melamínico, cor amêndoa rústica	m²				RN								-	-	-			-	-	
269	4	04	04.02	04.02.02.005	CIVIL	Divisória em compensado naval com revestimento melamínico, cor branca	m²				RN								-	-	-			-	-	
270	4	04	04.02	04.02.02.006	CIVIL	Divisória em compensado naval com painéis modulados, revestimento melamínico e núcleos com características termoacústicas com lâ de vidro, esp. 35mm, cor branca	m²				RN								-	-	-			-	-	
271	4	04	04.02	04.02.02.007	CIVIL	Divisória revestida com régua de piso laminado dispostas na horizontal	m²				RN								-	-	-			-	-	
272	4	04	04.02	04.02.02.008	CIVIL	Cantoneira PVC para arremate das arestas de paredes com material amadeirado, cor caramelo	m				RN								-	-	-			-	-	
273	4	04	04.02	04.02.02.009	CIVIL	Cantoneira em alumínio, acabamento anodizado fosco	m				RN								-	-	-			-	-	
274	4	04	04.02	04.02.02.010	CIVIL	Divisória Leve Sistema Divisystem inclusive portas	m²				RN								-	-	-			-	-	
275	2	04	04.03	04.03	CIVIL	Elementos vazados					RN	YC	CM							-	-	-	-	-	-	
276	3	04	04.03	04.03.001	CIVIL	Fechamento com elemento vazado de concreto pré-moldado, dimensões 10x39x39cm	m²				RN								-	-	-			-	-	
277	3	04	04.03	04.03.002	CIVIL	Placa cimentícia - 1,20x2,40 m com espessura de 10 mm	m²				RN								-	-	-			-	-	
278	1	05	05.01	05	CIVIL	ESQUADRIAS E SERRALHERIA					RN	YC	CM							-	-	-	-	-	-	
279	2	05	05.01	05.01	CIVIL	Esquadrias de madeira					RN	YC	CM							-	-	-	-	-	-	
280	3	05	05.01	05.01.001	CIVIL	Porta cega, 80x210cm, 1 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco real L515 TX com grelha venezianada 60x40cm em alumínio natural - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura Papaiz (Ref. Design 420 acetinada) e fixações com tubo metalon 5x5cm - fechadura entregue com chave - PM01 (RN)	unid				RN								-	-	-			-	-	
281	3	05	05.01	05.01.002	CIVIL	Fechamento elétrico e mola aérea, 80x210cm, Porta cega, 1 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco real L515 TX com grelha venezianada 60x40cm em alumínio natural - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura elétrica HDL C90 e fixações com tubo metalon 5x5cm - fechadura entregue com chave - PM01 (RN)	unid				RN								-	-	-			-	-	
282	3	05	05.01	05.01.003	CIVIL	Porta com grelha venezianada, 80x210cm, Porta cega, 1 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco real L515 TX com grelha venezianada 60x40cm em alumínio natural - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura Papaiz (Ref. Design 420 acetinada) e fixações com tubo metalon 5x5cm - fechadura entregue com chave - PM02 (RN)	unid				RN								-	-	-			-	-	
283	3	05	05.01	05.01.004	CIVIL	Porta sem grelha venezianada, 80x210cm, Porta cega, 1 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco real L515 TX - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura Papaiz (Ref. Design 420 acetinada) e fixações com tubo metalon 5x5cm - fechadura entregue com chave - PM02 (RN)	unid				RN								-	-	-			-	-	
284	3	05	05.01	05.01.005	CIVIL	Porta cega, 120x210cm, 2 folhas de abrir (1 folha de 90cm + 1 folha de 30cm), em madeira compensada semi-oca, laminada em fórmica cor branco real L515 TX - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura Papaiz (Ref. Design 420 acetinada), mola aérea Dorma potência 2 na folha de 90cm, fecho zincado branco no piso na folha de 30cm e fixações com tubo metalon 5x5cm - fechadura entregue com chave - PM04 (RN)	unid				RN								-	-	-			-	-	
285	3	05	05.01	05.01.006	CIVIL	Porta cega, 60x150cm, 1 folha de abrir, Divilux BP Plus com revestimento melamínico, cor branco real L515 TX com esquadria em alumínio anodizado branco - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296) e tranca na porta do lado interno - PM05 (RN)	unid				RN								-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
286	3	05	05.01	05.01.007	CIVIL	Porta cega, 80x210cm, 1 folha de abrir bipartida, compensada, semi-oca, laminada em fórmica cor branco real L515 TX - incluindo 2 dobradiças Papaiz de aço inox 76x63mm em cada folha (modelo 1296), fechadura Papaiz na folha inferior (Ref. Design 420 acetinada), fecho zincado branco na folha superior e balcão para revista de pertences em madeira fixado com suporte 20cm em ferro com pintura branca - PM06 (RN)	unid			RN								-	-	-			-	-	
287	3	05	05.01	05.01.008	CIVIL	Porta pivotante, 88x230cm, com MDF interno revestido com melamina branca (86x215cm) e MDF externo revestido com ACM cor Smoke Mettalic HT-134 (88x230cm) - PM07 (RN)	unid			RN								-	-	-			-	-	
288	3	05	05.01	05.01.009	CIVIL	Porta cega, 82x210cm, 1 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco real L515 TX, com puxador horizontal metálico (40cm) tipo alavanca na parte interna e revestimento resistente à impactos na parte inferior (chapas metálicas) - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura Papaiz (Ref. Design 420 acetinada) e fixações com tubo metalon 5x5cm - fechadura entregue com chave - PM08 (RN)	unid			RN								-	-	-			-	-	
289	3	05	05.01	05.01.010	CIVIL	Porta com visor, 60x210cm, 1 folha de abir, compensada, semi-oca, laminada em fórmica cor branco real L515 TX - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296) e fechadura Papaiz (Ref. Design 420 acetinada) - fechadura entregue com chave - PM09 (RN)	unid			RN								-	-	-			-	-	
290	3	05	05.01	05.01.011	CIVIL	Porta cega, 100x210cm, 1 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco real L515 TX com grelha venezianada 60x40cm em alumínio natural - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura Papaiz (Ref. Design 420 acetinada) e fixações com tubo metalon 5x5cm - fechadura entregue com chave - PM10 (RN)	unid			RN								-	-	-			-	-	
291	3	05	05.01	05.01.012	CIVIL	Porta cega, 1 folha de abrir, em madeira compensada semi-oca - 80x210cm - incluindo fechadura elétrica, 2 travas de segurança tipo tetra (superior e inferior) e dobradiças	unid			RN								-	-	-			-	-	
292	3	05	05.01	05.01.013	CIVIL	Porta cega, 80x210 cm, 01 folha de abrir em madeira compensada semi-oca com marco e guarnições 5x1cm em cedrinho. acabamento em fórmica fosca branca voltada para a reserva e em fórmica fosca preta voltada para a área de vendas. Maçaneta stam linha 804 REF. 11el em aço acabamento preto com trinco interno REF. 814, dobradiça piano papaiz 73x63mm, modelo 1296 em aço inox. Mola aérea com acabamento preto. Grelha de retorno (52,5x32,5) com aletas indeavassáveis e dupla moldura - cor preta - PM01 (YC)	unid				YC							-	-	-			-	-	
293	3	05	05.01	05.01.014	CIVIL	Porta cega, 90x200cm, 01 folha de abrir em madeira compensada semi-oca a 10cm do piso acabado, guarnições 5x1cm em cedrinho, acabamento em fórmica fosca branca, maçaneta stam linha 804 ref. 11el em aço inox com acabamento cinza e com trinco interno REF. 814. dobradiça piano papaiz 73x63mm modelo 1296 em aço inox instalada acima de gola da casa de máquinas h=0,10m - PM02 (YC)	unid				YC							-	-	-			-	-	
294	3	05	05.01	05.01.015	CIVIL	Porta cega, 60x210m, de 01 folha de abrir em MDF malaminico fosco preto e=18mm, abertura com fecho toque - PM03 (YC)	unid				YC							-	-	-			-	-	
295	3	05	05.01	05.01.016	CIVIL	Porta cega, 35x70/100cm, de 01 folha de abrir em mdf melaminico fosco preto e=18mm e fecho toque	unid				YC							-	-	-			-	-	
296	3	05	05.01	05.01.017	CIVIL	Porta cega dupla, 140x210cm, 2 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco REAL L515 TX - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura papaiz (ref. design 420 acetinada) e fixações com tubo metalon 5x5cm - fechadura entregue com chave;	unid					CM					-	-	-			-	-		
297	3	05	05.01	05.01.018	CIVIL	Porta cega, 80x210cm, 1 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco REAL L515 TX - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura papaiz (ref. design 420 acetinada) e fixações com tubo metalon 5x5cm - fechadura entregue com chave - com mola aérea Dorma potência 2 -	unid					CM					-	-	-			-	-		
298	3	05	05.01	05.01.019	CIVIL	Porta cega, 80x210cm, 1 folha de abrir, em madeira compensada semi-oca, laminada em fórmica cor branco REAL L515 TX - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura papaiz (ref. design 420 acetinada) e fixações com tubo metalon 5x5cm - fechadura entregue com chave - Com grelha de retorno Branca dim. 60x40cm;	unid					CM					-	-	-			-	-		
299	2	05	05.02	05.02	CIVIL	Esquadrias metálicas				RN	YC	CM						-	-	-			-	-	
300	3	05	05.02	05.02.001	CIVIL	Porta com fechamento automático, sem grelha - 80x210cm - Porta cega, 1 folha de abrir de aço dupla lisa, revestida em esmalte branco e fixada com grapas metálicas - incluindo fechamento automático HDL C90, dobradiças e 2 puxadores Papaiz (Ref. 500, acabamento acetinado) - PF01 (RN)	unid			RN							-	-	-			-	-		
301	3	05	05.02	05.02.002	CIVIL	Porta com mola aérea e grelha - 80x210cm - Porta cega, 1 folha de abrir de aço dupla lisa, revestida em esmalte branco e fixada com grapas metálicas - incluindo dobradiças, fechadura, 2 puxadores Papaiz (ref. 500, acabamento acetinado) e grelha venezianada 60x40cm em alumínio natural - PF01 (RN)	unid			RN							-	-	-			-	-		
302	3	05	05.02	05.02.003	CIVIL	Porta corta-fogo, 90x210cm, 1 folha de abrir de aço dupla lisa, revestida em esmalte branco, estruturada com tubos metálicos 30x30mm e 100x100mm e fixada com grapas metálicas - incluindo fechamento automático HDL C90, dobradiças e 2 puxadores Papaiz (Ref. 500, acabamento acetinado) - PF02 (RN)	unid			RN							-	-	-			-	-		
303	3	05	05.02	05.02.004	CIVIL	Porta corta-fogo, 200x210cm, 2 folhas de abrir de aço dupla lisa, revestida em esmalte branco, estruturada com tubos metálicos 30x30mm e 100x100mm e fixada com grapas metálicas - incluindo fechamento automático HDL C90, dobradiças e 4 puxadores Papaiz (Ref. 500, acabamento acetinado) - PF03 (RN)	unid			RN							-	-	-			-	-		
304	3	05	05.02	05.02.005	CIVIL	Porta corta-fogo, 90x210cm, 1 folha de abrir de aço dupla lisa, revestida em esmalte branco e fechamento com barra metálica anti-pânico na parte interna - incluindo dobradiças - PF04 (RN)	unid			RN							-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
305	3	05	05.02	05.02.006	CIVIL	Porta cega, 110x210cm, 2 folhas de abrir de aço, revestida com esmalte branco e batentes envolventes com perfil de borracha fixado para vedação - incluindo dobradiças Papaiz de aço inox 76x63mm (modelo 1296), fechadura Papaiz (Ref. Design 420 acetinada) e fecho zincado em uma das folhas no piso - PF05 (RN)	unid			RN								-	-	-			-	-		
306	3	05	05.02	05.02.007	CIVIL	Porta venezianada, 180x210cm, 2 folhas de abrir, acabamento em pintura esmalte sintético cor platina, estruturada em perfil "C" soldado de chapa de aço 14 (1,9mm), com reforço superior, inferior e intermediário, batente de porta em chapa de aço dobrada 14 e fixada com grapas metálicas - incluindo dobradiças e fechadura com trinco e cadeado - PF06 (RN)	unid			RN								-	-	-			-	-		
307	3	05	05.02	05.02.008	CIVIL	Porta corta-fogo, 100x210cm, 1 folha de abrir de aço dupla lisa, revestida em esmalte branco e fechamento com barra metálica anti-pânico na parte interna - incluindo dobradiças - PF09 (RN)	unid			RN									-	-	-			-	-	
308	3	05	05.02	05.02.009	CIVIL	Porta venezianada, 100x210cm, 1 folha de abrir, acabamento em pintura esmalte sintético cor platina, estruturada em perfil "C" soldado de chapa de aço 14 (1,9mm), com reforço superior, inferior e intermediário, batente de porta em chapa de aço dobrada 14 e fixada com grapas metálicas - incluindo dobradiças e fechadura com trinco e cadeado - PF10 (RN)	unid			RN									-	-	-			-	-	
309	3	05	05.02	05.02.010	CIVIL	Porta venezianada, 166x210cm, 2 folhas de abrir, acabamento em pintura esmalte sintético cor platina, estruturada em perfil "C" soldado de chapa de aço 14 (1,9mm), com reforço superior, inferior e intermediário, batente de porta em chapa de aço dobrada 14 e fixada com grapas metálicas - incluindo dobradiças e fechadura com trinco e cadeado - PF11 (RN)	unid			RN									-	-	-			-	-	
310	3	05	05.02	05.02.011	CIVIL	Porta corta-fogo, 90x210cm, 1 folha de abrir de aço dupla lisa, revestida em esmalte branco, estruturada com tubos metálicos 30x30mm e 100x100mm e fixada com grapas metálicas - incluindo 2 puxadores Papaiz com acabamento acetinado, dobradiças e fechadura - PF12 (RN)	unid			RN									-	-	-			-	-	
311	3	05	05.02	05.02.012	CIVIL	Porta de aço motorizada tipo cortina de enrolar, perfil meia-cana tipo Transvision, com microfuros de Ø2mm espaçados a cada 3mm e chapa com esp. 0,9mm em aço galvanizado com acabamento natural, fabricação Tecnoporta - inclusive instalação	m²			RN									-	-	-			-	-	
312	3	05	05.02	05.02.013	CIVIL	Porta de aço com isolamento acústico - incluindo ferragens e acessórios	m²			RN									-	-	-			-	-	
313	3	05	05.02	05.02.014	CIVIL	Porta em tela, 80x210cm, malha 2", fio 12, 1 folha de abrir, com requadro metálico revestida em esmalte branco - incluindo fechamento com porta cadeado em barra chata galvanizada, 2 puxadores Papaiz (Ref. 500, acabamento acetinado) e dobradiças - PT01 (RN)	unid			RN								-	-	-			-	-		
314	3	05	05.02	05.02.015	CIVIL	Porta em tela, malha 2", fio 12, 166x210cm, 2 folhas de abrir, com requadro metálico revestida em esmalte branco - incluindo fechamento com porta cadeado em barra chata galvanizada, 2 puxadores Papaiz (Ref. 500, acabamento acetinado) e dobradiças - PT02 (RN)	unid			RN								-	-	-			-	-		
315	3	05	05.02	05.02.016	CIVIL	Porta venezianada em alumínio - incluindo ferragens e acessórios	m²			RN									-	-	-			-	-	
316	3	05	05.02	05.02.017	CIVIL	Janela venezianada fixa em alumínio - incluindo acessórios, sem inclusão de vidros	m²			RN									-	-	-			-	-	
317	3	05	05.02	05.02.018	CIVIL	Janela fixa em alumínio - incluindo acessórios, sem inclusão de vidros	m²			RN									-	-	-			-	-	
318	3	05	05.02	05.02.019	CIVIL	Janela basculante em alumínio - incluindo acessórios, sem inclusão de vidros	m²			RN									-	-	-			-	-	
319	3	05	05.02	05.02.020	CIVIL	Janela de correr em alumínio - incluindo acessórios, sem inclusão de vidros	m²			RN									-	-	-			-	-	
320	3	05	05.02	05.02.021	CIVIL	Porta 1 folha de abrir de aço dupla lisa - 80x210cm - incluindo fechadura comum, 2 travas de segurança tipo tetra (superior e inferior) e dobradiças	unid			RN									-	-	-			-	-	
321	3	05	05.02	05.02.022	CIVIL	Porta de aço motorizada tipo cortina de enrolar, perfil meia-cana e chapa com esp. 0,95mm em aço galvanizado com acabamento em esmalte semibrilho na cor Grafite - inclusive fechaduras inferiores em ambas as laterias e piso, incluso instalação	m²			RN									-	-	-			-	-	
322	3	05	05.02	05.02.023	CIVIL	Cortina de enrolar metálica, 3,20 x3,76 cm, com movimento automático, perfil tipo transvision em aço galvanizado, microfuro 2mm, acabamento cor preta . Cortina terá alçapão (80X80cm) para acesso/saída da loja, incluindo estrutura metálica de sustentação da cortina e acabamento em pintura automotiva cor preto - PF01 (YC)	unid				YC							-	-	-			-	-		
323	3	05	05.02	05.02.024	CIVIL	Cortina de enrolar metálica, 4,5 x 4,74 cm, com movimento automático, perfil tipo transvision em aço galvanizado, microfuro 2mm, acabamento cor preta . Cortina terá alçapão (80X80cm) para acesso/saída da loja, incluindo estrutura metálica de sustentação da cortina e acabamento em pintura automotiva cor preto - PF01 (YC)	unid				YC							-	-	-			-	-		
324	3	05	05.02	05.02.025	CIVIL	Cortina de enrolar metálica com movimento automático, 4,22 x 2,77 cm, perfil tipo transvision em aço galvanizado, microfuro 2mm, acabamento cor preta . Cortina terá alçapão (80X80cm) para acesso/saída da loja, incluindo estrutura metálica de sustentação da cortina e acabamento em pintura automotiva cor preto - PF01 (YC)	unid				YC							-	-	-			-	-		
325	3	05	05.02	05.02.026	CIVIL	Cortina de enrolar metálica com movimento automático, 470x241cm, perfil tipo transvision em aço galvanizado, microfuro 2mm, acabamento cor branco brilho, conforme medidas de projeto - Prever portinhola de 80x80; (CM)	unid					CM						-	-	-			-	-		
326	3	05	05.02	05.02.027	CIVIL	Cortina de enrolar metálica com movimento automático, 600x340cm, perfil tipo transvision em aço galvanizado, microfuro 2mm, acabamento cor branco brilho, conforme medidas de projeto - Prever portinhola de 80x80; (CM)	unid					CM						-	-	-			-	-		
327	3	05	05.02	05.02.028	CIVIL	Porta cega, 60x180/30cm, de 01 folha de abrir em MDF laminado com marco e guarnições 5x1cm em cedrinho, acabamento em fórmica fosca branca voltada para a vitrine e em fórmica fosca preta voltada para a área de vendas, fechadura Imab tipo tranqueta para banheiro em aço inox com acabamento preto somente no lado da área de vendas e dobradiça piano papaiz 73x63mm modelo 1296 em aço inox. (YC)	unid				YC							-	-	-			-	-		
328	3	05	05.02	05.02.029	CIVIL	Porta cega, 80x200/20cm, de 01 folha de abrir em madeira compensada semi-oca com marco e guarnições 5x1cm em cedrinho. acabamento em pintura esmalte cor branco nas duas faces, maçaneta Stam linha 804 REF. 11el em aço inox com acabamento preto e com trinco interno REF. 814, dobradiça piano papaiz 73x63mm modelo 1296 em aço inox e grelha de retorno do ar condicionado 50x100cm (YC)	unid				YC							-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
329	3	05	05.02	05.02.030	CIVIL	Porta cega 90x210cm, 1 folha de abrir de 90cm, de aço, revestida em esmalte branco coral coralit, dobradiça plano Papaiz modelo 1296 de aço inox 76x63mm acetinada, maçaneta Papaiz design 420 acetinada, com batentes envolventes e soco h=20cm. Com grelha de retorno Branca dim 60x40cm (CM)	unid					CM						-	-	-			-	-		
330	3	05	05.02	05.02.031	CIVIL	Porta em ACM Cor Branco (Integrada ao Pórtico da Fachada) com fecho toque. Instalada a H=30cm do Piso Pronto. 35x70cm (CM)	unid					CM						-	-	-			-	-		
331	2	05	05.03	05.03	CIVIL	Esquadrias de vidro				RN									-	-	-			-	-	
332	3	05	05.03	05.03.001	CIVIL	Porta em vidro laminado 10mm, 80x210cm, com suporte para bandeira, dobradiça superior e inferior, perfil em alumínio acabamento natural, contra fechadura e fechadura, capuchino para trinco pivo inferior e trinco - PV01 (RN)	unid			RN								-	-	-			-	-		
333	3	05	05.03	05.03.002	CIVIL	Porta em vidro laminado 10mm - incluindo ferragens e acessórios	m²			RN								-	-	-			-	-		
334	2	05	05.04	05.04	CIVIL	Vidros, películas e espelhos				RN	YC	CM							-	-	-			-	-	
335	3	05	05.04	05.04.001	CIVIL	Vidro liso esp. 4mm	m²			RN								-	-	-			-	-		
336	3	05	05.04	05.04.002	CIVIL	Vidro liso esp. 6mm	m²			RN								-	-	-			-	-		
337	3	05	05.04	05.04.003	CIVIL	Vidro laminado, esp. 6mm	m²			RN								-	-	-			-	-		
338	3	05	05.04	05.04.004	CIVIL	Vidro temperado esp. 10mm	m²			RN								-	-	-			-	-		
339	3	05	05.04	05.04.005	CIVIL	Película poliéster autoadesiva na cor cinza escuro	m²			RN								-	-	-			-	-		
340	3	05	05.04	05.04.006	CIVIL	Espelho esp. 6mm, para colunas, provadores, vestiarios e sanitários - colocado	m²			RN				1,26				-	-	-			-	-		
341	3	05	05.04	05.04.007	CIVIL	Espelho esp. 6mm colado sobre MDF estruturado em perfis de aço para impedir deformação - inclusive colocação	m²			RN								-	-	-			-	-		
342	3	05	05.04	05.04.008	CIVIL	Instalação de espelhos para cabines provadores	unid			RN								-	-	-			-	-		
343	3	05	05.04	05.04.009	CIVIL	Película de Segurança Transparente Anti vandalismo PS4000	m²			RN								-	-	-			-	-		
344	3	05	05.04	05.04.010	CIVIL	Vidro Float comum incolor, esp. 6mm	m²			RN								-	-	-			-	-		
345	3	05	05.04	05.04.011	CIVIL	Espelho e=6mm colado sobre MDF em parede drywall, revestido com perfil de aço 1/2" inox polido colado sobre espelho para acabamentos das suas arestas. Rodapé e rodadeto em MDF preto h=15cm	m²				YC							-	-	-			-	-		
346	3	05	05.04	05.04.012	CIVIL	Espelho com cantos arredondados r=10cm, com laterais em acabamento jateado pela face posterior, aplicado sobre caixa em MDF com iluminação lateral em lâmpadas fluorescentes..	m²				YC							-	-	-			-	-		
347	2	05	05.05	05.05	CIVIL	Serralheria				RN	YC	CM							-	-	-			-	-	
348	3	05	05.05	05.05.001	CIVIL	Corrimão em aço, altura de acordo com a NBR 14718/2008	m			RN								-	-	-			-	-		
349	3	05	05.05	05.05.002	CIVIL	Guarda-corpo e corrimão em aço inox polido com fechamento em vidro segurança temperado 10mm - h= 1,10m	m			RN								-	-	-			-	-		
350	3	05	05.05	05.05.003	CIVIL	Guarda-corpo e corrimão em alumínio anodizado fosco com fechamento em vidro laminado 10mm - h= 1,10m	m			RN								-	-	-			-	-		
351	3	05	05.05	05.05.004	CIVIL	Guarda-corpo em aço, altura de acordo com a NBR 14718/2008	m			RN								-	-	-			-	-		
352	3	05	05.05	05.05.005	CIVIL	Tela de fechamento tipo Otis, malha quadrada dimensão máxima 1. 1/4" (31,75mm)	m²			RN				138,92				-	-	-			-	-		
353	3	05	05.05	05.05.006	CIVIL	Instalação de trilho em alumínio, com pintura eletrostática branca para vitrine	m²			RN								-	-	-			-	-		
354	3	05	05.05	05.05.007	CIVIL	Cantoneira 1/2"x1/2" em alumínio acabamento preto fosco colada para proteção de aresta da divisória drywall.	unid				YC	CM						-	-	-			-	-		
355	3	05	05.05	05.05.008	CIVIL	Rodapiso em cantoneira metálica 2x2" com tratamento anticorrosivo	m				YC							-	-	-			-	-		
356	3	05	05.05	05.05.009	CIVIL	Rodadeto em chapa dobrada	m				YC							-	-	-			-	-		
357	3	05	05.05	05.05.010	CIVIL	Corrimão em perfil tubular em ferro Ø45mm com acabamento em pintura esmalte cinza	m				YC							-	-	-			-	-		
358	3	05	05.05	05.05.011	CIVIL	Corrimão metálico duas alturas (H=70 cm E H=92cm)em tubo de ferro Ø4,5cm com acabamento em pintura esmalte pintura cor amarelo, incluindo suporte de fixação em barra de ferro Ø1,2" PERFIL "L" , travessa superior do guarda-corpo em tubo de ferro Ø4,5cm e travessas intermediárias e divisões internas do guarda corpo em tubo de ferro Ø1" com acabamento em pintura esmalte pintura cor amarelo	m					CM				-	-	-			-	-				
359	3	05	05.05	05.05.012	CIVIL	Quadro em perfil "L" de chapa de aço dobrada para suporte de iluminação com acabamento em pintura eletrostática por preto, incluindo tela der alambrado de arame galvanizada e malha 65mm com acabamento em pintura esmalte cor preto e estruturas de fixação	unid					CM						-	-	-			-	-		
360	1	06	06.01	06	CIVIL	COBERTURAS E PROTEÇÕES				RN	YC	CM							-	-	-			-	-	
361	2	06	06.01	06.01	CIVIL	Coberturas				RN									-	-	-			-	-	
362	3	06	06.01	06.01.001	CIVIL	Estrutura metálica para cobertura - inclusive montagem e acessórios	m²			RN								-	-	-			-	-		
363	3	06	06.01	06.01.002	CIVIL	Telha em alumínio	m²			RN								-	-	-			-	-		
364	3	06	06.01	06.01.003	CIVIL	Rufo em chapa metálica	m			RN								-	-	-			-	-		
365	3	06	06.01	06.01.004	CIVIL	Cumeeira em chapa metálica	m			RN								-	-	-			-	-		
366	3	06	06.01	06.01.005	CIVIL	Calha em chapa metálica	m			RN								-	-	-			-	-		
367	2	06	06.02	06.02	CIVIL	Impermeabilizações				RN	YC	CM							-	-	-			-	-	
368	3	06	06.02	06.02.001	CIVIL	Impermeabilização com argamassa polimérica	m²			RN								-	-	-			-	-		
369	3	06	06.02	06.02.002	CIVIL	Impermeabilização com pintura hidroasfáltica	m²			RN								-	-	-			-	-		
370	3	06	06.02	06.02.003	CIVIL	Proteção mecânica sobre impermeabilização com manta, com argamassa traço 1:4 (cimento e areia), esp. 3cm	m²			RN	YC	CM						-	-	-			-	-		
371	3	06	06.02	06.02.004	CIVIL	Teste de estanqueidade - impermeabilizações	unid			RN	YC	CM						-	-	-			-	-		
372	3	06	06.02	06.02.005	CIVIL	Impermeabilização com manta asfáltica, esp. 4mm	m²			RN	YC	CM		121,19				-	-	-			-	-		
373	3	06	06.02	06.02.006	CIVIL	Mantas magnéticas RFID	m²			RN				417,07				-	-	-			-	-		
374	1	07	07.01	07	CIVIL	REVESTIMENTOS, FORROS, MARCENARIA, SERRALHERIA, PINTURAS E TRATAMENTOS ESPECIAIS				RN	YC	CM							-	-	-			-	-	
375	2	07	07.01	07.01	CIVIL	Revestimentos internos				RN	YC	CM							-	-	-			-	-	
376	3	07	07.01	07.01.001	CIVIL	Chapisco interno	m²			RN								-	-	-			-	-		
377	3	07	07.01	07.01.002	CIVIL	Emboço interno	m²			RN								-	-	-			-	-		
378	3	07	07.01	07.01.003	CIVIL	Massa única interna	m²			RN				94,24				-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
379	3	07	07.01	07.01.004	CIVIL	Azulejo 20x20cm, classe A, cor branca - assentado com argamassa colante - inclusive rejuntamento	m²			RN								-	-	-			-	-		
380	3	07	07.01	07.01.005	CIVIL	Painel MDP com revestimento melamínico, cor branca	m²			RN								-	-	-			-	-		
381	3	07	07.01	07.01.006	CIVIL	Painel em compensado naval com revestimento melamínico, cor branca	m²			RN								-	-	-			-	-		
382	3	07	07.01	07.01.007	CIVIL	Isolamento acústico com duas mantas de lã de rocha revestidas com filme plástico, esp. 50mm, sobrepostas e transpassadas	m²			RN								-	-	-			-	-		
383	3	07	07.01	07.01.008	CIVIL	Revestimento para escada rolante em painéis ACM branco, com pintura poliéster branca, esp. 3mm, formado por duas chapas de alumínio esp. 0,3mm e núcleo de polietileno - inclusive colocação	m²			RN								-	-	-			-	-		
384	3	07	07.01	07.01.009	CIVIL	Cerâmica 240x54x9mm cor Amêndoa Flash REF. 2109 marca Gail Rejunte Quartzolit Marfim	m²				YC							-	-	-			-	-		
385	3	07	07.01	07.01.010	CIVIL	Cerâmica 60x60cm LOFT SGR	m²				YC							-	-	-			-	-		
386	3	07	07.01	07.01.011	CIVIL	Cerâmica 90x90cm LOFT SGR	m²				YC							-	-	-			-	-		
387	3	07	07.01	07.01.012	CIVIL	Cerâmica 60x120cm LOFT SGR	m²				YC							-	-	-			-	-		
388	3	07	07.01	07.01.013	CIVIL	Cerâmica 60x60cm ONIX NAT	m²				YC							-	-	-			-	-		
389	3	07	07.01	07.01.014	CIVIL	Cerâmica 60x60cm URBAN TARTAN	m²				YC							-	-	-			-	-		
390	3	07	07.01	07.01.015	CIVIL	Cerâmica 20x120cm ANTIQUE HD NO HARD	m²				YC							-	-	-			-	-		
391	3	07	07.01	07.01.016	CIVIL	Cerâmica 20x120cm GIORDINO BE NAT	m²				YC							-	-	-			-	-		
392	3	07	07.01	07.01.017	CIVIL	Revestimento em telha ondulada 17 marca Eternit com acabamento em pintura eletrostática acetinada cor preto, incluindo estrutura de fixação e acabamento com perfil "U" ou "L" em chapa de aço dobrada com acabamento em pintura cor preto	m²				YC							-	-	-			-	-		
393	3	07	07.01	07.01.018	CIVIL	MDF 15mm Duratex Linha Design - Padrão Carvalho Malva	m²					CM						-	-	-			-	-		
394	3	07	07.01	07.01.019	CIVIL	Azulejo Cecrisa Everest WH New Branco 32x45cm BOLD Rejunte marca Quartzolit, cinza platina;	m²					CM						-	-	-			-	-		
395	2	07	07.02	07.02	CIVIL	Revestimentos externos e Elementos da fachada				RN	YC	CM								-	-			-	-	
396	3	07	07.02	07.02.001	CIVIL	Chapisco externo	m²			RN								-	-	-			-	-		
397	3	07	07.02	07.02.002	CIVIL	Emboço externo	m²			RN								-	-	-			-	-		
398	3	07	07.02	07.02.003	CIVIL	Massa única externa	m²			RN								-	-	-			-	-		
399	3	07	07.02	07.02.004	CIVIL	Pórtico em estrutura metálica revestido com alumínio composto (ACM) e luminoso Renner em letra bloco de alumínio leitoso branco retroiluminado com lâmpadas fluorescentes. O módulo do revestimento de ACM que recebe o luminoso é móvel para possibilitar manutenção. O pórtico recebe cortina de enrolar com acionamento automático e caixa da cortina de enrolar com alçapões para manutenção. No topo do pórtico é fixado o contador de passagem - comprimento padrão 7m - NÃO INCLUI ESTRUTURA METÁLICA (item 3.2.7) e CORTINA DE ENROLAR (item 5.2.12).	unid			RN								-	-	-			-	-		
400	3	07	07.02	07.02.005	CIVIL	Vitrine box - incluindo estrutura primária, estrutura secundária, revestimentos, vidros, trilhos e luminárias - comprimento padrão 3m - (Detalhamento: Estutura primária composta por base de perfis em chapa dobrada de aço 100x250mm instalada através de chumbadores no piso acabado da loja, montantes horizontais em perfis de aço 50x100mm com flanges nas extremidades e montantes verticais em perfis de aço 140x60mm soldados com furos rosqueados. Estrutura secundária com montantes da porta pivotante e perfis de arremate, acabamento e fechamento da vitrine. O revestimento interno é composto por chapas de MDF com revestimento melamínico branco BP texturizado 18mm com acabamento das bordas em fita de PVC branca 0,45mm termocolada. Fechamento superior e inferior com esperas para trilho de luminárias e fluorescentes. Ambos planos contam com grelhas de ventilação. A base para fixação do ACM é executada em MDF cru 18mm em toda a extensão que recebe acabamento com exceção do fechamento de topo que é em MDF branco BP 18mm. Vidro cristal laminado de segurança 10mm com baguetes de fixação em alumínio natural não excedendo 1/2" (12,7mm) de lado.	unid			RN									-	-	-			-	-	
401	3	07	07.02	07.02.006	CIVIL	Vitrine box com fechamento aos fundos 1 - incluindo estrutura interna do tablado em tubo de aço 50x30cm e=1,5mm chumbada no piso, tablado em MDF acabamento em Mood Duratex linha Essencial ou fôrmica de cimento queimado F696 acab. SO (STONE) - h=0,30m, fechamento lateral e aos fundos em parede de dry wall, chapa em MDF e=18mm melamínico com revestimento na cor branca colada na parede drywall cantos 45°, painel de vitrine médio nos fundos, esquadria de aço com vidro de segurança laminado incolor 321X298cm e=10mm, baguetes metálico com acabamento em pintura eletrostática cor preto para fixação do vidro laminado.	unid				YC							-	-	-			-	-		
402	3	07	07.02	07.02.007	CIVIL	Vitrine sem fechamento aos fundos -422X474cm - esquadria de aço com vidro de segurança laminado incolor e=10mm, baguetes metálico com acabamento em pintura eletrostática cor preto para fixação do vidro laminado	m²				YC							-	-	-			-	-		
403	3	07	07.02	07.02.008	CIVIL	Vitrine Box 1 - Esquadria de vidro laminado (frontal 218,45x340 e lateral 90x340) e=10mm com quadro em estrutura de perfis metálicos com revestimento em chapa de inox com acabamento escovado. Incluindo estruturas de fixação	unid					CM						-	-	-			-	-		
404	3	07	07.02	07.02.009	CIVIL	Vitrine Box 2 - Esquadria de vidro laminado e=10mm com quadro em estrutura de perfis metálicos com revestimento em chapa de inox com acabamento escovado (h=400cm)	unid					CM						-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações		
405	3	07	07.02	07.02.010	CIVIL	Vitrine box - incluindo estrutura primária, estrutura secundária, revestimentos, vidros, trilhos e luminárias - comprimento padrão 4m - (Detalhamento: Estrutura primária composta por base de perfis em chapa dobrada de aço 100x250mm instalada através de chumbadores no piso acabado da loja, montantes horizontais em perfis de aço 50x100mm com flanges nas extremidades e montantes verticais em perfis de aço 140x60mm soldados com furos rosqueados. Estrutura secundária com montantes da porta pivotante e perfis de arremate, acabamento e fechamento da vitrine. O revestimento interno é composto por chapas de MDF com revestimento melamínico branco BP texturizado 18mm com acabamento das bordas em fita de PVC branca 0,45mm termocolada. Fechamento superior e inferior com esperas para trilho de luminárias e fluorescentes. Ambos planos contam com grelhas de ventilação. A base para fixação do ACM é executada em MDF cru 18mm em toda a extensão que recebe acabamento com exceção do fechamento de topo que é em MDF branco BP 18mm. Vidro cristal laminado de segurança 10mm com baguetes de fixação em alumínio natural não excedendo 1/2" (12,7mm) de lado.	unid			RN									-	-	-			-	-		
406	3	07	07.02	07.02.011	CIVIL	Painel em alumínio composto (ACM) fixado em alvenaria através de fita dupla-face - Estrutura em quadro externo e travessas intermediárias (conforme modulação das chapas de ACM), ambos em tubos metalon 50x30mm, aparafusada na alvenaria. O painel de ACM recebe luminoso com assinatura Renner completa (símbolo + logotipo) em letra bloco de acrílico branco termomoldado fixado na estrutura do painel. A iluminação da assinatura é em fitas de led fixadas diretamente na alvenaria. O luminoso é móvel para possibilitar acesso de manutenção.	unid			RN									-	-	-			-	-		
407	3	07	07.02	07.02.012	CIVIL	Vitrine Back	m²			RN									-	-	-			-	-		
408	3	07	07.02	07.02.013	CIVIL	Letreiro da fachada em aço inox e acrílico com iluminação de LED	m²			RN									-	-	-			-	-		
409	3	07	07.02	07.02.014	CIVIL	Screen Pannel	m²			RN									-	-	-			-	-		
410	3	07	07.02	07.02.016	CIVIL	MDF laminado fórmula fogo retardante preto fosca e=18mm	m²				YC								-	-	-			-	-		
411	3	07	07.02	07.02.017	CIVIL	Painéis em alumínio composto (ACM) - Branco Alto Brilho - PRO315 Projeto Alumínio ou Branco Neve Brilh Day Brasil - Tecbond	m²					CM							-	-	-			-	-		
412	3	07	07.02	07.02.018	CIVIL	Pórtico da fachada - Estrutura metálica de sustentação das esquadrias da fachada, incluindo perfis em tubo de aço 3x80 com pintura automotiva cor preto, vidros temperados e=10mm, com caixilho em perfis de 8X8CM e vidro fixado no vão por baguetes de alumínio de 1,25X1,25mm e demais elementos de fixação, incluindo fornecimento e instalação.	m²				YC							-	-	-			-	-			
413	3	07	07.02	07.02.019	CIVIL	Pórtico da fachada - Incluindo estrutura treliçada em perfis de aço e estrutura de MDF de sustentação do pórtico em ACM da fachada	conj					CM							-	-	-			-	-		
414	3	07	07.02	07.02.020	CIVIL	Letreiro 77x17cm em letra caixa de acrílico vermelho na parte interna	conj					CM							-	-	-			-	-		
415	3	07	07.02	07.02.021	CIVIL	painéis em alumínio composto (ACM) - com núcleo FR (resistente a fogo) e=3mm, com acabamento na cor branco fosco - REF.: Pure White 9010 - Fabricação Alucomaxx	conj					CM							-	-	-			-	-		
416	3	07	07.02	07.02.022	CIVIL	Vitrine box com fechamento aos fundos 2- incluindo estrutura interna do tablado em tubo de aço 50x30cm e=1,5mm chumbada no piso, tablado em MDF acabamento em Mood Duratex linha Essencial ou fórmula de cimento queimado F696 acab. SO (STONE) - h=0,30m, fechamento lateral e aos fundos em parede de dry wall, chapa em MDF e=18mm melamínico com revestimento na cor branca colada na parede drywall cantos 45°, painel de vitrine médio nos fundos, esquadria de aço com vidro de segurança laminado incolor 414x247cm - e=10mm, baguetes metálico com acabamento em pintura eletrostática cor preto para fixação do vidro laminado, rodapé de granito preto absoluto H=15cm, projetores Scenic grande 1X LED COB 2000LM e fechamento lateral em esquadria de aço com vidro de segurança temperado incolor 105x247cm - e=10mm	unid				YC								-	-	-			-	-		
417	3	07	07.02	07.02.023	CIVIL	Vitrine box com fechamento aos fundos 3- incluindo estrutura interna do tabalhado em tubo de aço 50x30cm e=1,5mm chumbada no piso, tablado em MDF acabamento em Mood Duratex linha Essencial ou fórmula de cimento queimado F696 acab. SO (STONE) - h=0,30m, fechamento lateral e aos fundos em parede de dry wall, chapa em MDF e=18mm melamínico com revestimento na cor branca colada na parede drywall cantos 45°, painel de vitrine médio nos fundos, esquadria de aço com vidro de segurança laminado incolor 255x376cm - e=10mm, baguetes metálico com acabamento em pintura eletrostática cor preto para fixação do vidro laminado, prever junta seca no encontro do vidro na aresta da fachada, adesivo vinílico Scotthal cristal 3cm dusted Crystal (jateada), rodapé de granito preto absoluto H=15cm, projetores Scenic grande 1X LED COB 2000LM e fechamento lateral em esquadria de aço com vidro de segurança temperado incolor 42x246cm	unid				YC								-	-	-			-	-		
418	2	07	07.03	07.03	CIVIL	Forros e elementos decorativos				RN	YC	CM								-	-	-			-	-	
419	3	07	07.03	07.03.001	CIVIL	Forro em painéis de gesso acartonado resistente a umidade, esp. 12,5mm, fixados em perfis longitudinais constituídos de chapas de aço galvanizado, espaçados a cada 60cm	m²			RN	YC								-	-	-			-	-		
420	3	07	07.03	07.03.002	CIVIL	Forro em painéis de 100mm com núcleo isolante em EPS (poliuretano expandido), revestimento em ambas as faces em aço zincado pré-pintado, acabamento liso, encaixe do tipo trapézio e largura padrão de 1144mm, comprimento variado - inclusive instalação	m²			RN									-	-	-			-	-		
421	3	07	07.03	07.03.003	CIVIL	Forro EPS em placa de lâ de vidro revestida na face aparente em PVC microperfurado, placas com dimensões 625x1250mm, esp. 20mm	m²			RN									-	-	-			-	-		
422	3	07	07.03	07.03.004	CIVIL	Forro modular de PVC, dimensões 625x1250mm, cor branca	m²			RN									-	-	-			-	-		
423	3	07	07.03	07.03.005	CIVIL	Sanca Perfil 1 - gesso acartonado, fixada em perfis longitudinais constituídos de chapas de aço galvanizado	m			RN									-	-	-			-	-		
424	3	07	07.03	07.03.006	CIVIL	Sanca Perfil 2 - gesso acartonado, fixada em perfis longitudinais constituídos de chapas de aço galvanizado	m			RN				35,75					-	-	-			-	-		
425	3	07	07.03	07.03.007	CIVIL	Sanca Perfil 3 - gesso acartonado, fixada em perfis longitudinais constituídos de chapas de aço galvanizado	m			RN									-	-	-			-	-		

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426	3	07	07.03	07.03.008	CIVIL	Sanca Perfil 4 - gesso acartonado, fixada em perfis longitudinais constituídos de chapas de aço galvanizado	m			RN								-	-	-			-	-		
427	3	07	07.03	07.03.009	CIVIL	Sanca Perfil 5 - gesso acartonado, fixada em perfis longitudinais constituídos de chapas de aço galvanizado	m			RN								-	-	-			-	-		
428	3	07	07.03	07.03.010	CIVIL	Execução de alçapões circulares em forro de gesso - diâmetro 60cm	unid			RN	YC							-	-	-			-	-		
429	3	07	07.03	07.03.011	CIVIL	Execução de alçapões circulares em forro de gesso - diâmetro 30cm	unid			RN								-	-	-			-	-		
430	3	07	07.03	07.03.012	CIVIL	Tabica metálica para forro de gesso	m			RN	YC			202,75				-	-	-			-	-		
431	3	07	07.03	07.03.013	CIVIL	Furação de forro de gesso para instalação de luminárias	unid			RN				187,00				-	-	-			-	-		
432	3	07	07.03	07.03.014	CIVIL	Reforços transversais nas aberturas dos forros para instalação de luminárias e demais elementos	unid			RN				68,00				-	-	-			-	-		
433	3	07	07.03	07.03.015	CIVIL	Forro em painéis de gesso acartonado, esp. 15mm, fixados em perfis longitudinais constituídos de chapas de aço galvanizado, espaçados a cada 60cm	m²			RN								-	-	-			-	-		
434	3	07	07.03	07.03.016	CIVIL	Forro em painéis de gesso acartonado resistente ao fogo, esp. 15mm, fixados em perfis longitudinais constituídos de chapas de aço galvanizado, espaçados a cada 60cm	m²			RN								-	-	-			-	-		
435	3	07	07.03	07.03.017	CIVIL	Forro em painéis de gesso acartonado resistente a umidade, esp. 15mm, fixados em perfis longitudinais constituídos de chapas de aço galvanizado, espaçados a cada 60cm	m²			RN								-	-	-			-	-		
436	3	07	07.03	07.03.018	CIVIL	Forro em MDF e=18mm com acabamento em fórmula cor preta, incluindo fixações	m²				YC							-	-	-			-	-		
437	3	07	07.03	07.03.019	CIVIL	Forro em painéis em alumínio composto (ACM) - Branco alto brilho - PRO315 Projeto Alumínio	m²					CM						-	-	-			-	-		
438	2	07	07.04	07.04	CIVIL	Pinturas				RN	YC	CM							-	-	-			-	-	
439	3	07	07.04	07.04.001	CIVIL	Selador (1 demão), massa corrida (1 demão) e pintura acrílica fosca em cores (2 demãos) para paredes dry wall	m²			RN								-	-	-			-	-		
440	3	07	07.04	07.04.002	CIVIL	Selador (1 demão), massa corrida (1 demão) e pintura acrílica fosca em cores (2 demãos) para rebaixos de forros de gesso	m²			RN								-	-	-			-	-		
441	3	07	07.04	07.04.003	CIVIL	Selador (1 demão), massa corrida (1 demão) e pintura acrílica semi-brilho branco neve (2 demãos) para paredes dry wall	m²			RN				1.518,14				-	-	-			-	-		
442	3	07	07.04	07.04.004	CIVIL	Selador (1 demão), massa corrida (1 demão) e pintura acrílica semi-brilho em cores (2 demãos) para paredes dry wall	m²			RN								-	-	-			-	-		
443	3	07	07.04	07.04.005	CIVIL	Selador (1 demão) e pintura acrílica semi-brilho branco neve (2 demãos) para paredes alvenarias e blocos	m²			RN								-	-	-			-	-		
444	3	07	07.04	07.04.006	CIVIL	Selador (1 demão) e pintura acrílica semi-brilho em cores (2 demãos) para paredes alvenarias e blocos	m²			RN								-	-	-			-	-		
445	3	07	07.04	07.04.007	CIVIL	Selador (1 demão) e pintura acrílica fosca branco neve (2 demãos) para lajes aparentes	m²			RN								-	-	-			-	-		
446	3	07	07.04	07.04.008	CIVIL	Selador (1 demão) e pintura PVA branco neve (2 demãos) para lajes aparentes	m²			RN								-	-	-			-	-		
447	3	07	07.04	07.04.009	CIVIL	Selador (1 demão) e pintura texturizada (2 demãos)	m²			RN				2,34				-	-	-			-	-		
448	3	07	07.04	07.04.010	CIVIL	Pintura esmalte a base de água sobre elementos de madeira - 2 demãos	m²			RN								-	-	-			-	-		
449	3	07	07.04	07.04.011	CIVIL	Pintura esmalte a base de água sobre elementos metálicos - 2 demãos	m²			RN								-	-	-			-	-		
450	3	07	07.04	07.04.012	CIVIL	Pintura epóxi a base de água - 2 demãos	m²			RN								-	-	-			-	-		
451	3	07	07.04	07.04.013	CIVIL	Pintura poliesportiva para piso - 2 demãos	m²			RN								-	-	-			-	-		
452	3	07	07.04	07.04.014	CIVIL	Pintura armário perfumaria com selador, aplicação de massa automobilística, lixamento, aplicação de massa corrida PVA, pintura PVA (1 demão) e pintura acrílica (2 demãos) - EXCLUSIVO PARA REFORMAS	m²			RN								-	-	-			-	-		
453	3	07	07.04	07.04.015	CIVIL	Pintura tubulações - diversas	m			RN								-	-	-			-	-		
454	3	07	07.04	07.04.016	CIVIL	Pintura com tinta Intumescente para superfícies metálicas	m²			RN								-	-	-			-	-		
455	3	07	07.04	07.04.017	CIVIL	Selador (1 demão), massa pva (1 demão) e pintura acrílica Suvinil fosco completo preto TVT21 (2 demãos) para paredes dry wall	m²				YC							-	-	-			-	-		
456	3	07	07.04	07.04.018	CIVIL	Selador (1 demão), massa pva (1 demão) e pintura pva fosca branco neve (2 demãos) para paredes dry wall	m²				YC							-	-	-			-	-		
457	3	07	07.04	07.04.019	CIVIL	Selador (1 demão), massa corrida (1 demão) e pintura acrílica fosca branco neve (2 demãos) para forros de gesso	m²			RN		CM		508,06				-	-	-			-	-		
458	3	07	07.04	07.04.020	CIVIL	Selador (1 demão), massa PVA (1 demão) e pintura PVA fosca branco neve (2 demãos) para paredes alvenarias e blocos	m²				YC							-	-	-			-	-		
459	3	07	07.04	07.04.021	CIVIL	Selador (1 demão) e pintura acrílica fosca cor branco neve (2 demãos) para paredes alvenarias e blocos	m²				YC							-	-	-			-	-		
460	3	07	07.04	07.04.022	CIVIL	Selador (1 demão) e pintura acrílica Suvinil fosco completo preto TVT21 (2 demãos) para paredes alvenarias e blocos	m²				YC							-	-	-			-	-		
461	3	07	07.04	07.04.023	CIVIL	Acabamento cimentício Havana cor metz para dry wall	m²				YC							-	-	-			-	-		
462	3	07	07.04	07.04.024	CIVIL	Revestimento Mr. Brulee cor natural, fornecedor Protécnica linha profissional bricolagem em dry wall	m²				YC							-	-	-			-	-		
463	3	07	07.04	07.04.025	CIVIL	Painel wall do mezanino com pintura acrílica branco fosco - sem forro	m²				YC							-	-	-			-	-		
464	3	07	07.04	07.04.026	CIVIL	Selador (1 demão), massa PVA (1 demão) e pintura PVA cor preta (2 demãos) para rebaixos de forros de gesso	m²				YC							-	-	-			-	-		
465	3	07	07.04	07.04.027	CIVIL	Selador (1 demão), massa PVA (1 demão) e pintura PVA cor branca (2 demãos) para rebaixos de forros de gesso	m²				YC							-	-	-			-	-		
466	3	07	07.04	07.04.028	CIVIL	Selador (1 demão) e pintura Suvinil cor fosca branco neve (2 demãos) para lajes aparentes	m²				YC							-	-	-			-	-		
467	3	07	07.04	07.04.029	CIVIL	Selador (1 demão) e pintura Suvinil fosco preto TVT 21 (2 demãos) para lajes aparentes	m²				YC							-	-	-			-	-		
468	3	07	07.04	07.04.030	CIVIL	Selador (1 demão) e pintura esmalte acetinada Suvinil cor Branco (2 demãos) para lajes aparentes	m²					CM						-	-	-			-	-		
469	3	07	07.04	07.04.031	CIVIL	Selador (1 demão) e pintura acrílica fosca Suvinil cor Cinza (2 demãos) para lajes aparentes	m²					CM						-	-	-			-	-		
470	1	08	08.01	08	CIVIL	PISOS E PAVIMENTAÇÕES				RN	YC	CM							-	-	-			-	-	
471	2	08	08.01	08.01	CIVIL	Pavimentações				RN	YC	CM							-	-	-			-	-	
472	3	08	08.01	08.01.001	CIVIL	Contrapiso de concreto magro	m³			RN								-	-	-			-	-		
473	3	08	08.01	08.01.002	CIVIL	Contrapiso de concreto armado	m³			RN				182,95				-	-	-			-	-		

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474	3	08	08.01	08.01.003	CIVIL	Regularização de contrapiso com argamassa pré-fabricada	m²			RN								-	-	-			-	-	
475	3	08	08.01	08.01.004	CIVIL	Reforço no contrapiso para área das antenas	m²			RN								-	-	-			-	-	
476	3	08	08.01	08.01.005	CIVIL	Piso cimentado alisado esp. 3,5cm	m²			RN								-	-	-			-	-	
477	3	08	08.01	08.01.006	CIVIL	Enchimento de piso com argila expandida	m³			RN								-	-	-			-	-	
478	3	08	08.01	08.01.007	CIVIL	Enchimento de piso com placas EPS	m³			RN								-	-	-			-	-	
479	3	08	08.01	08.01.008	CIVIL	Piso cerâmico 31x31cm, PEI 5, assentado com argamassa pré-fabricada - inclusive rejuntamento	m²			RN								-	-	-			-	-	
480	3	08	08.01	08.01.009	CIVIL	Piso cerâmico 40x40cm, PEI 5, assentado com argamassa pré-fabricada - inclusive rejuntamento	m²			RN								-	-	-			-	-	
481	3	08	08.01	08.01.010	CIVIL	Piso porcelanato 45x45cm, PEI 5, assentado com argamassa pré-fabricada - inclusive rejuntamento	m²			RN								-	-	-			-	-	
482	3	08	08.01	08.01.011	CIVIL	Piso porcelanato 60x60cm, PEI 5, retificado, assentado com argamassa pré-fabricada - inclusive rejuntamento	m²			RN								-	-	-			-	-	
483	3	08	08.01	08.01.012	CIVIL	Piso laminado decorativo, assentado sobre manta protetora com cola	m²			RN								-	-	-			-	-	
484	3	08	08.01	08.01.013	CIVIL	Piso vinílico em placas 60x60cm, assentado com cola	m²			RN								-	-	-			-	-	
485	3	08	08.01	08.01.014	CIVIL	Piso vinílico beaulieu, linha rock 302 KBW8531, assentado com cola	m²			RN								-	-	-			-	-	
486	3	08	08.01	08.01.015	CIVIL	Piso em granito branco Itaúnas, esp. 25mm, assentado com argamassa pré-fabricada	m²			RN								-	-	-			-	-	
487	3	08	08.01	08.01.016	CIVIL	Piso granito cinza Corumbá, esp. 25mm, assentado com argamassa pré-fabricada	m²			RN								-	-	-			-	-	
488	3	08	08.01	08.01.017	CIVIL	Revestimento de degrau em granito branco Itaúnas para escada metálica - incluindo borda ranhurada com limadura de ferro	m²			RN								-	-	-			-	-	
489	3	08	08.01	08.01.018	CIVIL	Piso em chapas corrugadas (chapa xadrez), com superfície antiderrapante em uma das faces, esp. 6,35mm	m²			RN								-	-	-			-	-	
490	3	08	08.01	08.01.019	CIVIL	Piso em chapas metálicas expandidas em malhas de 130x40mm, esp. 6,3mm, com proteção anti-corrosiva	m²			RN								-	-	-			-	-	
491	3	08	08.01	08.01.020	CIVIL	Piso composto de miolo de madeira laminada ou sarrafeada contraplacado em ambas as faces por lâminas de madeira e externamente por placas cimentícias em CRFS (cimento reforçado com fio sintético) prensadas, dimensões 120x250cm, esp. 4cm, fixado com presilhas (grapas fixas) e parafusos atarraxantes com perfil cantoneira metálica 51x4,75mm a cada 1200mm e aplicação de selante hidrofugante para proteção da face exposta - inclusive instalação	m²			RN							-	-	-			-	-		
492	3	08	08.01	08.01.021	CIVIL	Junta de movimentação do piso	m			RN	YC	CM		934,57				-	-	-			-	-	
493	3	08	08.01	08.01.022	CIVIL	Junta de desolidarização de perímetro do piso	m			RN	YC	CM		247,66				-	-	-			-	-	
494	3	08	08.01	08.01.023	CIVIL	Junta construtiva do prédio	m			RN								-	-	-			-	-	
495	3	08	08.01	08.01.024	CIVIL	Piso laminado Eucalflor Elegance - Carvalho Chamonix 8mm, assentado sobre manta protetora com cola	m²			RN								-	-	-			-	-	
496	3	08	08.01	08.01.025	CIVIL	Contrapiso de concreto leve	m³			RN	YC							-	-	-			-	-	
497	3	08	08.01	08.01.026	CIVIL	Piso cerâmico marca Cecrisa - Linha Metrôpole Bold Modelo SGR 45x45cm	m²				YC							-	-	-			-	-	
498	3	08	08.01	08.01.027	CIVIL	Porcelato 20x120cm PEI 4 retificado linha Antique HD REF. No Hard marca Portinari	m²				YC							-	-	-			-	-	
499	3	08	08.01	08.01.028	CIVIL	Piso vinílico em placas 30x30cm, assentado com cola	m²			RN	YC			267,01				-	-	-			-	-	
500	3	08	08.01	08.01.029	CIVIL	Piso vinílico - marca Tarkett, linha Paviflex Natural, coleção Intensity, 2mm, modelo Crystal Grey 30x30cm - Ref. 9211901	m²					CM						-	-	-			-	-	
501	3	08	08.01	08.01.030	CIVIL	Piso podotátil vinílico 25x25cm na Cor Amarelo	m²					CM						-	-	-			-	-	
502	2	08	08.02	08.02	CIVIL	Soleiras / Rodapés / Tabeiras / Acessórios de piso				RN	YC	CM						-	-	-			-	-	
503	3	08	08.02	08.02.001	CIVIL	Soleira perfil piso parede, dimensões 10x32x2100mm	m			RN								-	-	-			-	-	
504	3	08	08.02	08.02.002	CIVIL	Soleira em granito cinza Corumbá, dimensões 80x16,5cm - retaguarda	m²			RN								-	-	-			-	-	
505	3	08	08.02	08.02.003	CIVIL	Soleira em granito branco Itaúnas, largura 10cm	m			RN								-	-	-			-	-	
506	3	08	08.02	08.02.004	CIVIL	Soleira em granito branco Itaúnas, largura 15cm	m			RN								-	-	-			-	-	
507	3	08	08.02	08.02.005	CIVIL	Rodapé em granito branco Itaúnas, dimensões 10cm altura x 2cm largura	m			RN								-	-	-			-	-	
508	3	08	08.02	08.02.006	CIVIL	Rodapé em granito branco Itaúnas, dimensões 25cm altura x 2cm largura	m			RN								-	-	-			-	-	
509	3	08	08.02	08.02.007	CIVIL	Rodapé em granito branco Itaúnas, dimensões 30cm altura x 2cm largura	m			RN								-	-	-			-	-	
510	3	08	08.02	08.02.008	CIVIL	Rodapé de compensado sarrafeado revestido com laminado melamínico, dimensões 10cm altura x 190cm largura	m			RN								-	-	-			-	-	
511	3	08	08.02	08.02.009	CIVIL	Rodapé laminado em madeira, dimensões 10cm altura x 2cm largura	m			RN								-	-	-			-	-	
512	3	08	08.02	08.02.010	CIVIL	Rodapé cerâmico PEI 5, altura 10cm	m			RN								-	-	-			-	-	
513	3	08	08.02	08.02.011	CIVIL	Tabeira em granito branco Itaúnas, largura 15cm	m			RN								-	-	-			-	-	
514	3	08	08.02	08.02.012	CIVIL	Soleira em granito marrom imperial	m					CM						-	-	-			-	-	
515	3	08	08.02	08.02.013	CIVIL	Soleira em granito preto absoluto, incluindo perfil "U" em chapa metálica com acabamento em pintura eletrostática acetinada cor preto para acabamento do acesso	m				YC							-	-	-			-	-	
516	3	08	08.02	08.02.014	CIVIL	Rodapé em granito preto absoluto H=15cm	m				YC							-	-	-			-	-	
517	3	08	08.02	08.02.015	CIVIL	Rodapé H=8cm METROPOLE SGR	m			RN								-	-	-			-	-	
518	3	08	08.02	08.02.016	CIVIL	Rodapé H=11cm, 60CM de largura, Loft SGR	m			RN								-	-	-			-	-	
519	3	08	08.02	08.02.017	CIVIL	Rodapé H=15cm em MDF acabamento laminado em fórmica cor branca	m				YC							-	-	-			-	-	
520	3	08	08.02	08.02.018	CIVIL	Rodapé H=15cm em MDF acabamento laminado em fórmica cor preta	m				YC							-	-	-			-	-	
521	3	08	08.02	08.02.019	CIVIL	Rodapé h=7cm em MDF Branco	m					CM						-	-	-			-	-	
522	1	09	09.01	09	CIVIL	APARELHOS E METAIS				RN	YC	CM						-	-	-			-	-	
523	2	09	09.01	09.01	CIVIL	Aparelhos				RN	YC	CM						-	-	-			-	-	
524	3	09	09.01	09.01.001	CIVIL	Assento plástico para bacia sanitária, cor branca	unid			RN								-	-	-			-	-	
525	3	09	09.01	09.01.002	CIVIL	Bancada em granito, cor Cinza Corumbá - incluindo saia e espelho 12cm	m²			RN				0,92				-	-	-			-	-	
526	3	09	09.01	09.01.003	CIVIL	Bacia sanitária de louça para sanitário convencional, cor branca	unid			RN								-	-	-			-	-	
527	3	09	09.01	09.01.004	CIVIL	Cuba de louça de embutir oval	unid			RN					1,00			-	-	-			-	-	
528	3	09	09.01	09.01.005	CIVIL	Dispenser para papel toalha	unid			RN					3,00			-	-	-			-	-	
529	3	09	09.01	09.01.006	CIVIL	Dispenser para papel higiênico	unid			RN					3,00			-	-	-			-	-	
530	3	09	09.01	09.01.007	CIVIL	Dispenser para sabonete líquido	unid			RN					3,00			-	-	-			-	-	
531	3	09	09.01	09.01.008	CIVIL	Ducha eletrônica 5500W	unid			RN								-	-	-			-	-	
532	3	09	09.01	09.01.009	CIVIL	Lavatório de louça com coluna convencional, cor branca	unid			RN					2,00			-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
533	3	09	09.01	09.01.010	CIVIL	Pia de aço inox com cuba dupla retangular central e escorridor	unid			RN				1,00				-	-	-			-	-		
534	3	09	09.01	09.01.011	CIVIL	Mictório sifonado de louça, cor branca	unid			RN								-	-	-			-	-		
535	3	09	09.01	09.01.012	CIVIL	Tanque em louça, cor branca	unid			RN								-	-	-			-	-		
536	3	09	09.01	09.01.013	CIVIL	Tanque em aço inox	unid			RN				1,00				-	-	-			-	-		
537	3	09	09.01	09.01.014	CIVIL	Gabinete de aço para tanque simples	unid			RN								-	-	-			-	-		
538	3	09	09.01	09.01.015	CIVIL	Bebedouro elétrico metálico - 40 litros	unid			RN								-	-	-			-	-		
539	3	09	09.01	09.01.016	CIVIL	Purificador de água refrigerado, modelo FR600, cores branca ou prata	unid			RN				1,00				-	-	-			-	-		
540	2	09	09.02	09.02	CIVIL	Metais e acessórios				RN	YC	CM							-	-	-			-	-	
541	3	09	09.02	09.02.001	CIVIL	Torneira cromada de pressão com arejador incorporado - Pressmatic Alfa	unid			RN								-	-	-			-	-		
542	3	09	09.02	09.02.002	CIVIL	Torneira elétrica 5400W	unid			RN								-	-	-			-	-		
543	3	09	09.02	09.02.003	CIVIL	Arejador para torneiras existentes - Standard M24X1 Rosca Externa	unid			RN								-	-	-			-	-		
544	3	09	09.02	09.02.004	CIVIL	Regulador de vazão - Deca Cód.: 4266-061	unid			RN								-	-	-			-	-		
545	3	09	09.02	09.02.005	CIVIL	Sifão cromado 1"x1.1/2" - padrão médio	unid			RN				1,00				-	-	-			-	-		
546	3	09	09.02	09.02.006	CIVIL	Sifão PVC	unid			RN				2,00				-	-	-			-	-		
547	3	09	09.02	09.02.007	CIVIL	Válvula para mictório com fechamento automático - Deca Cód.: 2570C	unid			RN								-	-	-			-	-		
548	3	09	09.02	09.02.008	CIVIL	Válvula de descarga	unid			RN								-	-	-			-	-		
549	3	09	09.02	09.02.009	CIVIL	Valvula de escoamento para tanque	unid			RN				1,00				-	-	-			-	-		
550	3	09	09.02	09.02.010	CIVIL	Valvula de escoamento para lavatório	unid			RN				3,00				-	-	-			-	-		
551	1	10	10.01	10	CIVIL	PROPAGANDA E EQUIPAMENTOS				RN	YC	CM							-	-	-			-	-	
552	2	10	10.01	10.01	CIVIL	Mobiliários e equipamentos				RN	YC	CM							-	-	-			-	-	
553	3	10	10.01	10.01.001	CIVIL	Fornecimento e instalação de elevador de passageiros (clientes)	unid			RN								-	-	-			-	-		
554	3	10	10.01	10.01.002	CIVIL	Fornecimento e instalação de elevador de serviço (uso restrito)	unid			RN								-	-	-			-	-		
555	3	10	10.01	10.01.003	CIVIL	Elevador montacarga (uso restrito)	unid			RN				2,00				-	-	-			-	-		
556	3	10	10.01	10.01.004	CIVIL	Fornecimento e instalação de escada rolante	unid			RN								-	-	-			-	-		
557	3	10	10.01	10.01.005	CIVIL	Fornecimento e instalação de placa de ambientação com assinatura Renner	unid			RN				1,00				-	-	-			-	-		
558	3	10	10.01	10.01.006	CIVIL	Fornecimento e instalação de letreiro eletrônico	unid			RN								-	-	-			-	-		
559	3	10	10.01	10.01.007	CIVIL	Fornecimento e instalação de tapete articulado	m²			RN								-	-	-			-	-		
560	3	10	10.01	10.01.008	CIVIL	Mobiliário comercial	conj			RN				1,00				-	-	-			-	-		
561	3	10	10.01	10.01.009	CIVIL	Equipamentos comerciais (encantômetros, saldômetros, telefones, antenas de segurança, computadores, impressões, outros)	conj			RN				1,00				-	-	-			-	-		
562	3	10	10.01	10.01.010	CIVIL	Fornecimento e instalação de plataforma PNE	unid			RN	YC	CM		1,00				-	-	-			-	-		
563	1	11	11.01	11	CIVIL	ACESSIBILIDADE				RN	YC	CM							-	-	-			-	-	
564	2	11	11.01	11.01	CIVIL	Placas e adesivos				RN	YC	CM							-	-	-			-	-	
565	3	11	11.01	11.01.001	CIVIL	Adesivo branco laminação de jateado para provadores e divisórias de mesas - dimensões 15x15 cm, com fixação autoadesiva, incluso aplicação	unid			RN								-	-	-			-	-		
566	3	11	11.01	11.01.002	CIVIL	Demarcação da área de o para cadeirantes, dimensões 1,20 x 0,80 m com demarcação em Policarbonato texturizado, Esp. 0,25mm, Bayer Impressor por processo de Serigrafia ou termo transferência Dupla Face	m			RN				1,00				-	-	-			-	-		
567	3	11	11.01	11.01.003	CIVIL	Fita adesiva 3M amarela para indicação dos degraus 30x200mm, incluso aplicação	m			RN				13,60				-	-	-			-	-		
568	3	11	11.01	11.01.004	CIVIL	Placa de sinalização vertical, indicando estacionamento reservado para veículos autorizados - Dimensões 0,50x0,70m	unid			RN								-	-	-			-	-		
569	2	11	11.02	11.02	CIVIL	Pavimentação				RN	YC	CM							-	-	-			-	-	
570	3	11	11.02	11.02.001	CIVIL	Piso cimentado vassourado	m²			RN								-	-	-			-	-		
571	3	11	11.02	11.02.002	CIVIL	Piso em basalto levigado, assentado com argamassa pré-fabricada	m²			RN								-	-	-			-	-		
572	3	11	11.02	11.02.003	CIVIL	Piso em granito cinza corumbá flameado em faixas de 30cm para rampa	m²			RN								-	-	-			-	-		
573	3	11	11.02	11.02.004	CIVIL	Piso podotátil alerta direcional externo em ladrilho hidráulico, fixado com argamassa colante	m²			RN								-	-	-			-	-		
574	3	11	11.02	11.02.005	CIVIL	Piso podotátil alerta direcional em PVC, dimensões 250x250x3mm	m²			RN								-	-	-			-	-		
575	3	11	11.02	11.02.006	CIVIL	Piso podotátil alerta direcional com pinos revestidos em aço inox escovado	m²			RN				1,84				-	-	-			-	-		
576	3	11	11.02	11.02.007	CIVIL	Piso podotátil em placas de borracha antiderrapante	m²			RN				4,88				-	-	-			-	-		
577	2	11	11.03	11.03	CIVIL	Loucas e metais PNE				RN	YC	CM							-	-	-			-	-	
578	3	11	11.03	11.03.001	CIVIL	Assento para bacia sanitário PNE, cor branca - Deca AP.521	unid			RN								-	-	-			-	-		
579	3	11	11.03	11.03.002	CIVIL	Bacia sanitária de louça para sanitário PNE, cor branca - Deca linha Vogue Plus P51	unid			RN								-	-	-			-	-		
580	3	11	11.03	11.03.003	CIVIL	Lavatório de louça com coluna suspensa para PNE, cor branca - L51 + coluna CS.1V	unid			RN				1,00				-	-	-			-	-		
581	3	11	11.03	11.03.004	CIVIL	Torneira cromada de pressão com alavanca para PNE - Pressmatic Benefit Cód.: 00490706	unid			RN								-	-	-			-	-		
582	3	11	11.03	11.03.005	CIVIL	Barra de apoio cromada para PNE - 80cm	unid			RN	YC							-	-	-			-	-		
583	3	11	11.03	11.03.006	CIVIL	Barra de apoio cromada em aço inox para bacia sanitária	unid			RN								-	-	-			-	-		
584	3	11	11.03	11.03.007	CIVIL	Barra de apoio cromada em aço inox, para lavatório	unid			RN								-	-	-			-	-		
585	3	11	11.03	11.03.008	CIVIL	Cabide linha targa, deca - ref. 2060-C 40 CR	unid			RN								-	-	-			-	-		
586	3	11	11.03	11.03.009	CIVIL	Ducha higiênica, lorenzetti - Ref.1985 C61	unid			RN								-	-	-			-	-		
587	3	11	11.03	11.03.010	CIVIL	Válvula de descarga para PNE - Benefit 184906	unid			RN								-	-	-			-	-		
588	2	11	11.04	11.04	CIVIL	Complemetares				RN	YC	CM							-	-	-			-	-	
589	3	11	11.04	11.04.001	CIVIL	Alarme sonoro modelo AE05 ARCO - para sanitários masculino e feminino - contendo 2 sensores	m²			RN				1,00				-	-	-			-	-		
590	3	11	11.04	11.04.002	CIVIL	Bate pneu em tubo de ferro Ø3", altura total de 20cm	unid			RN								-	-	-			-	-		
591	3	11	11.04	11.04.003	CIVIL	Barra anti-pânico, incluso fixadores e instalação	unid			RN								-	-	-			-	-		
592	3	11	11.04	11.04.004	CIVIL	Capa para encosto das longarinas, com indicação para assento preferencial	unid			RN								-	-	-			-	-		
593	3	11	11.04	11.04.005	CIVIL	Corrimão em tubos metálicos de 38mm com pintura esmalte sintético, sobre tratamento anticorrosivo, incluso montante metálico chumbado na guia, anéis com textura contrastante instalados a 1,00m das extremidades e sinalização em braile - Incluso instalação	m			RN								-	-	-			-	-		
594	3	11	11.04	11.04.006	CIVIL	Espelho cristal com inclinação 10°, com base em MDF laminado para sanitários PNE	m²			RN								-	-	-			-	-		
595	3	11	11.04	11.04.007	CIVIL	Mola aérea Dorma	unid			RN				9,00				-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
596	3	11	11.04	11.04.008	CIVIL	Pintura demarcatória emborrachada, para vaga de deficiente físico - Dimensões vaga 3,70x5,50m, com aplicação de símbolo internacional de acesso para deficientes físicos (1,20x1,20)	unid			RN								-	-	-			-	-	
597	3	11	11.04	11.04.009	CIVIL	Porta objetos em madeira esp. 15cm revestido com laminado melaminico na cor cinza argila	unid			RN								-	-	-			-	-	
598	1	12	12.01	12	CIVIL	LIMPEZA E SERVIÇOS COMPLEMENTARES				RN	YC	CM						-	-	-			-	-	
599	2	12	12.01	12.01	CIVIL	Calafete e limpeza				RN	YC	CM						-	-	-			-	-	
600	3	12	12.01	12.01.001	CIVIL	Calafetagem de fissuras no substrato com mastique de poliuretano	m²			RN								-	-	-			-	-	
601	3	12	12.01	12.01.002	CIVIL	Limpeza final de obra	m²			RN								-	-	-			-	-	
602	3	12	12.01	12.01.003	CIVIL	Proteção do piso porcelanato após instalação	m²			RN								-	-	-			-	-	
603	2	12	12.02	12.02	CIVIL	Serviços complementares				RN	YC	CM						-	-	-			-	-	
604	3	12	12.02	12.02.001	CIVIL	Deslocamento e realocamento de mobiliário existente (em função da área construída)	m²			RN								-	-	-			-	-	
605	3	12	12.02	12.02.002	CIVIL	Transporte de cofres até a Tesouraria	unid			RN				3,00				-	-	-			-	-	
606	3	12	12.02	12.02.003	CIVIL	Apoio civil para instalação de equipamentos (elevadores, montacargas, plataformas e escadas rolantes)	unid			RN				3,00				-	-	-			-	-	
607	1	13	13.01	13	HIDRO	INSTALAÇÕES HIDROSSANITÁRIAS				RN	YC	CM						-	-	-			-	-	
608	2	13	13.01	13.01	HIDRO	Tubos, conexões e complementos de água fria				RN	YC	CM						-	-	-			-	-	
609	3	13	13.01	13.01.001	HIDRO	Tubo PVC rígido soldável para água fria 20mm - incluindo conexões e acessórios	m			RN	YC							-	-	-			-	-	
610	3	13	13.01	13.01.002	HIDRO	Tubo PVC rígido soldável para água fria 25mm - incluindo conexões e acessórios	m			RN		CM		82,28				-	-	-			-	-	
611	3	13	13.01	13.01.003	HIDRO	Tubo PVC rígido soldável para água fria 32mm - incluindo conexões e acessórios	m			RN		CM		57,22				-	-	-			-	-	
612	3	13	13.01	13.01.004	HIDRO	Tubo PVC rígido soldável para água fria 40mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
613	3	13	13.01	13.01.005	HIDRO	Tubo PVC rígido soldável para água fria 50mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
614	3	13	13.01	13.01.006	HIDRO	Tubo PVC rígido soldável para água fria 60mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
615	3	13	13.01	13.01.007	HIDRO	Tubo PVC rígido soldável para água fria 75mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
616	3	13	13.01	13.01.008	HIDRO	Tubo PVC rígido soldável para água fria 100mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
617	3	13	13.01	13.01.009	HIDRO	Hidrômetro 1"	unid			RN		CM		1,00				-	-	-			-	-	
618	3	13	13.01	13.01.010	HIDRO	Hidrômetro 2"	unid			RN	YC	CM						-	-	-			-	-	
619	3	13	13.01	13.01.011	HIDRO	Hidrômetro 1.1/4"	unid			RN								-	-	-			-	-	
620	3	13	13.01	13.01.012	HIDRO	Registro esfera, corpo em bronze 2.1/2"	unid			RN								-	-	-			-	-	
621	3	13	13.01	13.01.013	HIDRO	Registro esfera, corpo em bronze 2"	unid			RN								-	-	-			-	-	
622	3	13	13.01	13.01.014	HIDRO	Registro esfera, corpo em bronze 3/4"	unid			RN	YC	CM						-	-	-			-	-	
623	3	13	13.01	13.01.015	HIDRO	Registro esfera, corpo em bronze 1.1/4"	unid			RN				2,00				-	-	-			-	-	
624	3	13	13.01	13.01.016	HIDRO	Registro gaveta bruto 1"	unid			RN				2,00				-	-	-			-	-	
625	3	13	13.01	13.01.017	HIDRO	Registro gaveta com canopla cromada 2"	unid			RN								-	-	-			-	-	
626	3	13	13.01	13.01.018	HIDRO	Registro gaveta com canopla cromada 3/4"	unid			RN				7,00				-	-	-			-	-	
627	3	13	13.01	13.01.019	HIDRO	Registro esfera, 1"	unid					CM						-	-	-			-	-	
628	2	13	13.02	13.02	HIDRO	Tubos, conexões e acessórios de esgoto sanitário e pluvial				RN	YC	CM						-	-	-			-	-	
629	3	13	13.02	13.02.001	HIDRO	Tubo PVC esgoto Série R 40 mm - incluindo conexões e acessórios	m			RN		CM		8,63				-	-	-			-	-	
630	3	13	13.02	13.02.002	HIDRO	Tubo PVC esgoto Série R 50 mm - incluindo conexões e acessórios	m			RN	YC	CM		32,31				-	-	-			-	-	
631	3	13	13.02	13.02.003	HIDRO	Tubo PVC esgoto Série R 75 mm - incluindo conexões e acessórios	m			RN		CM		92,59				-	-	-			-	-	
632	3	13	13.02	13.02.004	HIDRO	Tubo PVC esgoto Série R 100 mm - incluindo conexões e acessórios	m			RN		CM		20,48				-	-	-			-	-	
633	3	13	13.02	13.02.005	HIDRO	Tubo PVC esgoto Série R 150 mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
634	3	13	13.02	13.02.006	HIDRO	Tubo PVC esgoto série normal 40 mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
635	3	13	13.02	13.02.007	HIDRO	Tubo PVC esgoto série normal 50 mm - incluindo conexões e acessórios	m			RN	YC	CM						-	-	-			-	-	
636	3	13	13.02	13.02.008	HIDRO	Tubo PVC esgoto série normal 75 mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
637	3	13	13.02	13.02.009	HIDRO	Tubo PVC esgoto série normal 100 mm - incluindo conexões e acessórios	m			RN								-	-	-			-	-	
638	3	13	13.02	13.02.010	HIDRO	Caixa de gordura com tampa de alumínio 250x172x50mm	unid			RN				1,00				-	-	-			-	-	
639	3	13	13.02	13.02.011	HIDRO	Caixa de gordura de aço inox 300x75mm	unid			RN	YC	CM						-	-	-			-	-	
640	3	13	13.02	13.02.012	HIDRO	Caixa sifonada PVC sem grelha 100x185x50mm	unid			RN								-	-	-			-	-	
641	3	13	13.02	13.02.013	HIDRO	Caixa sifonada PVC sem grelha 150x185x50mm	unid			RN	YC	CM						-	-	-			-	-	
642	3	13	13.02	13.02.014	HIDRO	Caixa sifonada PVC sem grelha 150x185x75mm	unid			RN				8,00				-	-	-			-	-	
643	3	13	13.02	13.02.015	HIDRO	Caixa sifonada PVC sem grelha 250x172x75mm	unid			RN								-	-	-			-	-	
644	3	13	13.02	13.02.016	HIDRO	Caixa sifonada PVC sem grelha 150x150x50mm	unid			RN		CM		5,00				-	-	-			-	-	
645	3	13	13.02	13.02.017	HIDRO	Caixa de inspeção cloacal com tampa de concreto	unid			RN								-	-	-			-	-	
646	3	13	13.02	13.02.018	HIDRO	Grelha redonada de latão cromado com aro 100mm	unid			RN	YC							-	-	-			-	-	
647	3	13	13.02	13.02.019	HIDRO	Grelha redonda de latão cromado com aro 150mm	unid			RN		CM		12,00				-	-	-			-	-	
648	3	13	13.02	13.02.020	HIDRO	Grelha redonda de latão cromado com aro 250mm	unid			RN								-	-	-			-	-	
649	3	13	13.02	13.02.021	HIDRO	Grelha e porta grelha quadrada de alumínio 150mm	unid			RN								-	-	-			-	-	
650	3	13	13.02	13.02.022	HIDRO	Ralo seco com saída articulada de 100x40mm	unid			RN								-	-	-			-	-	
651	3	13	13.02	13.02.023	HIDRO	Caixa de gordura com tampa de alumínio 250x250x75mm	unid					CM						-	-	-			-	-	
652	3	13	13.02	13.02.024	HIDRO	Caixa sifonada PVC sem grelha 150x150x75mm	unid					CM						-	-	-			-	-	
653	3	13	13.02	13.02.025	HIDRO	Caixa sifonada PVC sem grelha 100x100x50mm	unid				YC							-	-	-			-	-	
654	2	13	13.03	13.03	HIDRO	Diversos				RN		CM						-	-	-			-	-	
655	3	13	13.03	13.03.001	HIDRO	Treinamento operacional para redes hidráulicas	conj			RN		CM		1,00				-	-	-			-	-	
656	3	13	13.03	13.03.002	HIDRO	Teste das redes hidráulicas	unid			RN	YC	CM		1,00				-	-	-			-	-	
657	3	13	13.03	13.03.003	HIDRO	Teste de estanqueidade	unid			RN	YC	CM		1,00				-	-	-			-	-	
658	1	14	14.01	14	ELÉTRICA / SOM / SEGURANÇA	INSTALAÇÕES ELÉTRICAS, SONORIZAÇÃO, SEGURANÇA e AUTOMAÇÃO				RN	YC	CM						-	-	-			-	-	
659	2	14	14.01	14.01	ELÉTRICA / SOM / SEGURANÇA	Eletrodutos e Conexões				RN	YC	CM						-	-	-			-	-	
660	3	14	14.01	14.01.001	ELÉTRICA / SOM / SEGURANÇA	Barra redonda de aço, Ø10mm (80mm²), Re-bar, em barras de 3m	unid			RN	YC	CM						-	-	-			-	-	
661	3	14	14.01	14.01.002	ELÉTRICA / SOM / SEGURANÇA	Barra redonda de aço, Ø8mm (50mm²), Re-bar, em barras de 4m	unid			RN	YC	CM						-	-	-			-	-	
662	3	14	14.01	14.01.003	ELÉTRICA / SOM / SEGURANÇA	Braçadeira D para eletroduto	unid			RN	YC	CM						-	-	-			-	-	
663	3	14	14.01	14.01.004	ELÉTRICA / SOM / SEGURANÇA	Canaleta de alumínio 73X25mm com tampa e septo divisor deslocado (1/3)	m			RN	YC	CM						-	-	-			-	-	
664	3	14	14.01	14.01.005	ELÉTRICA / SOM / SEGURANÇA	Canaleta de alumínio 73X25mm com tampa e septo divisor deslocado (2/3)	m			RN	YC	CM						-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
665	3	14	14.01	14.01.006	ELÉTRICA / SOM / SEGURANÇA	Canaleta metálica simples duto, tipo "D", pintada, 73x25x3000mm	unid			RN	YC	CM						-	-	-			-	-	
666	3	14	14.01	14.01.007	ELÉTRICA / SOM / SEGURANÇA	Canaleta metálica triplo duto, tipo "D", pintada, 73x25x3000mm	unid			RN	YC	CM						-	-	-			-	-	
667	3	14	14.01	14.01.008	ELÉTRICA / SOM / SEGURANÇA	Condulute Alumínio Com Rosca E Tampa 1" (Condulute Múltiplo Com Rosca E Tampa Bitola 1")	unid			RN	YC	CM		310,00				-	-	-			-	-	
668	3	14	14.01	14.01.009	ELÉTRICA / SOM / SEGURANÇA	Condulute alumínio com rosca e tampa 1. 1/2"	unid			RN	YC	CM		11,00				-	-	-			-	-	
669	3	14	14.01	14.01.010	ELÉTRICA / SOM / SEGURANÇA	Condulute alumínio com rosca e tampa 1.1/2"	unid			RN	YC	CM						-	-	-			-	-	
670	3	14	14.01	14.01.011	ELÉTRICA / SOM / SEGURANÇA	Condulute alumínio com rosca e tampa 1.1/4"	unid			RN	YC	CM		10,00				-	-	-			-	-	
671	3	14	14.01	14.01.012	ELÉTRICA / SOM / SEGURANÇA	Condulute alumínio com rosca e tampa 2"	unid			RN	YC	CM		2,00				-	-	-			-	-	
672	3	14	14.01	14.01.013	ELÉTRICA / SOM / SEGURANÇA	Condulute alumínio com rosca e tampa 2.1/2"	unid			RN	YC	CM						-	-	-			-	-	
673	3	14	14.01	14.01.014	ELÉTRICA / SOM / SEGURANÇA	Condulute alumínio com rosca e tampa 3"	unid			RN	YC	CM		1,00				-	-	-			-	-	
674	3	14	14.01	14.01.015	ELÉTRICA / SOM / SEGURANÇA	Condulute alumínio com rosca e tampa 3/4"	unid			RN	YC	CM		226,00				-	-	-			-	-	
675	3	14	14.01	14.01.016	ELÉTRICA / SOM / SEGURANÇA	Condulute alumínio com rosca e tampa 4"	unid			RN	YC	CM		2,00				-	-	-			-	-	
676	3	14	14.01	14.01.017	ELÉTRICA / SOM / SEGURANÇA	Conector ATERINSERT com disco em latão e rosca fêmea M12 . Distância entre Re-bar e face da fôrma regulável entre 25 e 40 mm	unid			RN	YC	CM						-	-	-			-	-	
677	3	14	14.01	14.01.018	ELÉTRICA / SOM / SEGURANÇA	Conector fêmea RJ 45	unid			RN	YC	CM						-	-	-			-	-	
678	3	14	14.01	14.01.019	ELÉTRICA / SOM / SEGURANÇA	Conector M12 para conector ATERINSERT	unid			RN	YC	CM						-	-	-			-	-	
679	3	14	14.01	14.01.020	ELÉTRICA / SOM / SEGURANÇA	Conector para Sealtubo, tipo CMZ 3/4" (macho fixo)	unid			RN	YC	CM						-	-	-			-	-	
680	3	14	14.01	14.01.021	ELÉTRICA / SOM / SEGURANÇA	Conector Split Bolt para Minicaptores para cabos de 35a 70mm²	unid			RN	YC	CM						-	-	-			-	-	
681	3	14	14.01	14.01.022	ELÉTRICA / SOM / SEGURANÇA	Curva 90° de Barra Chata em Alumínio, 7/8" x 1/8" x 300 mm (70mm²)	unid			RN	YC	CM						-	-	-			-	-	
682	3	14	14.01	14.01.023	ELÉTRICA / SOM / SEGURANÇA	Curva horizontal 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 100 x 100 mm	unid			RN	YC	CM						-	-	-			-	-	
683	3	14	14.01	14.01.024	ELÉTRICA / SOM / SEGURANÇA	Curva horizontal 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 100 x 50 mm	unid			RN	YC	CM						-	-	-			-	-	
684	3	14	14.01	14.01.025	ELÉTRICA / SOM / SEGURANÇA	Curva horizontal 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 200 x 100 mm	unid			RN	YC	CM						-	-	-			-	-	
685	3	14	14.01	14.01.026	ELÉTRICA / SOM / SEGURANÇA	Curva horizontal 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 300 x 100 mm	unid			RN	YC	CM						-	-	-			-	-	
686	3	14	14.01	14.01.027	ELÉTRICA / SOM / SEGURANÇA	Curva horizontal 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 50 x 50 mm	unid			RN	YC	CM						-	-	-			-	-	
687	3	14	14.01	14.01.028	ELÉTRICA / SOM / SEGURANÇA	Curva para eletroduto de 1" galvanizado	unid			RN	YC	CM						-	-	-			-	-	
688	3	14	14.01	14.01.029	ELÉTRICA / SOM / SEGURANÇA	Curva para eletroduto de 3/4" galvanizado	unid			RN	YC	CM						-	-	-			-	-	
689	3	14	14.01	14.01.030	ELÉTRICA / SOM / SEGURANÇA	Curva vertical externa 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 100 x 50 mm	unid			RN	YC	CM						-	-	-			-	-	
690	3	14	14.01	14.01.031	ELÉTRICA / SOM / SEGURANÇA	Curva vertical interna 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 100 x 50 mm	unid			RN	YC	CM						-	-	-			-	-	
691	3	14	14.01	14.01.032	ELÉTRICA / SOM / SEGURANÇA	Curva vertical inversão 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 200 x 100 mm	unid			RN	YC	CM						-	-	-			-	-	
692	3	14	14.01	14.01.033	ELÉTRICA / SOM / SEGURANÇA	Curva vertical inversão 90° p/ eletrocalha em aço galvanizado - lisa - com tampa - #16 - 300 x 100 mm	unid			RN	YC	CM						-	-	-			-	-	
693	3	14	14.01	14.01.034	ELÉTRICA / SOM / SEGURANÇA	Eletrocalha em aço galvanizado - lisa - com tampa sob pressão - #16 - 100 x 100 mm - 3000mm comprimento (COM ACESSÓRIOS DE CONEXÃO)	unid			RN	YC	CM						-	-	-			-	-	
694	3	14	14.01	14.01.035	ELÉTRICA / SOM / SEGURANÇA	Eletrocalha em aço galvanizado - lisa - com tampa sob pressão - #16 - 200 x 100 mm - 3000mm comprimento	unid			RN	YC	CM		2,00				-	-	-			-	-	
695	3	14	14.01	14.01.036	ELÉTRICA / SOM / SEGURANÇA	Eletrocalha em aço galvanizado - lisa - com tampa sob pressão - #16 - 75 x 75 mm - 3000mm comprimento	unid			RN	YC	CM						-	-	-			-	-	
696	3	14	14.01	14.01.037	ELÉTRICA / SOM / SEGURANÇA	Eletrocalha em ferro galvanizado - lisa - com tampa sob pressão - #16 - 100 x 50 mm - 3000mm comprimento	unid			RN	YC	CM		120,00				-	-	-			-	-	
697	3	14	14.01	14.01.038	ELÉTRICA / SOM / SEGURANÇA	Eletrocalha em ferro galvanizado - lisa - com tampa sob pressão - #16 - 300 x 100 mm - 3000mm comprimento	unid			RN	YC	CM						-	-	-			-	-	
698	3	14	14.01	14.01.039	ELÉTRICA / SOM / SEGURANÇA	Eletrocalha metálica galvanizada à fogo do tipo pesada 100X50mm lisa com tampa aparafusada e com septo divisor deslocado (75mm elétricaELÉTRICA x 25mm som)	m			RN	YC	CM						-	-	-			-	-	
699	3	14	14.01	14.01.040	ELÉTRICA / SOM / SEGURANÇA	Eletroduto aço galvanizado eletrolítico Ø1 1/2" - incluindo acessórios e conexões	m			RN	YC	CM		51,00				-	-	-			-	-	
700	3	14	14.01	14.01.041	ELÉTRICA / SOM / SEGURANÇA	Eletroduto aço galvanizado eletrolítico Ø2 1/2" - incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-	
701	3	14	14.01	14.01.042	ELÉTRICA / SOM / SEGURANÇA	Eletroduto aço galvanizado eletrolítico Ø2" - incluindo acessórios e conexões	m			RN	YC	CM		6,00				-	-	-			-	-	
702	3	14	14.01	14.01.043	ELÉTRICA / SOM / SEGURANÇA	Eletroduto aço galvanizado eletrolítico Ø20mm - 3/4" - incluindo acessórios e conexões	m			RN	YC	CM		1.233,00				-	-	-			-	-	
703	3	14	14.01	14.01.044	ELÉTRICA / SOM / SEGURANÇA	Eletroduto aço galvanizado eletrolítico Ø25mm - 1" - incluindo acessórios e conexões	m			RN	YC	CM		966,00				-	-	-			-	-	
704	3	14	14.01	14.01.045	ELÉTRICA / SOM / SEGURANÇA	Eletroduto de PVC Ø20mm - 1/2" - incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-	
705	3	14	14.01	14.01.046	ELÉTRICA / SOM / SEGURANÇA	Eletroduto de PVC Ø25mm - 3/4" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
706	3	14	14.01	14.01.047	ELÉTRICA / SOM / SEGURANÇA	Eletroduto de PVC Ø32mm - 1" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
707	3	14	14.01	14.01.048	ELÉTRICA / SOM / SEGURANÇA	Eletroduto de PVC Ø40mm - 1 1/4" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
708	3	14	14.01	14.01.049	ELÉTRICA / SOM / SEGURANÇA	Eletroduto de PVC Ø50mm - 1 1/2" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
709	3	14	14.01	14.01.050	ELÉTRICA / SOM / SEGURANÇA	Eletroduto de PVC Ø60mm - 2" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
710	3	14	14.01	14.01.051	ELÉTRICA / SOM / SEGURANÇA	Eletroduto de PVC Ø75mm - 2 1/2" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
711	3	14	14.01	14.01.052	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø100mm - 4" - incluindo acessórios e conexões	m				YC	CM		21,00				-	-	-			-	-	
712	3	14	14.01	14.01.053	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø20mm - 3/4" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
713	3	14	14.01	14.01.054	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø25mm - 1" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
714	3	14	14.01	14.01.055	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø32mm - 1. 1/4" - incluindo acessórios e conexões	m			RN	YC	CM		39,00				-	-	-			-	-	
715	3	14	14.01	14.01.056	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø40mm - 1. 1/2" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
716	3	14	14.01	14.01.057	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø40mm - 1. 1/2" - incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-	
717	3	14	14.01	14.01.058	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø50mm - 2" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
718	3	14	14.01	14.01.059	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø65mm - 2. 1/2" - incluindo acessórios e conexões	m				YC	CM						-	-	-			-	-	
719	3	14	14.01	14.01.060	ELÉTRICA / SOM / SEGURANÇA	Eletroduto F.G. médio Ø80mm - 3" - incluindo acessórios e conexões	m				YC	CM		9,00				-	-	-			-	-	
720	3	14	14.01	14.01.061	ELÉTRICA / SOM / SEGURANÇA	Gancho Tipo B Para Eletrocalha	unid				YC	CM						-	-	-			-	-	
721	3	14	14.01	14.01.062	ELÉTRICA / SOM / SEGURANÇA	Gancho Tipo Para Perfilado	unid				YC	CM						-	-	-			-	-	
722	3	14	14.01	14.01.063	ELÉTRICA / SOM / SEGURANÇA	Leito Com Largura 200mm Longarinas 100X19X3000mm	unid				YC	CM						-	-	-			-	-	
723	3	14	14.01	14.01.064	ELÉTRICA / SOM / SEGURANÇA	Leito Com Largura 300mm Longarinas 100X19X3000mm	unid			RN	YC	CM						-	-	-			-	-	
724	3	14	14.01	14.01.065	ELÉTRICA / SOM / SEGURANÇA	Leito Com Largura 400mm Longarinas 100X19X3000mm	unid			RN	YC	CM						-	-	-			-	-	
725	3	14	14.01	14.01.066	ELÉTRICA / SOM / SEGURANÇA	Leito Com Largura 500mm Longarinas 100X19X3000mm	unid				YC	CM						-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
726	3	14	14.01	14.01.067	ELÉTRICA / SOM / SEGURANÇA / AU	Luva para eletroduto de 1" galvanizada, de aparafusar	unid				YC	CM						-	-	-			-	-	
727	2	14	14.02	14.02	ELÉTRICA / SOM / SEGURANÇA / AU	Fios e cabos para instalações de energia, iluminação, telefonia e lógica				RN	YC	CM						-	-	-			-	-	
728	3	14	14.02	14.02.001	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo 2x#1,0mm² - 450/750V ou 0,6/1kV - AFUMEX - Fab.: PRYSMIAN, KMP, CORDEIRO ou FICAP	m			RN	YC	CM						-	-	-			-	-	
729	3	14	14.02	14.02.002	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo 3x#1,5mm² - 450/750V - AFUMEX - Fab.: PRYSMIAN, KMP, CORDEIRO ou FICAP	m			RN	YC	CM						-	-	-			-	-	
730	3	14	14.02	14.02.003	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo 3x#2,5mm² - 450/750V ou 0,6/1kV - AFUMEX - Fab.: PRYSMIAN, KMP, CORDEIRO ou FICAP	m			RN	YC	CM		900,00				-	-	-			-	-	
731	3	14	14.02	14.02.004	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #10mm²	m			RN	YC	CM						-	-	-			-	-	
732	3	14	14.02	14.02.005	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #120mm²	m			RN	YC	CM						-	-	-			-	-	
733	3	14	14.02	14.02.006	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #2,5mm²	m			RN	YC	CM		24.200,00				-	-	-			-	-	
734	3	14	14.02	14.02.007	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #240mm²	m			RN	YC	CM						-	-	-			-	-	
735	3	14	14.02	14.02.008	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #25mm²	m			RN	YC	CM						-	-	-			-	-	
736	3	14	14.02	14.02.009	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #35mm²	m			RN	YC	CM						-	-	-			-	-	
737	3	14	14.02	14.02.010	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #4mm²	m			RN	YC	CM		2.900,00				-	-	-			-	-	
738	3	14	14.02	14.02.011	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #50mm²	m			RN	YC	CM						-	-	-			-	-	
739	3	14	14.02	14.02.012	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #6mm²	m			RN	YC	CM		90,00				-	-	-			-	-	
740	3	14	14.02	14.02.013	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #70mm²	m			RN	YC	CM						-	-	-			-	-	
741	3	14	14.02	14.02.014	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de cobre flexível, livre de halogênios e com baixa emissão de fumaça e gases tóxicos, encordoamento classe 5, isolamento 70°C/ 750V, #95mm²	m			RN	YC	CM						-	-	-			-	-	
742	3	14	14.02	14.02.015	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de Cobre nú #25mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
743	3	14	14.02	14.02.016	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de Cobre nú #50mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
744	3	14	14.02	14.02.017	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de Cobre nú #70mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
745	3	14	14.02	14.02.018	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de Cobre nú #95mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
746	3	14	14.02	14.02.019	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de média tensão 25mm² 15/20kV - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
747	3	14	14.02	14.02.020	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de média tensão 35mm² 15/20kV - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
748	3	14	14.02	14.02.021	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo de média tensão 50mm² 15/20kV - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
749	3	14	14.02	14.02.022	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 10mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
750	3	14	14.02	14.02.023	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 120mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
751	3	14	14.02	14.02.024	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 150mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
752	3	14	14.02	14.02.025	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 16mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		390,00				-	-	-			-	-	
753	3	14	14.02	14.02.026	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 2,5mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		290,00				-	-	-			-	-	
754	3	14	14.02	14.02.027	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 25mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		60,00				-	-	-			-	-	
755	3	14	14.02	14.02.028	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 35mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
756	3	14	14.02	14.02.029	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 4,0mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		310,00				-	-	-			-	-	
757	3	14	14.02	14.02.030	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 50mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		10,00				-	-	-			-	-	
758	3	14	14.02	14.02.031	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 6mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		10,00				-	-	-			-	-	
759	3	14	14.02	14.02.032	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0 kV 70mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
760	3	14	14.02	14.02.033	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0kV 185mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		30,00				-	-	-			-	-	
761	3	14	14.02	14.02.034	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0kV 240mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
762	3	14	14.02	14.02.035	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo EPR 0,6/1,0kV 95mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		30,00				-	-	-			-	-	
763	3	14	14.02	14.02.036	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo HDMI	m			RN	YC	CM						-	-	-			-	-	
764	3	14	14.02	14.02.037	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 10mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
765	3	14	14.02	14.02.038	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 120mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
766	3	14	14.02	14.02.039	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 150mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
767	3	14	14.02	14.02.040	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 16,0mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
768	3	14	14.02	14.02.041	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 185mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
769	3	14	14.02	14.02.042	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 2,5mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
770	3	14	14.02	14.02.043	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 240mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
771	3	14	14.02	14.02.044	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 25mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
772	3	14	14.02	14.02.045	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 35mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
773	3	14	14.02	14.02.046	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 4,0mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
774	3	14	14.02	14.02.047	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 50mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
775	3	14	14.02	14.02.048	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 6,0mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
776	3	14	14.02	14.02.049	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 70mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
777	3	14	14.02	14.02.050	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo PVC 450/750V 95mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
778	3	14	14.02	14.02.051	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo telefone interno CI 50-10 - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
779	3	14	14.02	14.02.052	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo UTP GIGALAN MAX GREEN U/UTP 23AWGX4P CAT. 6 LSZH VD RIB antichamas marca FURUKAWA	m			RN	YC	CM		11.200,00				-	-	-			-	-	
780	3	14	14.02	14.02.053	ELÉTRICA / SOM / SEGURANÇA / AU	Cordoalha de cobre nú #25mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
781	3	14	14.02	14.02.054	ELÉTRICA / SOM / SEGURANÇA / AU	Cordoalha de cobre nú #50mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
782	3	14	14.02	14.02.055	ELÉTRICA / SOM / SEGURANÇA / AU	Fita Cor Branca	m			RN	YC	CM						-	-	-			-	-	
783	3	14	14.02	14.02.056	ELÉTRICA / SOM / SEGURANÇA / AU	Fita De Auto Fusão	unid			RN	YC	CM						-	-	-			-	-	
784	3	14	14.02	14.02.057	ELÉTRICA / SOM / SEGURANÇA / AU	Identificação de cabo UTP	m			RN	YC	CM		11.200,00				-	-	-			-	-	
785	3	14	14.02	14.02.057	ELÉTRICA / SOM / SEGURANÇA / AU	Par de Fibra óptica multimodo LS	m			RN	YC	CM		230,00				-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
786	3	14	14.02	14.02.057	ELÉTRICA / SOM / SEGURANÇA / AU	Prensa Cabo 1/2"	unid			RN	YC	CM						-	-	-			-	-	
787	2	14	14.03	14.03	ELÉTRICA / SOM / SEGURANÇA / AL	Fios e cabos para instalações de sonorização				RN	YC	CM						-	-	-			-	-	
788	3	14	14.03	14.03.001	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo polarizado 300V, tipo Plastiflex, 2x1,5mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		1.200,00				-	-	-			-	-	
789	3	14	14.03	14.03.002	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo polarizado 300V, tipo Plastiflex, 2x2,5mm² - não propagador de chamas e gases tóxicos	m			RN	YC	CM		450,00				-	-	-			-	-	
790	2	14	14.04	14.04	ELÉTRICA / SOM / SEGURANÇA / AL	Fios e cabos para instalações de segurança				RN	YC	CM						-	-	-			-	-	
791	3	14	14.04	14.04.001	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo coaxial RG59 - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
792	3	14	14.04	14.04.002	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo DNI - 4X22BR FS401 2 Pares 0,30mm² FLEX BCO	m			RN	YC	CM						-	-	-			-	-	
793	3	14	14.04	14.04.003	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo IFE/SPAR 4x22 AWG - não propagador de chamas e gases tóxicos	m			RN	YC	CM		2.100,00				-	-	-			-	-	
794	3	14	14.04	14.04.004	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo KMP AF 2x18AWG - não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-	
795	2	14	14.05	14.05	ELÉTRICA / SOM / SEGURANÇA / AL	Caixas e Quadros de Comando para instalações elétricas de energia, iluminação, telefonia e lógica				RN	YC	CM						-	-	-			-	-	
796	3	14	14.05	14.05.001	ELÉTRICA / SOM / SEGURANÇA / AU	Bloco de ligação BLI-10	unid			RN	YC	CM						-	-	-			-	-	
797	3	14	14.05	14.05.002	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de Equipotencialização com 9 Terminais para uso Interno 210 x 210 x 90mm – Em aço	unid			RN	YC	CM						-	-	-			-	-	
798	3	14	14.05	14.05.003	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de inspeção em concreto Ø300x600mm c/ tampa de ferro fundido	unid			RN	YC	CM						-	-	-			-	-	
799	3	14	14.05	14.05.004	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de passagem de embutir CH#18 200x200x100mm	unid			RN	YC	CM						-	-	-			-	-	
800	3	14	14.05	14.05.005	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de passagem de embutir CH#18 400x300x200mm	unid			RN	YC	CM						-	-	-			-	-	
801	3	14	14.05	14.05.006	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de passagem em ferro galvanizado 100x100mm	unid			RN	YC	CM		30,00				-	-	-			-	-	
802	3	14	14.05	14.05.007	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de passagem em ferro galvanizado 50x100mm	unid			RN	YC	CM		204,00				-	-	-			-	-	
803	3	14	14.05	14.05.008	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de passagem embutida no piso com tampa antiderrapante. DIM. 100X100mm	unid			RN	YC	CM						-	-	-			-	-	
804	3	14	14.05	14.05.009	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa em alumínio fundido 100x100x45mm - embutida no piso	unid			RN	YC	CM						-	-	-			-	-	
805	3	14	14.05	14.05.010	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa esmaltada estampada 2"x4"	unid			RN	YC	CM						-	-	-			-	-	
806	3	14	14.05	14.05.011	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa esmaltada estampada 4"x4"	unid			RN	YC	CM						-	-	-			-	-	
807	3	14	14.05	14.05.012	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa sobrepor 400x400x120mm	unid			RN	YC	CM						-	-	-			-	-	
808	3	14	14.05	14.05.013	ELÉTRICA / SOM / SEGURANÇA / AU	Desembarque, transporte horizontal e vertical dos quadros elétricos	unid			RN	YC	CM		10,00				-	-	-			-	-	
809	3	14	14.05	14.05.014	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação DG - Quadro de Telefonia - completo- APRESENTAR CUSTOS	unid			RN	YC	CM		1,00				-	-	-			-	-	
810	3	14	14.05	14.05.015	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QCFP - Quadro de Correção do Fator de Potência - incluindo barramento e disjuntores	unid			RN	YC	CM		1,00				-	-	-			-	-	
811	3	14	14.05	14.05.016	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QDE-SS - Quadro de Distribuição de Segurança - incluindo barramento e disjuntores	unid			RN	YC	CM		1,00				-	-	-			-	-	
812	3	14	14.05	14.05.017	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QDG - Quadro de Distribuição Geral - incluindo barramento e disjuntores	unid			RN	YC	CM						-	-	-			-	-	
813	3	14	14.05	14.05.018	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QFAC - Quadro de Força Ar Condicionado - incluindo barramento e disjuntores	unid			RN	YC	CM						-	-	-			-	-	
814	3	14	14.05	14.05.019	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QF-HID - incluindo barramento e disjuntores	unid			RN	YC	CM						-	-	-			-	-	
815	3	14	14.05	14.05.020	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QF-INC - Quadro de força de incêndio - incluindo barramento e disjuntores	unid			RN	YC	CM						-	-	-			-	-	
816	3	14	14.05	14.05.021	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QGBT-N - Quadro Geral de Baixa Tensão - normal - incluindo barramento e disjuntores	unid			RN	YC	CM		1,00				-	-	-			-	-	
817	3	14	14.05	14.05.022	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QGBT-E - Quadro Geral de Baixa Tensão - emergência - incluindo barramento e disjuntores	unid			RN	YC	CM		1,00				-	-	-			-	-	
818	3	14	14.05	14.05.023	ELÉTRICA / SOM / SEGURANÇA / AU	Instalação QDE-NB - Quadro de Distribuição de Energia Estabilizada Nobreak	unid			RN	YC	CM		1,00				-	-	-			-	-	
819	3	14	14.05	14.05.024	ELÉTRICA / SOM / SEGURANÇA / AU	Instalação QDL - Quadro de distribuição de iluminação	unid			RN	YC	CM		2,00				-	-	-			-	-	
820	3	14	14.05	14.05.025	ELÉTRICA / SOM / SEGURANÇA / AU	Instalação QDT - Quadro de Distribuição de tomadas	unid			RN	YC	CM		2,00				-	-	-			-	-	
821	2	14	14.06	14.06	ELÉTRICA / SOM / SEGURANÇA / AL	Tomadas, disjuntores e interruptores				RN	YC	CM						-	-	-			-	-	
822	3	14	14.06	14.06.001	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa com 12 tomadas de energia normal, para carregadores de bateria	unid			RN	YC	CM						-	-	-			-	-	
823	3	14	14.06	14.06.002	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de tomadas múltiplas dos PDV'S, com 01 ponto de lógica, 03 pontos de energia normal e 06 pontos de energia estabilizada	unid			RN	YC	CM		9,00				-	-	-			-	-	
824	3	14	14.06	14.06.003	ELÉTRICA / SOM / SEGURANÇA / AU	Cigarra instalado em condutele de 3/4"	unid			RN	YC	CM						-	-	-			-	-	
825	3	14	14.06	14.06.004	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor bipolar 10A - 30A	unid			RN	YC	CM						-	-	-			-	-	
826	3	14	14.06	14.06.005	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor bipolar 35A - 50A	unid			RN	YC	CM						-	-	-			-	-	
827	3	14	14.06	14.06.006	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor bipolar 60A - 100A	unid			RN	YC	CM						-	-	-			-	-	
828	3	14	14.06	14.06.007	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor DR 25A-30mA	unid			RN	YC	CM						-	-	-			-	-	
829	3	14	14.06	14.06.008	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor monopolar 10A - 30A	unid			RN	YC	CM						-	-	-			-	-	
830	3	14	14.06	14.06.009	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor monopolar 32A	unid			RN	YC	CM						-	-	-			-	-	
831	3	14	14.06	14.06.010	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor monopolar 35A - 50A	unid			RN	YC	CM						-	-	-			-	-	
832	3	14	14.06	14.06.011	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor monopolar 60A - 100A	unid			RN	YC	CM						-	-	-			-	-	
833	3	14	14.06	14.06.012	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor tripolar 10A - 30A	unid			RN	YC	CM						-	-	-			-	-	
834	3	14	14.06	14.06.013	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor tripolar 125A - 225A	unid			RN	YC	CM						-	-	-			-	-	
835	3	14	14.06	14.06.014	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor tripolar 250A	unid			RN	YC	CM						-	-	-			-	-	
836	3	14	14.06	14.06.015	ELÉTRICA / SOM / SEGURANÇA / AU	Disjuntor tripolar 32A	unid			RN	YC	CM						-	-	-			-	-	
837	3	14	14.06	14.06.016	ELÉTRICA / SOM / SEGURANÇA / AU	Interruptor hotel - inclusive placa	unid			RN	YC	CM		4,00				-	-	-			-	-	
838	3	14	14.06	14.06.017	ELÉTRICA / SOM / SEGURANÇA / AU	Interruptor simples - 1 tecla - inclusive placa	unid			RN	YC	CM		28,00				-	-	-			-	-	
839	3	14	14.06	14.06.018	ELÉTRICA / SOM / SEGURANÇA / AU	Interruptor simples - 2 teclas - inclusive placa (DUPLO)	unid			RN	YC	CM						-	-	-			-	-	
840	3	14	14.06	14.06.019	ELÉTRICA / SOM / SEGURANÇA / AU	Interruptor simples - 3 teclas - inclusive placa (TRIPLO)	unid			RN	YC	CM		1,00				-	-	-			-	-	
841	3	14	14.06	14.06.020	ELÉTRICA / SOM / SEGURANÇA / AU	Prolongador 2P+T 10A	unid			RN	YC	CM		1.500,00				-	-	-			-	-	
842	3	14	14.06	14.06.021	ELÉTRICA / SOM / SEGURANÇA / AU	Prolongador 2P+T 20A	unid			RN	YC	CM						-	-	-			-	-	
843	3	14	14.06	14.06.022	ELÉTRICA / SOM / SEGURANÇA / AU	Tomada 2P+T 10A - inclusive placa	unid			RN	YC	CM		267,00				-	-	-			-	-	
844	3	14	14.06	14.06.023	ELÉTRICA / SOM / SEGURANÇA / AU	Tomada 2P+T 20A - inclusive placa	unid			RN	YC	CM		9,00				-	-	-			-	-	
845	3	14	14.06	14.06.024	ELÉTRICA / SOM / SEGURANÇA / AU	Tomada 2P+T 20A para condutele - inclusive placa	unid			RN	YC	CM		5,00				-	-	-			-	-	
846	3	14	14.06	14.06.025	ELÉTRICA / SOM / SEGURANÇA / AU	Tomada para telefone 4P	unid			RN	YC	CM						-	-	-			-	-	
847	3	14	14.06	14.06.026	ELÉTRICA / SOM / SEGURANÇA / AU	Tomada RJ45 - inclusive placa	unid			RN	YC	CM		36,00				-	-	-			-	-	
848	3	14	14.06	14.06.027	ELÉTRICA / SOM / SEGURANÇA / AU	Tomada RJ45 para condutele - inclusive placa	unid			RN	YC	CM		85,00				-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
849	2	14	14.07	14.07	ELÉTRICA / SOM / SEGURANÇA / AU	Kits de Iluminação				RN	YC	CM							-	-	-	-	-	-	
850	3	14	14.07	14.07.001	ELÉTRICA / SOM / SEGURANÇA / AU	Trilho alta - módulo 1m - ref. Tra 00001 preto fosco	unid			RN	YC	CM						-	-	-	-	-	-	-	
851	3	14	14.07	14.07.002	ELÉTRICA / SOM / SEGURANÇA / AU	Trilho alta - módulo 1m - ref. Tra 00001 preto fosco	unid			RN	YC	CM						-	-	-	-	-	-	-	
852	3	14	14.07	14.07.003	ELÉTRICA / SOM / SEGURANÇA / AU	Trilho alta - módulo 1m - ref. Tra 00001 preto fosco 18W/m	unid			RN	YC	CM						-	-	-	-	-	-	-	
853	3	14	14.07	14.07.004	ELÉTRICA / SOM / SEGURANÇA / AU	Trilho alta - módulo 1m - ref. tra00001 preto fosco	unid			RN	YC	CM						-	-	-	-	-	-	-	
854	3	14	14.07	14.07.005	ELÉTRICA / SOM / SEGURANÇA / AU	Trilho ref. tra00001 12v preto fosco - módulo 1,00m	unid			RN	YC	CM						-	-	-	-	-	-	-	
855	3	14	14.07	14.07.006	ELÉTRICA / SOM / SEGURANÇA / AUTOMAÇÃO					RN	YC	CM						-	-	-	-	-	-	-	
856	3	14	14.07	14.07.007	ELÉTRICA / SOM / SEGURANÇA / AUTOMAÇÃO					RN	YC	CM						-	-	-	-	-	-	-	
857	3	14	14.07	14.07.008	ELÉTRICA / SOM / SEGURANÇA / AUTOMAÇÃO					RN	YC	CM						-	-	-	-	-	-	-	
858	3	14	14.07	14.07.009	ELÉTRICA / SOM / SEGURANÇA / AUTOMAÇÃO					RN	YC	CM						-	-	-	-	-	-	-	
859	3	14	14.07	14.07.010	ELÉTRICA / SOM / SEGURANÇA / AUTOMAÇÃO					RN	YC	CM						-	-	-	-	-	-	-	
860	2	14	14.08	14.08	ELÉTRICA / SOM / SEGURANÇA / AU	Subestação				RN	YC	CM						-	-	-	-	-	-	-	
861	3	14	14.08	14.08.001	ELÉTRICA / SOM / SEGURANÇA / AU	Apoio Dos Para-Raios Em Ferro Cantoneira 50X50X5Mm	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
862	3	14	14.08	14.08.002	ELÉTRICA / SOM / SEGURANÇA / AU	Armação De Ferro Cantoneira 1" X 1" X 1/4"(25X25X6Mm) Para Fixação De Cabos	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
863	3	14	14.08	14.08.003	ELÉTRICA / SOM / SEGURANÇA / AU	Balancim Para Fixador Grande	unid			RN	YC	CM						-	-	-	-	-	-	-	
864	3	14	14.08	14.08.004	ELÉTRICA / SOM / SEGURANÇA / AU	Base Tripolar Para Fusível HH 400A-15Kv, Com Fusível Hh63A	unid			RN	YC	CM						-	-	-	-	-	-	-	
865	3	14	14.08	14.08.005	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa Para Medição Indireta Em B.T. (Horosazonal) - 1220 X 915 X 275 Mm - Padrão Concessionária	unid			RN	YC	CM						-	-	-	-	-	-	-	
866	3	14	14.08	14.08.006	ELÉTRICA / SOM / SEGURANÇA / AU	Chave Fusível 300A Base "C"-15Kv - Elos Fusível-15Kv	unid			RN	YC	CM						-	-	-	-	-	-	-	
867	3	14	14.08	14.08.007	ELÉTRICA / SOM / SEGURANÇA / AU	Chave seccionadora tripolar para uso interno, sob carga. 400 A - 15Kv- com fusível HH 25A	unid			RN	YC	CM						-	-	-	-	-	-	-	
868	3	14	14.08	14.08.008	ELÉTRICA / SOM / SEGURANÇA / AU	Cubículo de média tensão blindado composto de chave seccionadora de 400A e disjuntor de média tensão de 630A, 500MVA, conforme projeto e memorial descritivo	unid			RN	YC	CM						-	-	-	-	-	-	-	
869	3	14	14.08	14.08.009	ELÉTRICA / SOM / SEGURANÇA / AU	Desembarque, transporte horizontal e vertical de cubículo	unid			RN	YC	CM						-	-	-	-	-	-	-	
870	3	14	14.08	14.08.010	ELÉTRICA / SOM / SEGURANÇA / AU	Dispositivo de intertravamento entre chave seccionadora e disjuntor	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
871	3	14	14.08	14.08.011	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação BEL - Quadro de Equipotencialização - incluindo barramento e disjuntores	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
872	3	14	14.08	14.08.012	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e Instalação de transformador a óleo 300kVA - IP00	unid			RN	YC	CM						-	-	-	-	-	-	-	
873	3	14	14.08	14.08.013	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e Instalação de transformador a seco 225kVA - carenado - IP21	unid			RN	YC	CM						-	-	-	-	-	-	-	
874	3	14	14.08	14.08.014	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e Instalação de transformador a seco 750kVA - IP00	unid			RN	YC	CM						-	-	-	-	-	-	-	
875	3	14	14.08	14.08.015	ELÉTRICA / SOM / SEGURANÇA / AU	Haste De Aço Cobreada %9C 16 X 2400 Mm De Alta Camada.	unid			RN	YC	CM						-	-	-	-	-	-	-	
876	3	14	14.08	14.08.016	ELÉTRICA / SOM / SEGURANÇA / AU	instalação de transformador a seco 500kVA - carenado - IP21	unid			RN	YC	CM						-	-	-	-	-	-	-	
877	3	14	14.08	14.08.017	ELÉTRICA / SOM / SEGURANÇA / AU	interligação dos cabos de baixa tensão desde a medição até o QGBT-N	unid			RN	YC	CM						-	-	-	-	-	-	-	
878	3	14	14.08	14.08.018	ELÉTRICA / SOM / SEGURANÇA / AU	isolador De Pino 15kV	unid			RN	YC	CM						-	-	-	-	-	-	-	
879	3	14	14.08	14.08.019	ELÉTRICA / SOM / SEGURANÇA / AU	Manutenção no alimentador do QGBT-N existente	unid			RN	YC	CM						-	-	-	-	-	-	-	
880	3	14	14.08	14.08.020	ELÉTRICA / SOM / SEGURANÇA / AU	Minicaptor em Barra Chata de Alumínio, 7/8" x 1/8" x 300 mm	unid			RN	YC	CM						-	-	-	-	-	-	-	
881	3	14	14.08	14.08.021	ELÉTRICA / SOM / SEGURANÇA / AU	Montagem de subestação transformadora (no projeto informa que é responsabilidade do Shopping prancha RNR-ELT-EXE-004 R00)	unid			RN	YC	CM						-	-	-	-	-	-	-	
882	3	14	14.08	14.08.022	ELÉTRICA / SOM / SEGURANÇA / AU	Mufia Externa Polimérica-15Kv	unid			RN	YC	CM						-	-	-	-	-	-	-	
883	3	14	14.08	14.08.023	ELÉTRICA / SOM / SEGURANÇA / AU	Mufias para cabo média tensão 15kv	unid			RN	YC	CM						-	-	-	-	-	-	-	
884	3	14	14.08	14.08.024	ELÉTRICA / SOM / SEGURANÇA / AU	Padrão de proteção e medição - Energisa	unid			RN	YC	CM						-	-	-	-	-	-	-	
885	3	14	14.08	14.08.025	ELÉTRICA / SOM / SEGURANÇA / AU	Parametrização do disjuntor de média tensão da subestação	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
886	3	14	14.08	14.08.026	ELÉTRICA / SOM / SEGURANÇA / AU	Parametrização do relé da subestação	unid			RN	YC	CM						-	-	-	-	-	-	-	
887	3	14	14.08	14.08.027	ELÉTRICA / SOM / SEGURANÇA / AU	Para-raios tipo polimérico, 12kv - 10kA	unid			RN	YC	CM		3,00				-	-	-	-	-	-	-	
888	3	14	14.08	14.08.028	ELÉTRICA / SOM / SEGURANÇA / AU	Porta documentos de plástico transparente 230x320 mm	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
889	3	14	14.08	14.08.029	ELÉTRICA / SOM / SEGURANÇA / AU	Poste De Concreto Circular 11 (Onze) Metros 1000 Dan	unid			RN	YC	CM						-	-	-	-	-	-	-	
890	3	14	14.08	14.08.030	ELÉTRICA / SOM / SEGURANÇA / AU	Poste de concreto circular 12m x 10KN	unid			RN	YC	CM						-	-	-	-	-	-	-	
891	3	14	14.08	14.08.031	ELÉTRICA / SOM / SEGURANÇA / AU	Quadro De Aterramento - Bep	unid			RN	YC	CM						-	-	-	-	-	-	-	
892	3	14	14.08	14.08.032	ELÉTRICA / SOM / SEGURANÇA / AU	Tapete de borracha 15kV 500x500mm	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
893	3	14	14.08	14.08.033	ELÉTRICA / SOM / SEGURANÇA / AU	Terminação enfitada para cabo #35mm² - 15kV para uso interno	unid			RN	YC	CM						-	-	-	-	-	-	-	
894	3	14	14.08	14.08.034	ELÉTRICA / SOM / SEGURANÇA / AU	Terminal termocontrátil para uso interno para cabo 35 mm² - 15kV	unid			RN	YC	CM		4,00				-	-	-	-	-	-	-	
895	3	14	14.08	14.08.035	ELÉTRICA / SOM / SEGURANÇA / AU	Teste operacional e treinamento de pessoal - subestação	conj			RN	YC	CM		1,00				-	-	-	-	-	-	-	
896	3	14	14.08	14.08.036	ELÉTRICA / SOM / SEGURANÇA / AU	Testes da malha de aterramento existente	unid			RN	YC	CM						-	-	-	-	-	-	-	
897	2	14	14.09	14.09	ELÉTRICA / SOM / SEGURANÇA / AU	Grupo gerador				RN	YC	CM						-	-	-	-	-	-	-	
898	3	14	14.09	14.09.001	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QSE - Quadro de Comando do Gerador - incluindo barramento e disjuntores - APRESENTAR CUSTOS	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
899	3	14	14.09	14.09.002	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QTA - Quadro de Distribuição - incluindo barramento e disjuntores - APRESENTAR CUSTOS	unid			RN	YC	CM						-	-	-	-	-	-	-	
900	3	14	14.09	14.09.003	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação QTA-01	unid			RN	YC	CM						-	-	-	-	-	-	-	
901	3	14	14.09	14.09.004	ELÉTRICA / SOM / SEGURANÇA / AU	Instalação de grupo gerador carenado completo	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
902	3	14	14.09	14.09.005	ELÉTRICA / SOM / SEGURANÇA / AU	QSE	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
903	3	14	14.09	14.09.006	ELÉTRICA / SOM / SEGURANÇA / AU	QTA - Quadro de transferencia automática	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
904	2	14	14.10	14.10	ELÉTRICA / SOM / SEGURANÇA / AU	No Break				RN	YC	CM						-	-	-	-	-	-	-	
905	3	14	14.10	14.10.001	ELÉTRICA / SOM / SEGURANÇA / AU	Conjunto de Baterias p/ No Break	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
906	2	14	14.11	14.11	ELÉTRICA / SOM / SEGURANÇA / AU	Equipamentos para instalações de sonorização				RN	YC	CM						-	-	-	-	-	-	-	
907	3	14	14.11	14.11.001	ELÉTRICA / SOM / SEGURANÇA / AU	Espera para subwoofer em caixa 100x100mm aparente m no forro	unid			RN	YC	CM		6,00				-	-	-	-	-	-	-	
908	3	14	14.11	14.11.002	ELÉTRICA / SOM / SEGURANÇA / AU	Transformador de linha especial - sonorização - imobilizado	unid			RN	YC	CM		6,00				-	-	-	-	-	-	-	
909	3	14	14.11	14.11.003	ELÉTRICA / SOM / SEGURANÇA / AU	Transformadores de linha modelo 6700 - 10 watts	unid			RN	YC	CM		87,00				-	-	-	-	-	-	-	
910	3	14	14.11	14.11.004	ELÉTRICA / SOM / SEGURANÇA / AU	Unidade de ventilação - sonorização - imobilizado	unid			RN	YC	CM		1,00				-	-	-	-	-	-	-	
911	2	14	14.12	14.12	ELÉTRICA / SOM / SEGURANÇA / AU	Equipamentos para instalações de segurança				RN	YC	CM						-	-	-	-	-	-	-	
912	3	14	14.12	14.12.001	ELÉTRICA / SOM / SEGURANÇA / AU	Antena anti-furto ultra prime	unid			RN	YC	CM						-	-	-	-	-	-	-	
913	3	14	14.12	14.12.002	ELÉTRICA / SOM / SEGURANÇA / AU	Botoeira para porta de enrolar	unid			RN	YC	CM		2,00				-	-	-	-	-	-	-	
914	3	14	14.12	14.12.003	ELÉTRICA / SOM / SEGURANÇA / AU	Câmara fixa Bullet externa	unid			RN	YC	CM						-	-	-	-	-	-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
915	3	14	14.12	14.12.004	ELÉTRICA / SOM / SEGURANÇA / AU	Central de alarme de intrusão (porta de comunicação RS485, protocolo de comunicação mosbus TCP	unid			RN	YC	CM		1,00				-	-	-			-	-	
916	3	14	14.12	14.12.005	ELÉTRICA / SOM / SEGURANÇA / AU	Central de Sinalização de auxílio ao Cliente	unid			RN	YC	CM		1,00				-	-	-			-	-	
917	3	14	14.12	14.12.006	ELÉTRICA / SOM / SEGURANÇA / AU	Fechadura eletromagnética	unid			RN	YC	CM		5,00				-	-	-			-	-	
918	3	14	14.12	14.12.007	ELÉTRICA / SOM / SEGURANÇA / AU	Grade de proteção gaiola	unid			RN	YC	CM						-	-	-			-	-	
919	3	14	14.12	14.12.008	ELÉTRICA / SOM / SEGURANÇA / AU	Infravermelho passivo anti-mascaramento em condutele	unid			RN	YC	CM		1,00				-	-	-			-	-	
920	3	14	14.12	14.12.009	ELÉTRICA / SOM / SEGURANÇA / AU	Interfone interno	unid			RN	YC	CM						-	-	-			-	-	
921	3	14	14.12	14.12.010	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de Presença instalado em condutele	unid			RN	YC	CM		6,00				-	-	-			-	-	
922	3	14	14.12	14.12.011	ELÉTRICA / SOM / SEGURANÇA / AU	Sistema CFTV - Fornecimento de equipamentos	conj			RN	YC	CM		1,00				-	-	-			-	-	
923	3	14	14.12	14.12.012	ELÉTRICA / SOM / SEGURANÇA / AU	Teclado de programação em condutele	unid			RN	YC	CM		1,00				-	-	-			-	-	
924	3	14	14.12	14.12.013	ELÉTRICA / SOM / SEGURANÇA / AU	Teclado de senha para destrave de porta	unid			RN	YC	CM		4,00				-	-	-			-	-	
925	2	14	14.13	14.13	ELÉTRICA / SOM / SEGURANÇA / AU	Diversos				RN	YC	CM						-	-	-			-	-	
926	3	14	14.13	14.13.001	ELÉTRICA / SOM / SEGURANÇA / AU	Rack intermediário para transição de fiações que excedam 90m	unid			RN	YC	CM		1,00				-	-	-			-	-	
927	3	14	14.13	14.13.002	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e Instalação TC's e TP's	conj			RN	YC	CM						-	-	-			-	-	
928	3	14	14.13	14.13.003	ELÉTRICA / SOM / SEGURANÇA / AU	Certificação de cabos UTP	conj			RN	YC	CM		1,00				-	-	-			-	-	
929	3	14	14.13	14.13.004	ELÉTRICA / SOM / SEGURANÇA / AU	Projeto high power led 7000lm 100w (ir75) 3000k 120º 110-220v preto ip65 366x290x82mm	unid			RN	YC	CM						-	-	-			-	-	
930	3	14	14.13	14.13.005	ELÉTRICA / SOM / SEGURANÇA / AU	Testes operacionais para instalações de energia,iluminação, lógica, telefonia, sonorização, segurança	conj			RN	YC	CM		1,00				-	-	-			-	-	
931	2	14	14.14	14.14	ELÉTRICA / SOM / SEGURANÇA / AU	Equipamentos para Automação				RN	YC	CM						-	-	-			-	-	
932	3	14	14.14	14.14.001	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo 2x22 AWG - conforme lista cabos da automação	unid			RN	YC	CM						-	-	-			-	-	
933	3	14	14.14	14.14.002	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo 4x24AWG c/ blindagem em fita aluminizada com fio dreno ou malha trançada par a par - cobertura em PVC - 300V - Fab.: AF KMP, AFD, HIPERFIO ou AMP	unid			RN	YC	CM		500,00				-	-	-			-	-	
934	3	14	14.14	14.14.003	ELÉTRICA / SOM / SEGURANÇA / AU	Cabo 6x22 AWG - conforme lista cabos da automação	unid			RN	YC	CM						-	-	-			-	-	
935	3	14	14.14	14.14.004	ELÉTRICA / SOM / SEGURANÇA / AU	Cabos RS485 - 2x22AWG c/ blindagem em fita aluminizada e trançada de cobre estanhado e impedância característica de 100 Ohms - cobertura em PVC - 300V - Fab.: AF KMP, AFD, HIPERFIO ou AMP	unid			RN	YC	CM		250,00				-	-	-			-	-	
936	3	14	14.14	14.14.005	ELÉTRICA / SOM / SEGURANÇA / AU	CLP JACE 8000 - HONEYWELL	unid			RN	YC	CM		1,00				-	-	-			-	-	
937	3	14	14.14	14.14.006	ELÉTRICA / SOM / SEGURANÇA / AU	CLP principal - Mod.: SIMATIC ET200SP - CPU 6ES7510-1DJ01-0AA0 - SIEMENS	unid			RN	YC	CM						-	-	-			-	-	
938	3	14	14.14	14.14.007	ELÉTRICA / SOM / SEGURANÇA / AU	CLP principal Mod.: BUS ADAPTER 6ES7193-6AR00-0AA0 - SIEMENS	unid			RN	YC	CM						-	-	-			-	-	
939	3	14	14.14	14.14.008	ELÉTRICA / SOM / SEGURANÇA / AU	CLP principal Mod.: MEMORY CARD 6ES7954-8LE02-0AA0 - SIEMENS	unid			RN	YC	CM						-	-	-			-	-	
940	3	14	14.14	14.14.009	ELÉTRICA / SOM / SEGURANÇA / AU	Controlador dedicado p/Air Handling, Exaustor, Ventilador, Split System mod: MCF marca: Mercato	unid			RN	YC	CM						-	-	-			-	-	
941	3	14	14.14	14.14.010	ELÉTRICA / SOM / SEGURANÇA / AU	Controlador programável p/Bombas de água gelada mod: MCP50 marca: Mercato	unid			RN	YC	CM						-	-	-			-	-	
942	3	14	14.14	14.14.011	ELÉTRICA / SOM / SEGURANÇA / AU	Controlador universal proporcional - V2V By-Pass - SA:0-10V - EA: 0-10V - 24Vac - Ref: TCY-T-0121 - VECTOR (VECTUS)	unid			RN	YC	CM						-	-	-			-	-	
943	3	14	14.14	14.14.012	ELÉTRICA / SOM / SEGURANÇA / AU	Controladora dedicada para unidade de tratamento de ar (UTA) - Splitão	unid			RN	YC	CM						-	-	-			-	-	
944	3	14	14.14	14.14.013	ELÉTRICA / SOM / SEGURANÇA / AU	Controladora logico programável - Split System e Exaustor	unid			RN	YC	CM						-	-	-			-	-	
945	3	14	14.14	14.14.014	ELÉTRICA / SOM / SEGURANÇA / AU	Controle remoto central para controle das evaporadorasparas do sistema V.R.F. - Ref: CCM30 ou similar	unid			RN	YC	CM						-	-	-			-	-	
946	3	14	14.14	14.14.015	ELÉTRICA / SOM / SEGURANÇA / AU	Controle remoto com fio para sistema de split alta capacidade	unid			RN	YC	CM						-	-	-			-	-	
947	3	14	14.14	14.14.016	ELÉTRICA / SOM / SEGURANÇA / AU	Controle remoto com fio para sistema V.R.F.	unid			RN	YC	CM						-	-	-			-	-	
948	3	14	14.14	14.14.017	ELÉTRICA / SOM / SEGURANÇA / AU	Controle remoto com fio para split alata capacidade inverter	unid			RN	YC	CM						-	-	-			-	-	
949	3	14	14.14	14.14.018	ELÉTRICA / SOM / SEGURANÇA / AU	Conversor Modbus RTU individual para split alta capacidade	unid			RN	YC	CM						-	-	-			-	-	
950	3	14	14.14	14.14.019	ELÉTRICA / SOM / SEGURANÇA / AU	Conversor Modbus RTU p/Split Alta Capacidade (conversor unitário)	unid			RN	YC	CM						-	-	-			-	-	
951	3	14	14.14	14.14.020	ELÉTRICA / SOM / SEGURANÇA / AU	Display remoto digital	unid			RN	YC	CM						-	-	-			-	-	
952	3	14	14.14	14.14.021	ELÉTRICA / SOM / SEGURANÇA / AU	Fonte Chaveada 24 VDC - 120W Mod.: Phaseo - SCHNEIDER	unid			RN	YC	CM		1,00				-	-	-			-	-	
953	3	14	14.14	14.14.022	ELÉTRICA / SOM / SEGURANÇA / AU	Fontte Retificadora - 220Vca / 5 Vcc	unid			RN	YC	CM						-	-	-			-	-	
954	3	14	14.14	14.14.023	ELÉTRICA / SOM / SEGURANÇA / AU	Fornecimento e instalação modulo central de automação GETWAY (abertura de protocolo Modbus) - APRESENTAR CUSTOS	conj			RN	YC	CM						-	-	-			-	-	
955	3	14	14.14	14.14.024	ELÉTRICA / SOM / SEGURANÇA / AU	Fusivel 2A	unid			RN	YC	CM						-	-	-			-	-	
956	3	14	14.14	14.14.025	ELÉTRICA / SOM / SEGURANÇA / AU	Gateway de conversão RS485 p/ Ethernet Mod.: EGX-150 SCHNEIDER	unid			RN	YC	CM						-	-	-			-	-	
957	3	14	14.14	14.14.026	ELÉTRICA / SOM / SEGURANÇA / AU	Gateway de conversão RS485 p/ Ethernet Mod.: MCM - MERCATO	unid			RN	YC	CM						-	-	-			-	-	
958	3	14	14.14	14.14.027	ELÉTRICA / SOM / SEGURANÇA / AU	Instalação de quadro de controladores remotos CLP-PG - incluindo disjuntores, cabos, controladores e demais itens de projeto	unid			RN	YC	CM		1,00				-	-	-			-	-	
959	3	14	14.14	14.14.028	ELÉTRICA / SOM / SEGURANÇA / AU	Instalação de quadro de controladores remotos CLP-PR - incluindo disjuntores, cabos, controladores e demais itens de projeto	unid			RN	YC	CM						-	-	-			-	-	
960	3	14	14.14	14.14.029	ELÉTRICA / SOM / SEGURANÇA / AU	Módulo Remota Dedicada Mod.: MFC - MERCATO	unid			RN	YC	CM						-	-	-			-	-	
961	3	14	14.14	14.14.030	ELÉTRICA / SOM / SEGURANÇA / AU	Módulo Remota Dedicada Mod.: MFC - MERCATO	unid			RN	YC	CM						-	-	-			-	-	
962	3	14	14.14	14.14.031	ELÉTRICA / SOM / SEGURANÇA / AU	Módulo Remota Dedicada Mod.: MFC46 - MERCATO	unid			RN	YC	CM						-	-	-			-	-	
963	3	14	14.14	14.14.032	ELÉTRICA / SOM / SEGURANÇA / AU	Módulo Remota Mod.: MCP46A - MERCATO	unid			RN	YC	CM						-	-	-			-	-	
964	3	14	14.14	14.14.033	ELÉTRICA / SOM / SEGURANÇA / AU	Módulo Remota Mod.: MCP460 - MERCATO	unid			RN	YC	CM						-	-	-			-	-	
965	3	14	14.14	14.14.034	ELÉTRICA / SOM / SEGURANÇA / AU	Módulo Remota Mod.: ME22-A - MERCATO	unid			RN	YC	CM						-	-	-			-	-	
966	3	14	14.14	14.14.035	ELÉTRICA / SOM / SEGURANÇA / AU	Módulo Remota Mod.: ME46-A - MERCATO	unid			RN	YC	CM		2,00				-	-	-			-	-	
967	3	14	14.14	14.14.036	ELÉTRICA / SOM / SEGURANÇA / AU	Placa de expansão	unid			RN	YC	CM						-	-	-			-	-	
968	3	14	14.14	14.14.037	ELÉTRICA / SOM / SEGURANÇA / AU	Pressostato Diferencial de Ar - Mod.: ADPS-04-2-N - DWYER	unid			RN	YC	CM						-	-	-			-	-	
969	3	14	14.14	14.14.038	ELÉTRICA / SOM / SEGURANÇA / AU	Quadro de controladores remotos CLP-PG - incluindo disjuntores, cabos, controladores e demais itens de projeto	unid			RN	YC	CM		1,00				-	-	-			-	-	
970	3	14	14.14	14.14.039	ELÉTRICA / SOM / SEGURANÇA / AU	Quadro de controladores remotos CLP-PR - incluindo disjuntores, cabos, controladores e demais itens de projeto	unid			RN	YC	CM						-	-	-			-	-	
971	3	14	14.14	14.14.040	ELÉTRICA / SOM / SEGURANÇA / AU	Relé de corrente REF.: CCS-121050 : DWYER	unid			RN	YC	CM						-	-	-			-	-	
972	3	14	14.14	14.14.041	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de CO2 - Mod.: CDT-2W40 - DWYER	unid			RN	YC	CM						-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
973	3	14	14.14	14.14.042	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de temperatura	unid			RN	YC	CM						-	-	-			-	-		
974	3	14	14.14	14.14.043	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de Temperatura - PARA DUTO- Mod.: TE-DFG-B-04-4-8-00 - DWYER	unid			RN	YC	CM						-	-	-			-	-		
975	3	14	14.14	14.14.044	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de Temperatura DE IMERSÃO COM POÇO- Mod.: TE-IBG-D-25-4-4-12 - DWYER	unid			RN	YC	CM						-	-	-			-	-		
976	3	14	14.14	14.14.045	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de Temperatura e CO2 Integrado - Mod.: CDT-2W44 - DWYER	unid			RN	YC	CM						-	-	-			-	-		
977	3	14	14.14	14.14.046	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de Temperatura e Umidade Relativa do Ar - Mod.: RHP-2W44 - DWYER	unid			RN	YC	CM						-	-	-			-	-		
978	3	14	14.14	14.14.047	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de Temperatura e Umidade Relativa do Ar - Mod.: RHP-2W44 - DWYER	unid			RN	YC	CM						-	-	-			-	-		
979	3	14	14.14	14.14.048	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor de Temperatura e Umidade Relativa do Ar uso externo IP-65 - Mod.: RHP-2011 - DWYER	unid			RN	YC	CM						-	-	-			-	-		
980	3	14	14.14	14.14.049	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor Temperatura Parede (AR) - Mod.: TE-WND-A - DWYER	unid			RN	YC	CM						-	-	-			-	-		
981	3	14	14.14	14.14.050	ELÉTRICA / SOM / SEGURANÇA / AU	Switch Mod.: Conexium - SCHNEIDER	unid			RN	YC	CM						-	-	-			-	-		
982	3	14	14.14	14.14.051	ELÉTRICA / SOM / SEGURANÇA / AU	Transformador - 220/24vac - 150 VA	unid			RN	YC	CM						-	-	-			-	-		
983	3	14	14.14	14.14.052	ELÉTRICA / SOM / SEGURANÇA / AU	Transformador 150VA 220V - 24VAC	unid			RN	YC	CM						-	-	-			-	-		
984	3	14	14.14	14.14.053	ELÉTRICA / SOM / SEGURANÇA / AU	Transmissor de Fluxo AG - Mod.: PTF-IAN-B111-S - DWYER	unid			RN	YC	CM						-	-	-			-	-		
985	3	14	14.14	14.14.054	ELÉTRICA / SOM / SEGURANÇA / AU	Transmissor de Pressão - Mod.: 628-10-GH-P1-E1-S1 - DWYER bombas água gelada	unid			RN	YC	CM						-	-	-			-	-		
986	3	14	14.14	14.14.055	ELÉTRICA / SOM / SEGURANÇA / AU	Transmissor de temperatura aparente na parede, instalado em condutele "3/4	unid			RN	YC	CM						-	-	-			-	-		
987	1	15	15.01	15	PPCI	INSTALAÇÕES DE P.P.C.I.				RN	YC	CM							-	-	-			-	-	
988	2	15	15.01	15.01	PPCI	Tubos e Conexões				RN	YC	CM							-	-	-			-	-	
989	3	15	15.01	15.01.001	PPCI	Tubo ferro preto DIN 2440 com rosca, sem costura, CL10 1" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
990	3	15	15.01	15.01.002	PPCI	Tubo ferro preto DIN 2440 com rosca, sem costura, CL10 3/4" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
991	3	15	15.01	15.01.003	PPCI	Tubo ferro preto DIN 2440 com rosca, sem costura, CL10 1.1/4" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
992	3	15	15.01	15.01.004	PPCI	Tubo ferro preto DIN 2440 com rosca, sem costura, CL10 1.1/2" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
993	3	15	15.01	15.01.005	PPCI	Tubo ferro preto DIN 2440 com rosca, sem costura, CL10 2" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
994	3	15	15.01	15.01.006	PPCI	Tubo ferro preto DIN 2440 com rosca, sem costura, CL10 2. 1/2" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
995	3	15	15.01	15.01.007	PPCI	Tubo ferro preto DIN 2440 com rosca, sem costura, CL10 4" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
996	3	15	15.01	15.01.008	PPCI	Tubo de aço preto DIN 2440 aço carbono para solda CL150 2. 1/2" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
997	3	15	15.01	15.01.009	PPCI	Tubo de aço preto DIN 2440 aço carbono para solda CL150 3" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
998	3	15	15.01	15.01.010	PPCI	Tubo de aço preto DIN 2440 aço carbono para solda CL150 4" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
999	3	15	15.01	15.01.011	PPCI	Tubo de aço preto DIN 2440 aço carbono para solda CL150 6" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1000	3	15	15.01	15.01.012	PPCI	Tubo ferro preto DINN 2440 com rosca, sem costura, CL10 6" - inclusive acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1001	3	15	15.01	15.01.013	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 1/2", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM						-	-	-			-	-		
1002	3	15	15.01	15.01.014	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 3/4", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM						-	-	-			-	-		
1003	3	15	15.01	15.01.015	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 1", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM		495,38				-	-	-			-	-		
1004	3	15	15.01	15.01.016	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 1.1/4", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM		164,43				-	-	-			-	-		
1005	3	15	15.01	15.01.017	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 1.1/2", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM		171,71				-	-	-			-	-		
1006	3	15	15.01	15.01.018	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 2", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM		60,59				-	-	-			-	-		
1007	3	15	15.01	15.01.019	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 2.1/2", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM		36,39				-	-	-			-	-		
1008	3	15	15.01	15.01.020	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 3", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM		133,55				-	-	-			-	-		
1009	3	15	15.01	15.01.021	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 4", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM		43,89				-	-	-			-	-		
1010	3	15	15.01	15.01.022	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 5", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM						-	-	-			-	-		
1011	3	15	15.01	15.01.023	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 6", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM		34,09				-	-	-			-	-		
1012	3	15	15.01	15.01.024	PPCI	Tubulações de aço carbono SCH40 S/C - Ø 8", com tratamento anticorrosivo, isolamento térmico em espuma elastomérica - incluindo conexões, soldas, colas, fitas, suportes e demais acessórios	m			RN	YC	CM						-	-	-			-	-		
1013	2	15	15.02	15.02	PPCI	Válvulas e registros				RN	YC	CM							-	-	-			-	-	
1014	3	15	15.02	15.02.001	PPCI	Registro angular 45º, corpo em bronze, 2.1/2" BSP x rosca 5 fios	unid			RN	YC	CM		10,00				-	-	-			-	-		
1015	3	15	15.02	15.02.002	PPCI	Registro borboleta bruto, em ferro fundido e flangeado, 4"	unid			RN	YC	CM		1,00				-	-	-			-	-		
1016	3	15	15.02	15.02.003	PPCI	Registro borboleta bruto, em ferro fundido e flangeado, 6"	unid			RN	YC	CM		1,00				-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1017	3	15	15.02	15.02.004	PPCI	Registro esfera, corpo em bronze, esfera em aço inox, rosca BSP, 1"	unid			RN	YC	CM		1,00				-	-	-			-	-	
1018	2	15	15.03	15.03.001	PPCI	Chuveiros automáticos				RN	YC	CM						-	-	-			-	-	
1019	3	15	15.03	15.03.001	PPCI	Canopla cromada para acabamento	unid			RN	YC	CM		19,00				-	-	-			-	-	
1020	3	15	15.03	15.03.002	PPCI	Canopla na cor branca para acabamento	unid			RN	YC	CM		32,00				-	-	-			-	-	
1021	3	15	15.03	15.03.003	PPCI	Chuveiro automático Sprinkler 68°C, bronze, tipo âmpola, 1/2"	unid			RN	YC	CM						-	-	-			-	-	
1022	3	15	15.03	15.03.004	PPCI	Chuveiro automático Sprinkler 68°C, cromado, tipo âmpola, 1/2"	unid			RN	YC	CM		49,00				-	-	-			-	-	
1023	3	15	15.03	15.03.005	PPCI	Chuveiro automático Sprinkler 68°C, upright, tipo âmpola, 1/2"	unid			RN	YC	CM		223,00				-	-	-			-	-	
1024	3	15	15.03	15.03.006	PPCI	Chuveiro automático Sprinkler 68°C, branco, tipo âmpola, 1/2"	unid			RN	YC	CM		36,00				-	-	-			-	-	
1025	3	15	15.03	15.03.007	PPCI	Chuveiro automático Sprinkler 79°C upright 1/2"	unid			RN	YC	CM						-	-	-			-	-	
1026	3	15	15.03	15.03.008	PPCI	Grade de proteção para Sprinkler pendente	unid			RN	YC	CM		11,00				-	-	-			-	-	
1027	3	15	15.03	15.03.009	PPCI	Canopla na cor preta para acabamento	unid			RN	YC	CM						-	-	-			-	-	
1028	2	15	15.04	15.04.001	PPCI	Hidrantes/Mangotinhos				RN	YC	CM						-	-	-			-	-	
1029	3	15	15.04	15.04.001	PPCI	Abrigo metálico para hidrantes 60x120x30cm	unid			RN	YC	CM		5,00				-	-	-			-	-	
1030	3	15	15.04	15.04.002	PPCI	Abrigo metálico para hidrantes 90x120x30cm	unid			RN	YC	CM						-	-	-			-	-	
1031	3	15	15.04	15.04.003	PPCI	Adaptador fêmea 2.1/2" BSP x 1.1/2" STORZ	unid			RN	YC	CM		10,00				-	-	-			-	-	
1032	3	15	15.04	15.04.004	PPCI	Chave de aperto dupla 2.1/2" x 1.1/2"	unid			RN	YC	CM		5,00				-	-	-			-	-	
1033	3	15	15.04	15.04.005	PPCI	Esguicho regulável 1.1/2"	unid			RN	YC	CM		5,00				-	-	-			-	-	
1034	3	15	15.04	15.04.006	PPCI	Esguicho regulável 2.1/2"	unid			RN	YC	CM						-	-	-			-	-	
1035	3	15	15.04	15.04.007	PPCI	Esguicho JS 1.1/2"	unid			RN	YC	CM						-	-	-			-	-	
1036	3	15	15.04	15.04.008	PPCI	Esguicho JS 2.1/2"	unid			RN	YC	CM		5,00				-	-	-			-	-	
1037	3	15	15.04	15.04.009	PPCI	Mangueira poliéster revestida de borracha, com conexão STORZ, 1.1/2" x 15m	unid			RN	YC	CM		20,00				-	-	-			-	-	
1038	3	15	15.04	15.04.010	PPCI	Mangueira poliéster revestida de borracha, com conexão STORZ, 2.1/2" x 15m	unid			RN	YC	CM						-	-	-			-	-	
1039	3	15	15.04	15.04.011	PPCI	Suporte para mangueira em chapa de aço	unid			RN	YC	CM		5,00				-	-	-			-	-	
1040	3	15	15.04	15.04.012	PPCI	Mangueira semi rígida, 1" x 30m tipo II	unid			RN	YC	CM						-	-	-			-	-	
1041	3	15	15.04	15.04.013	PPCI	Registro esfera, corpo em bronze, esfera em aço inox, Classe 150, 1"	unid			RN	YC	CM						-	-	-			-	-	
1042	3	15	15.04	15.04.014	PPCI	Esguicho regulável 1"	unid			RN	YC	CM						-	-	-			-	-	
1043	2	15	15.05	15.05.001	PPCI	Extintores				RN	YC	CM						-	-	-			-	-	
1044	3	15	15.05	15.05.001	PPCI	Extintor CO2 40 BC I sobre roda	unid			RN	YC	CM						-	-	-			-	-	
1045	3	15	15.05	15.05.002	PPCI	Extintor CO2 6 kg com suporte para fixar em parede	unid			RN	YC	CM		4,00				-	-	-			-	-	
1046	3	15	15.05	15.05.003	PPCI	Extintor AP 10 litros com suporte para fixar em parede	unid			RN	YC	CM						-	-	-			-	-	
1047	3	15	15.05	15.05.004	PPCI	Extintor de PQS ABC 4 kg com suporte para fixar em parede - incluindo nota fiscal da compra	unid			RN	YC	CM						-	-	-			-	-	
1048	3	15	15.05	15.05.005	PPCI	Extintor de PQS ABC 6 kg com suporte para fixar em parede - incluindo nota fiscal da compra	unid			RN	YC	CM		14,00				-	-	-			-	-	
1049	3	15	15.05	15.05.006	PPCI	Extintor de PQS BC 4 kg com suporte para fixar em parede - incluindo nota fiscal da compra	unid			RN	YC	CM						-	-	-			-	-	
1050	3	15	15.05	15.05.007	PPCI	Extintor de PQS BC 6 kg com suporte para fixar em parede - incluindo nota fiscal da compra	unid			RN	YC	CM						-	-	-			-	-	
1051	3	15	15.05	15.05.008	PPCI	Deslocamento de extintores existentes - 4kg	unid			RN	YC	CM						-	-	-			-	-	
1052	3	15	15.05	15.05.009	PPCI	Deslocamento de extintores existentes - 6kg	unid			RN	YC	CM						-	-	-			-	-	
1053	3	15	15.05	15.05.010	PPCI	Deslocamento de extintores existentes - 10kg	unid			RN	YC	CM						-	-	-			-	-	
1054	2	15	15.06	15.06.001	PPCI	Deteção de alarme				RN	YC	CM						-	-	-			-	-	
1055	3	15	15.06	15.06.001	PPCI	Acionadores manuais com carcaça plástica vermelha, 24VCC	unid			RN	YC	CM		5,00				-	-	-			-	-	
1056	3	15	15.06	15.06.002	PPCI	Alertadores sonoros, sirene eletrônica tipo FA-DÔ, tensão 24 V	unid			RN	YC	CM		5,00				-	-	-			-	-	
1057	3	15	15.06	15.06.003	PPCI	Alertadores visuais estroboscópicos	unid			RN	YC	CM						-	-	-			-	-	
1058	3	15	15.06	15.06.004	PPCI	Central de alarme endereçável 4 laços	unid			RN	YC	CM		1,00				-	-	-			-	-	
1059	3	15	15.06	15.06.005	PPCI	Central de alarme endereçável 2 laços	unid			RN	YC	CM						-	-	-			-	-	
1060	3	15	15.06	15.06.006	PPCI	Condulete de alumínio 4"x4"	unid			RN	YC	CM						-	-	-			-	-	
1061	3	15	15.06	15.06.007	PPCI	Resistência de final de linha (470HMS)	unid			RN	YC	CM		1,00				-	-	-			-	-	
1062	3	15	15.06	15.06.008	PPCI	Detector óptico de fumaça com base endereçável	unid			RN	YC	CM		73,00				-	-	-			-	-	
1063	3	15	15.06	15.06.009	PPCI	Detector óptico de temperatura termovelocimétrico com base endereçável	unid			RN	YC	CM		5,00				-	-	-			-	-	
1064	3	15	15.06	15.06.010	PPCI	Eletroduto, aço galvanizado, esmaltado anti-chama 1"	m			RN	YC	CM						-	-	-			-	-	
1065	3	15	15.06	15.06.011	PPCI	Eletroduto, aço galvanizado, esmaltado anti-chama 3/4"	m			RN	YC	CM		435,00				-	-	-			-	-	
1066	3	15	15.06	15.06.012	PPCI	Fiação AF control 2x1,5mm² blindado com malha e dreno e indicação de laço	m			RN	YC	CM		652,50				-	-	-			-	-	
1067	3	15	15.06	15.06.013	PPCI	Fiação dos alertadores sonoro/visual 2x2,5mm²	m			RN	YC	CM		282,75				-	-	-			-	-	
1068	3	15	15.06	15.06.014	PPCI	Fiação de alarme por contato seco 2x1,5mm²	m			RN	YC	CM						-	-	-			-	-	
1069	3	15	15.06	15.06.015	PPCI	Fiação de alarme por contato seco 4x1,5mm²	m			RN	YC	CM		40,00				-	-	-			-	-	
1070	3	15	15.06	15.06.016	PPCI	Módulo de comando para extração de fumaça	unid			RN	YC	CM						-	-	-			-	-	
1071	3	15	15.06	15.06.017	PPCI	Interligação de central da loja a central do shopping	m			RN	YC	CM						-	-	-			-	-	
1072	3	15	15.06	15.06.018	PPCI	Teste operacional de central de alarme	unid			RN	YC	CM		1,00				-	-	-			-	-	
1073	3	15	15.06	15.06.019	PPCI	Sistema interligado ao alarme de incêndio para abertura das portas em caso de acionamento de alarme	unid			RN	YC	CM						-	-	-			-	-	
1074	3	15	15.06	15.06.020	PPCI	Central de baterias do sistema de alarme autonomia de mais de uma hora	unid			RN	YC	CM		1,00				-	-	-			-	-	
1075	3	15	15.06	15.06.021	PPCI	Chave de fluxo com retardo pneumático	unid			RN	YC	CM		2,00				-	-	-			-	-	
1076	2	15	15.07	15.07.001	PPCI	Sinalizações				RN	YC	CM						-	-	-			-	-	
1077	3	15	15.07	15.07.001	PPCI	Adesivo refletivo de emergência com fundo vermelho e titulações brancas	unid			RN	YC	CM						-	-	-			-	-	
1078	3	15	15.07	15.07.002	PPCI	Luminária autônoma para sinalização de emergência Acrileds, ref. 09	unid			RN	YC	CM						-	-	-			-	-	
1079	3	15	15.07	15.07.003	PPCI	Luminária autônoma para sinalização de emergência Acrileds, ref. 01	unid			RN	YC	CM		4,00				-	-	-			-	-	
1080	3	15	15.07	15.07.004	PPCI	Luminária autônoma para sinalização de emergência Acrileds, ref. 07	unid			RN	YC	CM						-	-	-			-	-	
1081	3	15	15.07	15.07.005	PPCI	Luminária de emergência 9W de embutir, LFA - 9E da Aureon	unid			RN	YC	CM						-	-	-			-	-	
1082	3	15	15.07	15.07.006	PPCI	Luminária de emergência 9W de sobrepor, BLF - 9E da Aureon	unid			RN	YC	CM						-	-	-			-	-	
1083	3	15	15.07	15.07.007	PPCI	Placa suspensa em chapas sobrepostas de alumínio composto e titulações e pictogramas em adesivo vinílico	m²			RN	YC	CM						-	-	-			-	-	
1084	3	15	15.07	15.07.008	PPCI	Instalação de placa suspensa	unid			RN	YC	CM		4,00				-	-	-			-	-	
1085	3	15	15.07	15.07.009	PPCI	Placas indicativas, explicativas, de advertência e de regulamentação em chapas sobrepostas de alumínio composto e titulações e pictogramas em adesivo vinílico	unid			RN	YC	CM						-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
1086	3	15	15.07	15.07.010	PPCI	Instalação de placas indicativas, explicativas, de advertência e de regulamentação com fita adesiva dupla face	unid			RN	YC	CM						-	-	-			-	-		
1087	3	15	15.07	15.07.011	PPCI	Placa de emergência em chapas sobrepostas de alumínio composto e titulações e pictogramas em adesivo refletivo de segurança branco	m²			RN	YC	CM						-	-	-			-	-		
1088	3	15	15.07	15.07.012	PPCI	Instalação de placa de emergência com fita adesiva dupla face	unid			RN	YC	CM						-	-	-			-	-		
1089	3	15	15.07	15.07.013	PPCI	Placa fotoluminescente "SAÍDA" conforme código 17 da NBR 13434-2 H=126mm	unid			RN	YC	CM						-	-	-			-	-		
1090	3	15	15.07	15.07.014	PPCI	Placa fotoluminescente "SAÍDA" conforme código 13 da NBR 13434-2 H=126mm	unid			RN	YC	CM						-	-	-			-	-		
1091	3	15	15.07	15.07.015	PPCI	Placa fotoluminescente "SAÍDA" conforme código 14 da NBR 13434-2 H=126mm	unid			RN	YC	CM						-	-	-			-	-		
1092	3	15	15.07	15.07.016	PPCI	Placa fotoluminescente "ESCADA DE EMERGÊNCIA" conforme código 16 da NBR 13434-2 H=126mm	unid			RN	YC	CM						-	-	-			-	-		
1093	3	15	15.07	15.07.017	PPCI	Placa fotoluminescente "HIDRANTE" conforme código 25 da NBR 13434-2 L=252mm	unid			RN	YC	CM						-	-	-			-	-		
1094	3	15	15.07	15.07.018	PPCI	Placa fotoluminescente "EXTINTORES" conforme código 23 da NBR 13434-2 L=252mm	unid			RN	YC	CM						-	-	-			-	-		
1095	3	15	15.07	15.07.019	PPCI	Placa fotoluminescente "COMANDO MANUAL DE ALARME" conforme código 21 da NBR 13434-2 L=252mm	unid			RN	YC	CM						-	-	-			-	-		
1096	3	15	15.07	15.07.020	PPCI	Placa fotoluminescente "ALARME SONORO" conforme código 20 da NBR 13434-2 L=252mm	unid			RN	YC	CM						-	-	-			-	-		
1097	3	15	15.07	15.07.021	PPCI	Bloco autônomo de iluminação de L. emergência 2x 11W (aclaramento e balizamento), com 2 lâmpadas fluorescentes compactas 4 pinos 11W (1800 lumens), grau de proteção IP-44, impactos mecânico IK-09.	unid			RN	YC	CM		54,00				-	-	-			-	-		
1098	3	15	15.07	15.07.022	PPCI	Placa fotoluminescente "SAÍDA DE EMERGÊNCIA À DIREITA OU À ESQUERDA" conforme código S1 da NBR 13437	unid			RN	YC	CM						-	-	-			-	-		
1099	3	15	15.07	15.07.023	PPCI	Placa fotoluminescente "SAÍDA DE EMERGÊNCIA À FRENTE" conforme código S3 da NBR 13437	unid			RN	YC	CM						-	-	-			-	-		
1100	3	15	15.07	15.07.024	PPCI	Placa fotoluminescente "ESCADA DE EMERGÊNCIA" conforme código S11 da NBR 13437	unid			RN	YC	CM						-	-	-			-	-		
1101	3	15	15.07	15.07.025	PPCI	Placa fotoluminescente "ESCADA DE EMERGÊNCIA" conforme código S9 da NBR 13437	unid			RN	YC	CM						-	-	-			-	-		
1102	3	15	15.07	15.07.026	PPCI	Placa fotoluminescente "ESCADA DE EMERGÊNCIA" conforme código S8 da NBR 13438	unid			RN	YC	CM						-	-	-			-	-		
1103	3	15	15.07	15.07.027	PPCI	Placa fotoluminescente "SAÍDA DE EMERGÊNCIA" conforme código S12 da NBR 13437	unid			RN	YC	CM						-	-	-			-	-		
1104	3	15	15.07	15.07.028	PPCI	Placa fotoluminescente "Número do pavimento" conforme código S17 da NBR 13438	unid			RN	YC	CM						-	-	-			-	-		
1105	3	15	15.07	15.07.029	PPCI	Placa fotoluminescente "ALARME SONORO" conforme código E1 da NBR 13437	unid			RN	YC	CM						-	-	-			-	-		
1106	3	15	15.07	15.07.030	PPCI	Placa fotoluminescente "COMANDO MANUAL DE ALARME DE INCÊNDIO" conforme código E2 da NBR 13437	unid			RN	YC	CM						-	-	-			-	-		
1107	3	15	15.07	15.07.031	PPCI	Placa fotoluminescente "EXTINTOR DE INCÊNDIO" conforme código E5 da NBR 13437	unid			RN	YC	CM						-	-	-			-	-		
1108	3	15	15.07	15.07.032	PPCI	Placa fotoluminescente "ALARME SONORO" conforme código E1 da NBR 13438	unid			RN	YC	CM						-	-	-			-	-		
1109	3	15	15.07	15.07.033	PPCI	Placa fotoluminescente "COMANDO MANUAL DE ALARME SONORO" conforme código E2 da NBR 13439	unid			RN	YC	CM						-	-	-			-	-		
1110	3	15	15.07	15.07.034	PPCI	Placa fotoluminescente "ABRIGO DE MANGUEIRA E HIDRANTE" conforme código E7 da NBR 13440	unid			RN	YC	CM						-	-	-			-	-		
1111	3	15	15.07	15.07.035	PPCI	Placa fotoluminescente "HIDRANTE DE INCÊNDIO" conforme código E8 da NBR 13441	unid			RN	YC	CM						-	-	-			-	-		
1112	3	15	15.07	15.07.036	PPCI	PLACA DE RISCO DE CHOQUE	unid			RN	YC	CM						-	-	-			-	-		
1113	3	15	15.07	15.07.037	PPCI	Sinalização "sentido da rota de saída"	unid			RN	YC	CM						-	-	-			-	-		
1114	3	15	15.07	15.07.038	PPCI	Sinalização "instrução abertura porta com barra anti-pânico"	unid			RN	YC	CM		1,00				-	-	-			-	-		
1115	3	15	15.07	15.07.039	PPCI	Sinalização "instruções para porta corta-fogo"	unid			RN	YC	CM		1,00				-	-	-			-	-		
1116	3	15	15.07	15.07.040	PPCI	Sinalização "Alerta geral"	unid			RN	YC	CM						-	-	-			-	-		
1117	3	15	15.07	15.07.041	PPCI	Sinalização "risco de incêndio"	unid			RN	YC	CM						-	-	-			-	-		
1118	3	15	15.07	15.07.042	PPCI	Sinalização "risco de explosão"	unid			RN	YC	CM						-	-	-			-	-		
1119	3	15	15.07	15.07.043	PPCI	Sinalização "Risco de choque elétrico"	unid			RN	YC	CM		2,00				-	-	-			-	-		
1120	3	15	15.07	15.07.044	PPCI	Sinalização "Proibido produzir chama"	unid			RN	YC	CM						-	-	-			-	-		
1121	3	15	15.07	15.07.045	PPCI	Sinalização "Proibido usar água para apagar fogo"	unid			RN	YC	CM						-	-	-			-	-		
1122	3	15	15.07	15.07.046	PPCI	Sinalização "Proibido fumar"	unid			RN	YC	CM		5,00				-	-	-			-	-		
1123	3	15	15.07	15.07.047	PPCI	Sinalização "Proibido utilizar elevador em caso de incêndio"	unid			RN	YC	CM						-	-	-			-	-		
1124	3	15	15.07	15.07.048	PPCI	Placa de advertência e regulamentação 'ATENÇÃO ALARME' 25x25cm	unid			RN	YC	CM						-	-	-			-	-		
1125	3	15	15.07	15.07.049	PPCI	Placa de advertência de parede 'CFTV SALÃO DE VENDAS' 25x25cm	unid			RN	YC	CM						-	-	-			-	-		
1126	3	15	15.07	15.07.050	PPCI	Placa de advertência de parede 'ORGANIZAÇÃO RESERVA' 25x25cm	unid			RN	YC	CM						-	-	-			-	-		
1127	3	15	15.07	15.07.051	PPCI	Placa de advertência de parede 'COFRE' 25x25cm	unid			RN	YC	CM						-	-	-			-	-		
1128	2	15	15.08	15.08	PPCI	Diversos				RN	YC	CM							-	-	-			-	-	
1129	3	15	15.08	15.08.001	PPCI	Treinamento operacional para instalações de combate a incêndio	conj			RN	YC	CM		1,00				-	-	-			-	-		
1130	3	15	15.08	15.08.002	PPCI	Testes de ajuste e balanceamento das instalações	conj			RN	YC	CM		1,00				-	-	-			-	-		
1131	3	15	15.08	15.08.003	PPCI	Testes hidrostáticos	conj			RN	YC	CM		1,00				-	-	-			-	-		
1132	3	15	15.08	15.08.004	PPCI	Atestado de ativação do sistema de proteção e combate a incêndio	unid			RN	YC	CM		1,00				-	-	-			-	-		
1133	3	15	15.08	15.08.005	PPCI	Acompanhamento de vistoria do corpo de bombeiros - incluindo estadias, horas técnicas, deslocamentos, alimentação e outros	conj			RN	YC	CM		1,00				-	-	-			-	-		
1134	3	15	15.08	15.08.006	PPCI	Quadros de automação de sistema de incendio	unid			RN	YC	CM		1,00				-	-	-			-	-		
1135	1	16	16.01	16	CLIMATIZAÇÃO	INSTALAÇÕES DE CLIMATIZAÇÃO				RN	YC	CM						-	-	-			-	-		
1136	2	16	16.01	16.01	CLIMATIZAÇÃO	Resfriadores de Líquido (RL)				RN	YC	CM						-	-	-			-	-		
1137	3	16	16.01	16.01.001	CLIMATIZAÇÃO	Instalação de resfriador de líquido 80 TR, condensação a ar, incluindo calços amortecedores, ligação hidráulica (tubulações,válvula de balanceamento, válvulas borboletas, juntas de expansão e acessórios) e ligações finais de força/comando/automação.	unid			RN								-	-	-			-	-		
1138	3	16	16.01	16.01.002	CLIMATIZAÇÃO	Instalação de resfriador de líquido 100 TR, condensação a ar, incluindo calços amortecedores, ligação final de hidráulica (tubulações,válvula de balanceamento, válvulas borboletas, juntas de expansão e acessórios) e ligações finais de força/comando/automação.	unid			RN								-	-	-			-	-		
1139	3	16	16.01	16.01.003	CLIMATIZAÇÃO	Instalação de resfriador de líquido 120 TR, condensação a ar, incluindo calços amortecedores, ligação final de hidráulica (tubulações,válvula de balanceamento, válvulas borboletas, juntas de expansão e acessórios) e ligações finais de força/comando/automação.	unid			RN								-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1140	3	16	16.01	16.01.004	CLIMATIZAÇÃO	Instalação de resfriador de líquido 140 TR, condensação a ar, incluindo calços amortecedores, ligação final de hidráulica (tubulações,válvula de balanceamento, válvulas borboletas, juntas de expansão e acessórios) e ligações finais de força/comando/automação.	unid			RN								-	-	-			-	-	
1141	3	16	16.01	16.01.005	CLIMATIZAÇÃO	Instalação de resfriador de líquido160 TR, condensação a ar, incluindo calços amortecedores, ligação final de hidráulica (tubulações,válvula de balanceamento, válvulas borboletas, juntas de expansão e acessórios) e ligações finais de força/comando/automação.	unid			RN								-	-	-			-	-	
1142	3	16	16.01	16.01.006	CLIMATIZAÇÃO	Instalação de resfriador de líquido 180 TR, condensação a ar, incluindo calços amortecedores, ligação final de hidráulica (tubulações,válvula de balanceamento, válvulas borboletas, juntas de expansão e acessórios) e ligações finais de força/comando/automação.	unid			RN								-	-	-			-	-	
1143	3	16	16.01	16.01.007	CLIMATIZAÇÃO	Instalação de resfriador de líquido 200 TR, condensação a ar, incluindo calços amortecedores, ligação final de hidráulica (tubulações,válvula de balanceamento, válvulas borboletas, juntas de expansão e acessórios.) e ligações finais de força/comando/automação.	unid			RN								-	-	-			-	-	
1144	3	16	16.01	16.01.008	CLIMATIZAÇÃO	Desembarque, transporte horizontal e vertical do resfriador até a sua base	unid			RN								-	-	-			-	-	
1145	2	16	16.02	16.02	CLIMATIZAÇÃO	Bombas de Água Gelada (BA)				RN	YC	CM						-	-	-			-	-	
1146	3	16	16.02	16.02.001	CLIMATIZAÇÃO	Fornecimento de moto-bomba, centrífuga, monobloco, faixa de vazão de 30,0 a 40,0 m³/h, altura manométrica na faixa de 25 a 35 mca, motor alto rendimento 4 pólos acionado por inversor de frequência.	unid			RN								-	-	-			-	-	
1147	3	16	16.02	16.02.002	CLIMATIZAÇÃO	Fornecimento de moto-bomba, centrífuga, monobloco, faixa de vazão de 40,1 a 50,0 m³/h, altura manométrica na faixa de 25 a 35 mca, motor alto rendimento 4 pólos acionado por inversor de frequência.	unid			RN								-	-	-			-	-	
1148	3	16	16.02	16.02.003	CLIMATIZAÇÃO	Fornecimento de moto-bomba, centrífuga, monobloco, faixa de vazão de 50,1 a 60,0 m³/h, altura manométrica na faixa de 25 a 35 mca, motor alto rendimento 4 pólos acionado por inversor de frequência.	unid			RN								-	-	-			-	-	
1149	3	16	16.02	16.02.004	CLIMATIZAÇÃO	Fornecimento e instalação da base metálica e calços amortecedores para as bombas	unid			RN								-	-	-			-	-	
1150	3	16	16.02	16.02.005	CLIMATIZAÇÃO	Ligação hidráulica final da moto-bomba (registros borboletas, válvula de retenção, filtro Y, juntas de expansão, manovacúômetros e demais acessórios.) e interligações de força/comando/automação.	unid			RN								-	-	-			-	-	
1151	3	16	16.02	16.02.006	CLIMATIZAÇÃO	Desembarque, transporte horizontal e vertical da moto-bomba até a sua base	unid			RN								-	-	-			-	-	
1152	2	16	16.03	16.03	CLIMATIZAÇÃO	Condicionadores de ar - Fan-coil (FCU)				RN	YC	CM						-	-	-			-	-	
1153	3	16	16.03	16.03.001	CLIMATIZAÇÃO	Instalação do fan-coil, tubulação Ø1", incluindo calços amortecedores, ligação final de hidráulica (registros esfera, válvula de balanceamento, filtro Y, tubos, isolamento térmico e acessórios), ligações finais de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1154	3	16	16.03	16.03.002	CLIMATIZAÇÃO	Instalação do fan-coil, tubulação Ø1.1/4", incluindo calços amortecedores, ligação final de hidráulica (registros esfera, válvula de balanceamento, filtro Y, tubos, isolamento térmico e acessórios), ligações finais de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1155	3	16	16.03	16.03.003	CLIMATIZAÇÃO	Instalação do fan-coil, tubulação Ø1.1/2", ligação final de hidráulica (registros esfera, válvula de balanceamento, filtro Y, tubos, isolamento térmico e acessórios), ligações finais de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1156	3	16	16.03	16.03.004	CLIMATIZAÇÃO	Instalação do fan-coil, tubulação Ø2", ligação final de hidráulica (registros esfera, válvula de balanceamento, filtro Y, tubos, isolamento térmico e acessórios), iligações finais de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1157	3	16	16.03	16.03.005	CLIMATIZAÇÃO	Instalação do fan-coil, tubulação Ø2.1/2", ligação final de hidráulica (registros esfera, válvula de balanceamento, filtro Y, tubos, isolamento térmico e acessórios), ligações finais de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1158	3	16	16.03	16.03.006	CLIMATIZAÇÃO	Desembarque, transporte horizontal e vertical do fan-coil até a sua base	unid			RN								-	-	-			-	-	
1159	3	16	16.03	16.03.007	CLIMATIZAÇÃO	Filtros de ar tipo manta providórios, classe G4-1", para os fan-coils na fase de start-up	unid			RN								-	-	-			-	-	
1160	2	16	16.04	16.04	CLIMATIZAÇÃO	Condicionadores de ar - Splitão (UE/UC)				RN	YC	CM						-	-	-			-	-	
1161	3	16	16.04	16.04.001	CLIMATIZAÇÃO	Instalação splitão 5,0 TR (evaporador+condensador), incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1162	3	16	16.04	16.04.002	CLIMATIZAÇÃO	Instalação splitão 7,5 TR (evaporador+condensador), incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1163	3	16	16.04	16.04.003	CLIMATIZAÇÃO	Instalação splitão 10,0 TR (evaporador+condensador), incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1164	3	16	16.04	16.04.004	CLIMATIZAÇÃO	Instalação splitão 15,0 TR (evaporador+condensador), incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1165	3	16	16.04	16.04.005	CLIMATIZAÇÃO	Instalação splitão 20,0 TR (evaporador+ 2 condensadores), incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1166	3	16	16.04	16.04.006	CLIMATIZAÇÃO	Instalação splitão 25,0 TR (evaporador+ 2 condensadores), incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1167	3	16	16.04	16.04.007	CLIMATIZAÇÃO	Instalação splitão 30,0 TR (evaporador+ 2 condensadores), incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	
1168	3	16	16.04	16.04.008	CLIMATIZAÇÃO	Instalação splitão 40,0 TR (evaporador+ 2 condensadores), incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
1169	3	16	16.04	16.04.009	CLIMATIZAÇÃO	Desembarque, transporte horizontal e vertical dos splitões (evaporador e condensadores) até a suas bases	unid			RN								-	-	-			-	-		
1170	2	16	16.05	16.05	CLIMATIZAÇÃO	Condicionadores de ar - VRF (UE/UC)				RN	YC	CM							-	-	-			-	-	
1171	3	16	16.05	16.05.001	CLIMATIZAÇÃO	Instalação evaporador VRF 8,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN				1,00				-	-	-			-	-		
1172	3	16	16.05	16.05.002	CLIMATIZAÇÃO	Instalação evaporador VRF 10,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1173	3	16	16.05	16.05.003	CLIMATIZAÇÃO	Instalação evaporador VRF 12,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1174	3	16	16.05	16.05.004	CLIMATIZAÇÃO	Instalação evaporador VRF 14,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1175	3	16	16.05	16.05.005	CLIMATIZAÇÃO	Instalação evaporador VRF 16,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1176	3	16	16.05	16.05.006	CLIMATIZAÇÃO	Instalação evaporador VRF 20,0 HP, incluindo calços amortecedores, ligação frigorígena final com acessórios, interligações de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1177	3	16	16.05	16.05.007	CLIMATIZAÇÃO	Instalação evaporador VRF 22,0 HP, incluindo calços amortecedores, ligação frigorígena final com acessórios, interligações de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1178	3	16	16.05	16.05.008	CLIMATIZAÇÃO	Instalação evaporador VRF 24,0 HP, incluindo calços amortecedores, ligação frigorígena final com acessórios, interligações de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1179	3	16	16.05	16.05.009	CLIMATIZAÇÃO	Instalação condensador VRF 8,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1180	3	16	16.05	16.05.010	CLIMATIZAÇÃO	Instalação condensador VRF 10,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1181	3	16	16.05	16.05.011	CLIMATIZAÇÃO	Instalação condensador VRF 12,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1182	3	16	16.05	16.05.012	CLIMATIZAÇÃO	Instalação condensador VRF 14,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1183	3	16	16.05	16.05.013	CLIMATIZAÇÃO	Instalação condensador VRF 16,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1184	3	16	16.05	16.05.014	CLIMATIZAÇÃO	Instalação condensador VRF 20,0 HP, incluindo calços amortecedores, ligação frigorígena final com acessórios, carga de gás R-410A, interligações de força/comando/automação.	unid			RN								-	-	-			-	-		
1185	3	16	16.05	16.05.015	CLIMATIZAÇÃO	Instalação condensador VRF 22,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1186	3	16	16.05	16.05.016	CLIMATIZAÇÃO	Instalação condensador VRF 24,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN								-	-	-			-	-		
1187	3	16	16.05	16.05.017	CLIMATIZAÇÃO	Desembarque, transporte horizontal e vertical dos VRF (evaporador e condensadores) até a suas bases	unid			RN								-	-	-			-	-		
1188	2	16	16.06	16.06	CLIMATIZAÇÃO	Válvulas de Controle e By-pass com atuador proporcional (VC)				RN	YC	CM							-	-	-			-	-	
1189	3	16	16.06	16.06.001	CLIMATIZAÇÃO	Válvula esfera/globo, 2 vias, Ø 1/2", atuador proporcional /on-off com feedback e botão manual de operação	unid			RN								-	-	-			-	-		
1190	3	16	16.06	16.06.002	CLIMATIZAÇÃO	Válvula esfera/globo 2 vias, Ø 3/4", atuador proporcional/on-off com feedback e botão manual de operação	unid			RN								-	-	-			-	-		
1191	3	16	16.06	16.06.003	CLIMATIZAÇÃO	Válvula esfera/globo2 vias, Ø 1", atuador proporcional /on-off com feedback e botão manual de operação	unid			RN								-	-	-			-	-		
1192	3	16	16.06	16.06.004	CLIMATIZAÇÃO	Válvula esfera/globo2 vias, Ø 1.1/2", atuador proporcional /on-off com feedback e botão manual de operação	unid			RN								-	-	-			-	-		
1193	3	16	16.06	16.06.005	CLIMATIZAÇÃO	Válvula esfera/globo 2 vias, Ø 2", atuador proporcional /on-off com feedback e botão manual de operação	unid			RN								-	-	-			-	-		
1194	3	16	16.06	16.06.006	CLIMATIZAÇÃO	Válvula esfera/globo 2 vias, Ø 2.1/2", atuador proporcional /on-off com feedback e botão manual de operação	unid			RN								-	-	-			-	-		
1195	3	16	16.06	16.06.007	CLIMATIZAÇÃO	Válvula esfera/globo 2 vias, Ø 3", atuador proporcional /on-off com feedback e botão manual de operação	unid			RN								-	-	-			-	-		
1196	3	16	16.06	16.06.008	CLIMATIZAÇÃO	Válvula de controle e balanceamento independente de pressão, 2 vias, Ø 1/2", atuador proporcional com feedback e botão manual de operação.	unid			RN								-	-	-			-	-		
1197	3	16	16.06	16.06.009	CLIMATIZAÇÃO	Válvula de controle e balanceamento independente de pressão, 2 vias, Ø 3/4", atuador proporcional com feedback e botão manual de operação.	unid			RN								-	-	-			-	-		
1198	3	16	16.06	16.06.010	CLIMATIZAÇÃO	Válvula de controle e balanceamento independente de pressão, 2 vias, Ø 1", atuador proporcional com feedback e botão manual de operação.	unid			RN								-	-	-			-	-		
1199	3	16	16.06	16.06.011	CLIMATIZAÇÃO	Válvula de controle e balanceamento independente de pressão, 2 vias, Ø 1.1/2", atuador proporcional com feedback e botão manual de operação.	unid			RN								-	-	-			-	-		
1200	3	16	16.06	16.06.012	CLIMATIZAÇÃO	Válvula de controle e balanceamento independente de pressão, 2 vias, Ø 2", atuador proporcional com feedback e botão manual de operação.	unid			RN								-	-	-			-	-		
1201	3	16	16.06	16.06.013	CLIMATIZAÇÃO	Válvula de controle e balanceamento independente de pressão, 2 vias, Ø 2.1/2", atuador proporcional com feedback e botão manual de operação.	unid			RN								-	-	-			-	-		
1202	2	16	16.07	16.07	CLIMATIZAÇÃO	Condicionadores de Ar tipo Split System				RN	YC	CM							-	-	-			-	-	
1203	3	16	16.07	16.07.001	CLIMATIZAÇÃO	Fornecimento e instalação de High Wall 27.000/30.000 BTU/h, inverter, ciclo frio, carga de gás R-410A , incluindo suporte do condensador e calços amortecedores .	unid			RN								-	-	-			-	-		
1204	3	16	16.07	16.07.002	CLIMATIZAÇÃO	Fornecimento e instalação de High Wall 22.000/24.000 BTU/h, inverter, ciclo frio, carga de gás R-410A, incluindo suporte do condensador e calços amortecedores .	unid			RN								-	-	-			-	-		
1205	3	16	16.07	16.07.003	CLIMATIZAÇÃO	Fornecimento e instalação de High Wall 18.000 BTU/h, inverter, ciclo frio, carga de gás R-410A, incluindo suporte do condensador e calços amortecedores .	unid			RN				2,00				-	-	-			-	-		
1206	2	16	16.08	16.08	CLIMATIZAÇÃO	Dispositivos de insuflação, retorno e regulação do ar				RN	YC	CM							-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1207	3	16	16.08	16.08.001	CLIMATIZAÇÃO	Difusor de exaustão em plástico ABS - DVK-R Ø200mm	unid			RN	YC	CM						-	-	-			-	-	
1208	3	16	16.08	16.08.002	CLIMATIZAÇÃO	Porta de inspeção para dutos, isolada. Fab: Refrin Mod: PIPER GA-SP-I Dimensões: até 0,2 m².	unid			RN	YC	CM						-	-	-			-	-	
1209	3	16	16.08	16.08.003	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área até 0,10 m²	unid			RN	YC	CM						-	-	-			-	-	
1210	3	16	16.08	16.08.004	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área de 0,11 a 0,20 m²	unid			RN	YC	CM						-	-	-			-	-	
1211	3	16	16.08	16.08.005	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área de 0,21 a 0,30 m²	unid			RN	YC	CM		4,00				-	-	-			-	-	
1212	3	16	16.08	16.08.006	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área de 0,31 a 0,40 m²	unid			RN	YC	CM						-	-	-			-	-	
1213	3	16	16.08	16.08.007	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área de 0,41 a 0,50 m²	unid			RN	YC	CM						-	-	-			-	-	
1214	3	16	16.08	16.08.008	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área de 0,51 a 0,75 m²	unid			RN	YC	CM		2,00				-	-	-			-	-	
1215	3	16	16.08	16.08.009	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área de 0,76 a 1,25 m²	unid			RN	YC	CM						-	-	-			-	-	
1216	3	16	16.08	16.08.010	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área de 1,26 a 1,75 m²	unid			RN	YC	CM		2,00				-	-	-			-	-	
1217	3	16	16.08	16.08.011	CLIMATIZAÇÃO	Registro de vazão de ar, lâminas aerodinâmicas. Fab: Trox Mod: JN-B. Área de 1,76 a 2,25 m²	unid			RN	YC	CM						-	-	-			-	-	
1218	3	16	16.08	16.08.012	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área até 0,10 m²	unid			RN	YC	CM		6,00				-	-	-			-	-	
1219	3	16	16.08	16.08.013	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área de 0,11 a 0,20 m²	unid			RN	YC	CM		5,00				-	-	-			-	-	
1220	3	16	16.08	16.08.014	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área de 0,21 a 0,30 m²	unid			RN	YC	CM		3,00				-	-	-			-	-	
1221	3	16	16.08	16.08.015	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área de 0,31 a 0,40 m²	unid			RN	YC	CM						-	-	-			-	-	
1222	3	16	16.08	16.08.016	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área de 0,41 a 0,50 m²	unid			RN	YC	CM		1,00				-	-	-			-	-	
1223	3	16	16.08	16.08.017	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área de 0,51 a 0,75 m²	unid			RN	YC	CM						-	-	-			-	-	
1224	3	16	16.08	16.08.018	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área de 0,76 a 1,25 m²	unid			RN	YC	CM						-	-	-			-	-	
1225	3	16	16.08	16.08.019	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área de 1,26 a 1,75 m²	unid			RN	YC	CM						-	-	-			-	-	
1226	3	16	16.08	16.08.020	CLIMATIZAÇÃO	Registro de vazão de ar, linha leve. Fab: Trox Mod: RL-B. Área de 1,76 a 2,25 m²	unid			RN	YC	CM						-	-	-			-	-	
1227	3	16	16.08	16.08.021	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/AGÁrea até 0,10 m².	unid			RN	YC	CM		46,00				-	-	-			-	-	
1228	3	16	16.08	16.08.022	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AH-15/AGÁrea de 0,11 a 0,20 m².	unid			RN	YC	CM						-	-	-			-	-	
1229	3	16	16.08	16.08.023	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/AGÁrea de 0,21 a 0,30 m².	unid			RN	YC	CM		1,00				-	-	-			-	-	
1230	3	16	16.08	16.08.024	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/AGÁrea de 0,31 a 0,40 m².	unid			RN	YC	CM						-	-	-			-	-	
1231	3	16	16.08	16.08.025	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/ágata da Islândia Fab: Trox Mod: AH-15/AGÁrea de 0,41 a 0,50 m².	unid			RN	YC	CM						-	-	-			-	-	
1232	3	16	16.08	16.08.026	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.. Fab: Trox Mod: AH-15/AGÁrea de 0,51 a 0,60 m².	unid			RN	YC	CM						-	-	-			-	-	
1233	3	16	16.08	16.08.027	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/AGÁrea de 0,61 a 0,70 m².	unid			RN	YC	CM						-	-	-			-	-	
1234	3	16	16.08	16.08.028	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AH-15/AGÁrea de 0,71 a 0,80 m².	unid			RN	YC	CM						-	-	-			-	-	
1235	3	16	16.08	16.08.029	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AH-15/ÁÁrea até 0,10 m².	unid			RN	YC	CM		11,00				-	-	-			-	-	
1236	3	16	16.08	16.08.030	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AH-15/ÁÁrea de 0,11 a 0,20 m².	unid			RN	YC	CM		2,00				-	-	-			-	-	
1237	3	16	16.08	16.08.031	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/ÁÁrea de 0,21 a 0,30 m².	unid			RN	YC	CM		2,00				-	-	-			-	-	
1238	3	16	16.08	16.08.032	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/ÁÁrea de 0,31 a 0,40 m².	unid			RN	YC	CM						-	-	-			-	-	
1239	3	16	16.08	16.08.033	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/ÁÁrea de 0,41 a 0,50 m².	unid			RN	YC	CM						-	-	-			-	-	
1240	3	16	16.08	16.08.034	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AH-15/ÁÁrea de 0,51 a 0,60 m².	unid			RN	YC	CM		2,00				-	-	-			-	-	
1241	3	16	16.08	16.08.035	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/ÁÁrea de 0,61 a 0,70 m².	unid			RN	YC	CM		10,00				-	-	-			-	-	
1242	3	16	16.08	16.08.036	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AH-15/ÁÁrea de 0,71 a 0,80 m².	unid			RN	YC	CM						-	-	-			-	-	
1243	3	16	16.08	16.08.037	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AR/AGÁrea até 0,10 m².	unid			RN	YC	CM						-	-	-			-	-	
1244	3	16	16.08	16.08.038	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AR/AGÁrea de 0,11 a 0,20 m².	unid			RN	YC	CM						-	-	-			-	-	
1245	3	16	16.08	16.08.039	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AR/AGÁrea de 0,21 a 0,30 m².	unid			RN	YC	CM						-	-	-			-	-	
1246	3	16	16.08	16.08.040	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AR/AGÁrea de 0,31 a 0,40 m².	unid			RN	YC	CM						-	-	-			-	-	
1247	3	16	16.08	16.08.041	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/ágata da Islândia Fab: Trox Mod: AR/AGÁrea de 0,41 a 0,50 m².	unid			RN	YC	CM						-	-	-			-	-	
1248	3	16	16.08	16.08.042	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.. Fab: Trox Mod: AR/AGÁrea de 0,51 a 0,60 m².	unid			RN	YC	CM						-	-	-			-	-	
1249	3	16	16.08	16.08.043	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AR/AGÁrea de 0,61 a 0,70 m².	unid			RN	YC	CM						-	-	-			-	-	
1250	3	16	16.08	16.08.044	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AR/AGÁrea de 0,71 a 0,80 m².	unid			RN	YC	CM						-	-	-			-	-	
1251	3	16	16.08	16.08.045	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, miolo removível, cor branco acetinado/ Ágata da Islândia.Fab: Trox Mod: AHS/ÁÁrea até 0,25 m².	unid			RN	YC	CM						-	-	-			-	-	
1252	3	16	16.08	16.08.046	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, sem registro, miolo removível, cor branco acetinado/ Ágata da Islândia.Fab: Trox Mod: AHS/ÁÁrea de 0,25m2 a 0,50m².	unid			RN	YC	CM						-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1253	3	16	16.08	16.08.047	CLIMATIZAÇÃO	Grelha em alumínio, aletas dupla deflexão, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: VAT-DGÁrea até 0,10 m².	unid			RN	YC	CM						-	-	-			-	-	
1254	3	16	16.08	16.08.048	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AH-15/AGÁrea de 0,11 a 0,20 m².	unid			RN	YC	CM						-	-	-			-	-	
1255	3	16	16.08	16.08.049	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/AGÁrea de 0,21 a 0,30 m².	unid			RN	YC	CM						-	-	-			-	-	
1256	3	16	16.08	16.08.050	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/AGÁrea de 0,31 a 0,40 m².	unid			RN	YC	CM						-	-	-			-	-	
1257	3	16	16.08	16.08.051	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/ágata da Islândia Fab: Trox Mod: AH-15/AGÁrea de 0,41 a 0,50 m².	unid			RN	YC	CM						-	-	-			-	-	
1258	3	16	16.08	16.08.052	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.. Fab: Trox Mod: AH-15/AGÁrea de 0,51 a 0,60 m².	unid			RN	YC	CM						-	-	-			-	-	
1259	3	16	16.08	16.08.053	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: AH-15/AGÁrea de 0,61 a 0,70 m².	unid			RN	YC	CM						-	-	-			-	-	
1260	3	16	16.08	16.08.054	CLIMATIZAÇÃO	Grelha em alumínio, aletas fixas horizontais, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: AH-15/AGÁrea de 0,71 a 0,80 m².	unid			RN	YC	CM						-	-	-			-	-	
1261	3	16	16.08	16.08.055	CLIMATIZAÇÃO	Grelha em alumínio , aletas dupla deflexão, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: VAT-DGÁrea de 0,00 a 0,10 m².	unid			RN	YC	CM						-	-	-			-	-	
1262	3	16	16.08	16.08.056	CLIMATIZAÇÃO	Grelha em alumínio, aletas dupla deflexão, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: VAT-DGÁrea de 0,11 a 0,20 m².	unid			RN	YC	CM						-	-	-			-	-	
1263	3	16	16.08	16.08.057	CLIMATIZAÇÃO	Grelha em alumínio, aletas dupla deflexão, com registro, cor branco acetinado/Ágata da Islândia. Fab: Trox Mod: VAT-DGÁrea de 0,21 a 0,30 m².	unid			RN	YC	CM						-	-	-			-	-	
1264	3	16	16.08	16.08.058	CLIMATIZAÇÃO	Grelha em alumínio, aletas dupla deflexão, com registro, cor branco acetinado/Ágata da Islândia.Fab: Trox Mod: VAT-DGÁrea de 0,31 a 0,40 m².	unid			RN	YC	CM						-	-	-			-	-	
1265	3	16	16.08	16.08.059	CLIMATIZAÇÃO	Grelha em alumínio, para portas, aletas fixas horizontais em "V", contra-moldura, cor branco acetinado. Fab: Trox Mod: AGS-TÁrea até 0,10 m².	unid			RN	YC	CM						-	-	-			-	-	
1266	3	16	16.08	16.08.060	CLIMATIZAÇÃO	Grelha em alumínio, para portas, aletas fixas horizontais em "V", contra-moldura, cor branco acetinado. Fab: Trox Mod: AGS-TÁrea de 0,11 a 0,20 m².	unid			RN	YC	CM		8,00				-	-	-			-	-	
1267	3	16	16.08	16.08.061	CLIMATIZAÇÃO	Grelha em alumínio, para portas, aletas fixas horizontais em "V", contra-moldura, cor branco acetinado. Fab: Trox Mod: AGS-TÁrea de 0,21 a 0,30 m².	unid			RN	YC	CM						-	-	-			-	-	
1268	3	16	16.08	16.08.062	CLIMATIZAÇÃO	Grelha em alumínio, para portas, aletas fixas horizontais em "V", contra-moldura, cor branco acetinado. Fab: Trox Mod: AGS-TÁrea de 0,31 a 0,40 m².	unid			RN	YC	CM						-	-	-			-	-	
1269	3	16	16.08	16.08.063	CLIMATIZAÇÃO	Grelha em alumínio, para portas, aletas fixas horizontais em "V", contra-moldura, cor branco acetinado. Fab: Trox Mod: AGS-TÁrea de 0,41 a 0,50 m².	unid			RN	YC	CM						-	-	-			-	-	
1270	3	16	16.08	16.08.064	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área até 0,10 m².	unid			RN	YC	CM						-	-	-			-	-	
1271	3	16	16.08	16.08.065	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área de 0,11 a 0,20 m².	unid			RN	YC	CM		2,00				-	-	-			-	-	
1272	3	16	16.08	16.08.066	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK. Área de 0,21 a 0,30 m².	unid			RN	YC	CM						-	-	-			-	-	
1273	3	16	16.08	16.08.067	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área de 0,31 a 0,40 m².	unid			RN	YC	CM						-	-	-			-	-	
1274	3	16	16.08	16.08.068	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área de 0,41 a 0,50 m².	unid			RN	YC	CM						-	-	-			-	-	
1275	3	16	16.08	16.08.069	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área de 0,51 a 0,75 m².	unid			RN	YC	CM						-	-	-			-	-	
1276	3	16	16.08	16.08.070	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área de 0,75 a 0,1,0 m².	unid			RN	YC	CM						-	-	-			-	-	
1277	3	16	16.08	16.08.071	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área de 0,76 a 1,25 m².	unid			RN	YC	CM						-	-	-			-	-	
1278	3	16	16.08	16.08.072	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área de 1,26 a 1,75 m².	unid			RN	YC	CM						-	-	-			-	-	
1279	3	16	16.08	16.08.073	CLIMATIZAÇÃO	Veneziana em alumínio, aletas fixas horizontais, tela de PVC, pintada na cor da parede/fachada.Fab: Trox Mod: AWG/AWK.Área de 1,76 a 2,25 m².	unid			RN	YC	CM						-	-	-			-	-	
1280	3	16	16.08	16.08.074	CLIMATIZAÇÃO	Damper corta-fogo, elemento fusível 72°C, chave fim de curso, estanque para fumaça fria e quente.Fab: Trox Mod: FKA-TI-BR-60.Área até 0,25 m²	unid			RN	YC	CM						-	-	-			-	-	
1281	3	16	16.08	16.08.075	CLIMATIZAÇÃO	Damper corta-fogo, elemento fusível 72°C, chave fim de curso, estanque para fumaça fria e quente.Fab: Trox Mod: FKA-TI-BR-60.Área de 0,26 a 0,50 m²	unid			RN	YC	CM						-	-	-			-	-	
1282	3	16	16.08	16.08.076	CLIMATIZAÇÃO	Damper corta-fogo, elemento fusível 72°C, chave fim de curso, estanque para fumaça fria e quente.Fab: Trox Mod: FKA-TI-BR-60.Área de 0,51 a 0,75 m²	unid			RN	YC	CM						-	-	-			-	-	
1283	3	16	16.08	16.08.077	CLIMATIZAÇÃO	Damper corta-fogo, elemento fusível 72°C, chave fim de curso, estanque para fumaça fria e quente.Fab: Trox Mod: FKA-TI-BR-60.Área de 0,76 a 1,0 m²	unid			RN	YC	CM						-	-	-			-	-	
1284	3	16	16.08	16.08.078	CLIMATIZAÇÃO	Damper corta-fogo, elemento fusível 72°C, chave fim de curso, estanque para fumaça fria e quente.Fab: Trox Mod: FKA-TI-BR-60.Área de 1,01 a 1,25 m².	unid			RN	YC	CM						-	-	-			-	-	
1285	3	16	16.08	16.08.079	CLIMATIZAÇÃO	Difusor de alumínio quadrado, 4 vias, caixa plenum AK6 , com registro, cor branco acetinado/Ágata da Islândia. FAB: Trox Mod: ADLQ-AK-AG Tamanho 3	unid			RN	YC	CM						-	-	-			-	-	
1286	3	16	16.08	16.08.080	CLIMATIZAÇÃO	Difusor de alumínio quadrado, 4 vias, caixa plenum AK6 , com registro, cor branco acetinado/Ágata da Islândia. FAB: Trox Mod: ADLQ-AK-AG Tamanho 4	unid			RN	YC	CM						-	-	-			-	-	
1287	3	16	16.08	16.08.081	CLIMATIZAÇÃO	Difusor de alumínio quadrado, 4 vias, caixa plenum AK6 , com registro, cor branco acetinado/Ágata da Islândia. FAB: Trox Mod: ADLQ-AK-AG Tamanho 5	unid			RN	YC	CM						-	-	-			-	-	
1288	3	16	16.08	16.08.082	CLIMATIZAÇÃO	Difusor de alumínio quadrado, 4 vias, com registro, cor branco acetinado/Ágata da Islândia. FAB: Trox Mod: ADLQ-AG Tamanho 3	unid			RN	YC	CM		8,00				-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1289	3	16	16.08	16.08.083	CLIMATIZAÇÃO	Difusor de alumínio quadrado, 4 vias, com registro, cor branco acetinado/Ágata da Islândia. FAB: Trox Mod: ADLQ-AG Tamanho 4	unid			RN	YC	CM						-	-	-			-	-	
1290	3	16	16.08	16.08.084	CLIMATIZAÇÃO	Difusor de alumínio quadrado, 4 vias, com registro, cor branco acetinado/Ágata da Islândia. FAB: Trox Mod: ADLQ-AG Tamanho 5	unid			RN	YC	CM		9,00				-	-	-			-	-	
1291	3	16	16.08	16.08.085	CLIMATIZAÇÃO	Difusor de alumínio quadrado, 4 vias, alta indução, caixa plenum com entrada lateral/superior, cor branco acetinado/Ágata da Islândia.FAB: Trox Mod: VD Tamanho 425	unid			RN	YC	CM						-	-	-			-	-	
1292	3	16	16.08	16.08.086	CLIMATIZAÇÃO	Difusor de alumínio quadrado, 4 vias, alta indução, caixa plenum com entrada lateral/superior, cor branco acetinado/Ágata da Islândia.FAB: Trox Mod: VD Tamanho 625	unid			RN	YC	CM						-	-	-			-	-	
1293	3	16	16.08	16.08.087	CLIMATIZAÇÃO	Difusor linear de alumínio, 02 fendas, terminais direito e esquerdo, lâminas plásticas pretas, caixa plenum AK, cor branco acetinado.FAB: Trox Mod: VSD35-2-AK.Comprimento total até 1,0 m.	unid			RN	YC	CM						-	-	-			-	-	
1294	3	16	16.08	16.08.088	CLIMATIZAÇÃO	Difusor linear de alumínio, 02 fendas, terminais direito e esquerdo, lâminas plásticas pretas, caixa plenum AK, cor branco acetinado.FAB: Trox Mod: VSD35-2-AK.Comprimento total de 1,1 a 2,0 m.	unid			RN	YC	CM						-	-	-			-	-	
1295	3	16	16.08	16.08.089	CLIMATIZAÇÃO	Difusor linear de alumínio, 02 fendas, terminais direito e esquerdo, lâminas plásticas pretas, caixa plenum AK, cor branco acetinado.FAB: Trox Mod: VSD35-2-AK.Comprimento total de 2,1 a 3,0 m.	unid			RN	YC	CM						-	-	-			-	-	
1296	3	16	16.08	16.08.090	CLIMATIZAÇÃO	Difusor linear de alumínio, 02 fendas, terminais direito e esquerdo, lâminas plásticas pretas, caixa plenum AK, cor branco acetinado.FAB: Trox Mod: VSD35-2-AK.Comprimento total de 3,1 a 4,0 m.	unid			RN	YC	CM						-	-	-			-	-	
1297	3	16	16.08	16.08.091	CLIMATIZAÇÃO	Difusor linear de alumínio, 02 fendas, terminais direito e esquerdo, lâminas plásticas pretas, caixa plenum AK, cor branco acetinado.FAB: Trox Mod: VSD35-2-AK.Comprimento total de 4,1 a 5,0 m.	unid			RN	YC	CM		7,00				-	-	-			-	-	
1298	3	16	16.08	16.08.092	CLIMATIZAÇÃO	Difusor linear de alumínio, 02 fendas, terminais direito e esquerdo, lâminas plásticas pretas, caixa plenum AK, cor branco acetinado.FAB: Trox Mod: VSD35-2-AK.Comprimento total de 5,1 a 6,0 m.	unid			RN	YC	CM		2,00				-	-	-			-	-	
1299	2	16	16.09	16.09	CLIMATIZAÇÃO	Rede de dutos de insuflação, retorno, exaustão e ar exterior				RN	YC	CM							-	-			-	-	
1300	3	16	16.09	16.09.001	CLIMATIZAÇÃO	Dutos executados em chapas de aço galvanizadas, padrão TDC, #20, conforme tabela B.9 da NBR 16401-1:2008, acessórios, pintura e suportes necessários.	kg			RN	YC	CM						-	-	-			-	-	
1301	3	16	16.09	16.09.002	CLIMATIZAÇÃO	Dutos executados em chapas de aço galvanizadas, padrão TDC, #22, conforme tabela B.9 da NBR 16401-1:2008, acessórios, pintura e suportes necessários.	kg			RN		CM						-	-	-			-	-	
1302	3	16	16.09	16.09.003	CLIMATIZAÇÃO	Dutos executados em chapas de aço galvanizadas, padrão TDC, #24, conforme tabela B.9 da NBR 16401-1:2008, acessórios, pintura e suportes necessários.	kg			RN	YC	CM						-	-	-			-	-	
1303	3	16	16.09	16.09.004	CLIMATIZAÇÃO	Dutos executados em chapas de aço galvanizadas, padrão TDC, #26, conforme tabela B.9 da NBR 16401-1:2008, acessórios, pintura e suportes necessários.	kg			RN	YC	CM						-	-	-			-	-	
1304	3	16	16.09	16.09.005	CLIMATIZAÇÃO	Dutos flexíveis com isolamento em lã de vidro, esp. 25mm, Ø15cm	m			RN				135,00				-	-	-			-	-	
1305	3	16	16.09	16.09.006	CLIMATIZAÇÃO	Dutos flexíveis com isolamento em lã de vidro, esp. 25mm, Ø20cm	m			RN								-	-	-			-	-	
1306	3	16	16.09	16.09.007	CLIMATIZAÇÃO	Dutos flexíveis com isolamento em lã de vidro, esp. 25mm, Ø25cm	m			RN								-	-	-			-	-	
1307	3	16	16.09	16.09.008	CLIMATIZAÇÃO	Manta lã de vidro aluminizada, espessura 38mm, incluindo fita plástica aluminizada, cantoneiras, pintura e demais acessórios.	m²			RN								-	-	-			-	-	
1308	3	16	16.09	16.09.009	CLIMATIZAÇÃO	Manta em fibra cerâmica, revestida com filme de alumínio, para isolamento de dutos extração de fumaça, densidade 96 kg/cm³, espessura 50 mm. Incluindo fita adesiva de alumínio, fita/selos de aço para fixação e demais acessórios. próprios para altas temperaturas. Prever pintura de acabamento.	m²			RN		CM						-	-	-			-	-	
1309	3	16	16.09	16.09.010	CLIMATIZAÇÃO	Dutos executados em painéis tipo sanduiche (MPU/AluPir), espessura 20mm, núcleo de poliuretano/PIR, revestido nas duas faces com alumínio, incluindo fita adesiva, vedante, conexões de PVC, perfis e discos de alumínio, cantos, reforços, acessórios, pintura e suportes necessários.	m²			RN	YC	CM						-	-	-			-	-	
1310	3	16	16.09	16.09.011	CLIMATIZAÇÃO	Conexão/junta flexível de lona de vinil resistente aos raios UV fixada em chapa galvanizada	m			RN								-	-	-			-	-	
1311	3	16	16.09	16.09.012	CLIMATIZAÇÃO	Chapa de aço INOX para dutos de exaustão com no mínimo e=1,09 de acordo com a norma NBR 14518	kg			RN								-	-	-			-	-	
1312	3	16	16.09	16.09.013	CLIMATIZAÇÃO	Dutos de exaustão em chapa preta #16 conforme NBR14518	kg			RN								-	-	-			-	-	
1313	3	16	16.09	16.09.014	CLIMATIZAÇÃO	Dutos flexíveis com isolamento em lã de vidro, esp. 25mm, Ø10cm	m			RN								-	-	-			-	-	
1314	3	16	16.09	16.09.015	CLIMATIZAÇÃO	Isolamento térmico executado com espuma elastomérica esp: 19mm, incluindo cinta adesiva, cola, acessórios e suportes necessários.	m²				YC							-	-	-			-	-	
1315	3	16	16.09	16.09.016	CLIMATIZAÇÃO	Isolamento térmico executado com espuma elastomérica esp: 9mm, incluindo cinta adesiva, cola, acessórios e suportes necessários.	m²				YC							-	-	-			-	-	
1316	3	16	16.09	16.09.017	CLIMATIZAÇÃO	Dutos executados em painéis tipo sanduiche (MPU/AluPir), espessura 30mm, núcleo de poliuretano/PIR, revestido nas duas faces com alumínio, incluindo fita adesiva, vedante, conexões de PVC, perfis e discos de alumínio, cantos, reforços, acessórios, pintura e suportes necessários.	m²					CM		1.140,00				-	-	-			-	-	
1317	2	16	16.10	16.10	CLIMATIZAÇÃO	Tubulações - Água gelada e Frigorigenas				RN	YC	CM							-	-			-	-	
1318	3	16	16.10	16.10.001	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 1/2", tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN	YC	CM						-	-	-			-	-	
1319	3	16	16.10	16.10.002	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 3/4", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1320	3	16	16.10	16.10.003	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 1", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1321	3	16	16.10	16.10.004	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 1.1/4", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1322	3	16	16.10	16.10.005	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 1.1/2", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1323	3	16	16.10	16.10.006	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 2", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN	YC	CM						-	-	-			-	-	
1324	3	16	16.10	16.10.007	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 2.1/2", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1325	3	16	16.10	16.10.008	CLIMATIZAÇÃO	Tubulo aço carbono SCH40 S/C Ø 3", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1326	3	16	16.10	16.10.009	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 4", tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1327	3	16	16.10	16.10.010	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 5", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1328	3	16	16.10	16.10.011	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 6", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1329	3	16	16.10	16.10.012	CLIMATIZAÇÃO	Tubo aço carbono SCH40 S/C Ø 8", com tratamento anticorrosivo, isolado com espuma elastomérica, incluindo conexões, soldas, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1330	3	16	16.10	16.10.013	CLIMATIZAÇÃO	Tubo aço galvanizado DIN 2440 C/C Ø1/2", isolado com espuma elastomérica, incluindo conexões, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1331	3	16	16.10	16.10.014	CLIMATIZAÇÃO	Tubo aço galvanizado DIN 2440 C/C Ø3/4 ", isolado com espuma elastomérica, incluindo conexões, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1332	3	16	16.10	16.10.015	CLIMATIZAÇÃO	Tubo aço galvanizado DIN 2440 C/C Ø1.1/4", isolado com espuma elastomérica, incluindo conexões, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1333	3	16	16.10	16.10.016	CLIMATIZAÇÃO	Tubo aço galvanizado DIN 2440 C/C Ø1.1/2", isolado com espuma elastomérica, incluindo conexões, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1334	3	16	16.10	16.10.017	CLIMATIZAÇÃO	Tubo aço galvanizado DIN 2440 C/C Ø2", isolado com espuma elastomérica, incluindo conexões, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1335	3	16	16.10	16.10.018	CLIMATIZAÇÃO	Tubo aço galvanizado DIN 2440 C/C Ø2.1/2", isolado com espuma elastomérica, incluindo conexões, cola, fita, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1336	3	16	16.10	16.10.019	CLIMATIZAÇÃO	Tubo PVC marrom Ø20/25 mm - inclusive acessórios, suportes e conexões	m			RN								-	-	-			-	-	
1337	3	16	16.10	16.10.020	CLIMATIZAÇÃO	Tubo PVC marrom Ø32/40 mm - inclusive acessórios, suportes e conexões	m			RN								-	-	-			-	-	
1338	3	16	16.10	16.10.021	CLIMATIZAÇÃO	Manta Armaflex 32 mm, cola, fita adesiva e demais acessórios	m²			RN								-	-	-			-	-	
1339	3	16	16.10	16.10.022	CLIMATIZAÇÃO	Manta Armaflex 10mm, cola, fita adesiva e demais acessórios	m²			RN								-	-	-			-	-	
1340	3	16	16.10	16.10.023	CLIMATIZAÇÃO	Alumínio liso espessura 0,6 mm, calandrado, proteção mecânica do isolamento tubulações.	m			RN								-	-	-			-	-	
1341	3	16	16.10	16.10.024	CLIMATIZAÇÃO	Alumínio corrugado, espessura 0,15 mm, proteção mecânica do isolamento tubulações.	m²			RN								-	-	-			-	-	
1342	3	16	16.10	16.10.025	CLIMATIZAÇÃO	Reservatório de polietileno 100/300 litros (vaso de expansão), com sensor/chave bóia elétrica de nível (superior/inferior), interligações elétricas incluindo cabos, eletrodutos e acessórios.	unid			RN								-	-	-			-	-	
1343	3	16	16.10	16.10.026	CLIMATIZAÇÃO	Tubo cobre S/C Ø1/4" (Ø6,35mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1344	3	16	16.10	16.10.027	CLIMATIZAÇÃO	Tubo cobre S/C Ø3/8"(Ø9,52mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1345	3	16	16.10	16.10.028	CLIMATIZAÇÃO	Tubo cobre S/C Ø1/2"(Ø12,7mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN				5,00				-	-	-			-	-	
1346	3	16	16.10	16.10.029	CLIMATIZAÇÃO	Tubo cobre S/C Ø5/8"(Ø15,9mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN				70,00				-	-	-			-	-	
1347	3	16	16.10	16.10.030	CLIMATIZAÇÃO	Tubo cobre S/C Ø3/4"(Ø19,1mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN				69,00				-	-	-			-	-	
1348	3	16	16.10	16.10.031	CLIMATIZAÇÃO	Tubo cobre S/C Ø7/8"(Ø22,2mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN				55,00				-	-	-			-	-	
1349	3	16	16.10	16.10.032	CLIMATIZAÇÃO	Tubo cobre S/C Ø1"(Ø25,4mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1350	3	16	16.10	16.10.033	CLIMATIZAÇÃO	Tubo cobre S/C Ø1.1/8"(Ø28,6mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN				68,00				-	-	-			-	-	
1351	3	16	16.10	16.10.034	CLIMATIZAÇÃO	Tubo cobre S/C Ø1.1/4"(Ø31,8mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN				26,00				-	-	-			-	-	
1352	3	16	16.10	16.10.035	CLIMATIZAÇÃO	Tubo cobre S/C Ø1.3/8"(Ø34,9mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1353	3	16	16.10	16.10.036	CLIMATIZAÇÃO	Tubo cobre S/C Ø1.1/2"(Ø38,1mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN				46,00				-	-	-			-	-	
1354	3	16	16.10	16.10.037	CLIMATIZAÇÃO	Tubo cobre S/C Ø1.5/8"(Ø41,3mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1355	3	16	16.10	16.10.038	CLIMATIZAÇÃO	Tubo cobre S/C Ø1.3/4"(Ø44,5mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN				48,00				-	-	-			-	-	
1356	3	16	16.10	16.10.039	CLIMATIZAÇÃO	Tubo cobre S/C Ø1.7/8"(Ø47,6mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1357	3	16	16.10	16.10.040	CLIMATIZAÇÃO	Tubo cobre S/C Ø2"(Ø50,8mm), gás R-410A, isolado com espuma elastomérica, incluindo conexões, solda, cola, fita plástica, suportes e demais acessórios.	m			RN								-	-	-			-	-	
1358	3	16	16.10	16.10.041	CLIMATIZAÇÃO	Gás refrigerante R-410A	kg			RN								-	-	-			-	-	
1359	2	16	16.11	16.11	CLIMATIZAÇÃO	Quadros Elétricos e de Controle/Automação				RN	YC	CM						-	-	-			-	-	
1360	3	16	16.11	16.11.001	CLIMATIZAÇÃO	Instalação de sensor de temperatura Splitão/VRF	unid			RN	YC	CM						-	-	-			-	-	
1361	3	16	16.11	16.11.002	CLIMATIZAÇÃO	Instalação do quadro elétrico de força (QEAC), ligações elétricas do quadro até o motor, incluindo cabos, eletrodutos e acessórios - Motores até 6,0cv (com ou sem inversor).	unid			RN	YC	CM		4,00				-	-	-			-	-	
1362	3	16	16.11	16.11.003	CLIMATIZAÇÃO	Instalação do quadro elétrico de força (QEAC), ligações elétricas do quadro até o motor, incluindo cabos, eletrodutos e acessórios - Motores de 7,5 a 15,0cv (com ou sem inversor).	unid			RN	YC	CM						-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações	
1363	3	16	16.11	16.11.004	CLIMATIZAÇÃO	Instalação do quadro elétrico de força (QEAC), splits do no-break, , ligações elétricas do quadro até os evaporadores/condensadores, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM		1,00				-	-	-			-	-		
1364	3	16	16.11	16.11.005	CLIMATIZAÇÃO	Instalação do quadro de comando/automação (QCAC) e interligações necessárias (sensores, atuadores, QEAC, QCR, etc.), incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM		6,00				-	-	-			-	-		
1365	3	16	16.11	16.11.006	CLIMATIZAÇÃO	Instalação do quadro de comando remoto (QCR) e interligações necessárias (controlador, sensores.), incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM		1,00				-	-	-			-	-		
1366	3	16	16.11	16.11.007	CLIMATIZAÇÃO	Instalação do conjunto de sensores (Temperatura, umidade, CO2) e interligações necessárias incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1367	3	16	16.11	16.11.008	CLIMATIZAÇÃO	Fornecimento e instalação de sensor integrado, temperatura e umidade do ar, interno aos dutos, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1368	3	16	16.11	16.11.009	CLIMATIZAÇÃO	Fornecimento e instalação de sensor integrado, temperatura e umidade do ar, instalação em ambiente (interno/externo) , incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1369	3	16	16.11	16.11.010	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de temperatura do ar para instalação interno em dutos, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM		5,00				-	-	-			-	-		
1370	3	16	16.11	16.11.011	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de umidade do ar, para ambientes internos, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM		2,00				-	-	-			-	-		
1371	3	16	16.11	16.11.012	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de nível de CO2, para ambientes internos, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM		2,00				-	-	-			-	-		
1372	3	16	16.11	16.11.013	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de nível de CO2, interno aos dutos, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM		1,00				-	-	-			-	-		
1373	3	16	16.11	16.11.014	CLIMATIZAÇÃO	Fornecimento e instalação de pressostato diferencial para ar, interno aos dutos, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM		3,00				-	-	-			-	-		
1374	3	16	16.11	16.11.015	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de temperatura de imersão na água, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1375	3	16	16.11	16.11.016	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de pressão diferencial de imersão na água, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1376	3	16	16.11	16.11.017	CLIMATIZAÇÃO	Transmissor de vazão ultrassônico para imersão em água, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1377	3	16	16.11	16.11.018	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de umidade do ar, ambiente externo (IP65), incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1378	3	16	16.11	16.11.019	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de nível de CO2, ambiente externo (IP65), incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1379	3	16	16.11	16.11.020	CLIMATIZAÇÃO	Fornecimento e instalação de pressostato diferencial, interno aos dutos, ambiente externo (IP65), incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1380	3	16	16.11	16.11.021	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de nível de água, superior e inferior, IP 65, incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1381	3	16	16.11	16.11.022	CLIMATIZAÇÃO	Fornecimento e instalação de chave bóia de nível de água, superior e inferior, IPX8 incluindo cabos, eletrodutos e acessórios.	unid			RN	YC	CM						-	-	-			-	-		
1382	2	16	16.12	16.12	CLIMATIZAÇÃO	Interligações Elétricas de Força e Comando				RN	YC	CM								-	-			-	-	
1383	3	16	16.12	16.12.001	CLIMATIZAÇÃO	Eletroduto F.G. médio Ø25mm(3/4"), incluindo acessórios e conexões	m			RN	YC	CM		2.700,00				-	-	-			-	-		
1384	3	16	16.12	16.12.002	CLIMATIZAÇÃO	Eletroduto F.G. médio Ø32mm (1"), incluindo acessórios e conexões	m			RN	YC	CM		500,00				-	-	-			-	-		
1385	3	16	16.12	16.12.003	CLIMATIZAÇÃO	Eletroduto F.G. médio Ø40mm (1. 1/4"), incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1386	3	16	16.12	16.12.004	CLIMATIZAÇÃO	Eletroduto F.G. médio Ø75mm(2. 1/2"), incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1387	3	16	16.12	16.12.005	CLIMATIZAÇÃO	Perfilado zincado liso 19x38mm, chapa #18, incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1388	3	16	16.12	16.12.006	CLIMATIZAÇÃO	Perfilado zincado liso 38x38mm, chapa #18, incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1389	3	16	16.12	16.12.007	CLIMATIZAÇÃO	Perfilado zincado liso 76x38mm, chapa #18, incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1390	3	16	16.12	16.12.008	CLIMATIZAÇÃO	Perfilado zincado perfurado 19x38mm, chapa #18, incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1391	3	16	16.12	16.12.009	CLIMATIZAÇÃO	Perfilado zincado perfurado 38x38mm, chapa #18, incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1392	3	16	16.12	16.12.010	CLIMATIZAÇÃO	Perfilado zincado perfurado 38x38mm, chapa #18, incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1393	3	16	16.12	16.12.011	CLIMATIZAÇÃO	Eletroduto F.G. médio Ø50mm (1. 1/2"), incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1394	3	16	16.12	16.12.012	CLIMATIZAÇÃO	Eletroduto F.G. médio Ø60mm (2"), incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1395	3	16	16.12	16.12.013	CLIMATIZAÇÃO	Cabo Flexível, 750V PVC 1,5mm², não propagador de chamas e gases tóxicos	m			RN	YC	CM		4.600,00				-	-	-			-	-		
1396	3	16	16.12	16.12.014	CLIMATIZAÇÃO	Cabo Flexível, 750V PVC 2,5mm², não propagador de chamas e gases tóxicos	m			RN	YC	CM		1.900,00				-	-	-			-	-		
1397	3	16	16.12	16.12.015	CLIMATIZAÇÃO	Cabo Flexível, 750V PVC 4,0mm², não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-		
1398	3	16	16.12	16.12.016	CLIMATIZAÇÃO	Cabo Flexível, 750V PVC 6,0mm², não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-		
1399	3	16	16.12	16.12.017	CLIMATIZAÇÃO	Cabo Flexível, 750V PVC 10,0mm², não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-		
1400	3	16	16.12	16.12.018	CLIMATIZAÇÃO	Cabo Flexível, 750V PVC 16,0mm², não propagador de chamas e gases tóxicos	m			RN	YC	CM		1.600,00				-	-	-			-	-		
1401	3	16	16.12	16.12.019	CLIMATIZAÇÃO	Cabo Flexível, 750V PVC 25,0mm², não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-		
1402	3	16	16.12	16.12.020	CLIMATIZAÇÃO	Cabo Flexível, 750V PVC 35,0mm², não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-		
1403	3	16	16.12	16.12.021	CLIMATIZAÇÃO	Cabo PP 470/750V PVC (2x1,5mm²), não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-		
1404	3	16	16.12	16.12.022	CLIMATIZAÇÃO	Cabo PP 470/750V PVC (3x1,5mm²), não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-		
1405	3	16	16.12	16.12.023	CLIMATIZAÇÃO	Cabo PP 470/750V PVC (5x1,5mm²), não propagador de chamas e gases tóxicos	m			RN	YC	CM						-	-	-			-	-		
1406	3	16	16.12	16.12.024	CLIMATIZAÇÃO	Cabo 1 par x 22AWG, dupla blindagem, condutores de cobre estanhado, encordoamento classe 4 conforme NM 280. Isolação em Polietileno expandido 70°C, tensão de 300V.	m			RN	YC	CM		600,00				-	-	-			-	-		
1407	3	16	16.12	16.12.025	CLIMATIZAÇÃO	Cabo 2 pares x 22AWG, dupla blindagem, condutores de cobre estanhado, encordoamento classe 4 conforme NM 280. Isolação em Polietileno expandido 70°C, tensão de 300V.	m			RN	YC	CM		600,00				-	-	-			-	-		
1408	3	16	16.12	16.12.026	CLIMATIZAÇÃO	Cabo 3 pares x 22AWG, dupla blindagem, condutores de cobre estanhado, encordoamento classe 4 conforme NM 280. Isolação em Polietileno expandido 70°C, tensão de 300V.	m			RN	YC	CM		500,00				-	-	-			-	-		
1409	3	16	16.12	16.12.027	CLIMATIZAÇÃO	Eletrocalha 10x10cm, chapa de aço galvanizada #18, perfurada, incluindo acessórios e conexões	m			RN	YC	CM						-	-	-			-	-		
1410	3	16	16.12	16.12.028	CLIMATIZAÇÃO	Eletrocalha 15x10cm, chapa de aço galvanizada #18, perfurada, incluindo acessórios e conexões	m			RN	YC	CM		200,00				-	-	-			-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1411	3	16	16.12	16.12.029	CLIMATIZAÇÃO	Eletrocalha 20x10cm, chapa de aço galvanizada #18, perfurada, incluindo acessórios e conexões	m			RN	YC	CM		200,00				-	-	-			-	-	
1412	2	16	16.13	16.13	CLIMATIZAÇÃO	Ventiladores de ar exterior (VAE) e Ventiladores de exaustão (VEX)				RN	YC	CM						-	-	-			-	-	
1413	3	16	16.13	16.13.001	CLIMATIZAÇÃO	Fornecimento e instalação de gabinete de ventilação, centrífugo, faixa de vazão de ar até 1.500m³/h e altura manométrica na faixa de 15 a 25mmca, motor alto rendimento, 4 pólos, calços amortecedores, suporte e acessórios.	unid			RN								-	-	-			-	-	
1414	3	16	16.13	16.13.002	CLIMATIZAÇÃO	Fornecimento e instalação de gabinete de ventilação, centrífugo, faixa de vazão de ar de 1.501 a 3.000 m³/h e altura manométrica na faixa de 15 a 25mmca, motor alto rendimento, 4 pólos, calços amortecedores, suporte e acessórios.	unid			RN				2,00				-	-	-			-	-	
1415	3	16	16.13	16.13.003	CLIMATIZAÇÃO	Fornecimento e instalação de gabinete de ventilação, centrífugo, filtro G4-1", faixa de vazão de ar de 3.000m³/h e altura manométrica na faixa de 25 a 45mmca, motor alto rendimento, 4 pólos, calços amortecedores, suporte e acessórios.	unid			RN								-	-	-			-	-	
1416	3	16	16.13	16.13.004	CLIMATIZAÇÃO	Fornecimento e instalação de gabinete de ventilação, centrífugo, filtro G4-1", faixa de vazão de ar de 3.001 a 6.000m³/h e altura manométrica na faixa de 25 a 45mmca, motor alto rendimento, 4 pólos, calços amortecedores, suporte e acessórios.	unid			RN								-	-	-			-	-	
1417	3	16	16.13	16.13.005	CLIMATIZAÇÃO	Fornecimento e instalação de gabinete de ventilação, centrífugo, filtro G4-1", faixa de vazão de ar de 6.001 a 9.000m³/h e altura manométrica na faixa de 25 a 45mmca, motor alto rendimento, 4 pólos, calços amortecedores, suporte e acessórios.	unid			RN								-	-	-			-	-	
1418	3	16	16.13	16.13.006	CLIMATIZAÇÃO	Fornecimento e instalação de ventilador, centrífugo, in line, faixa de vazão de ar até 1.500m³/h e altura manométrica na faixa de 15 a 25mmca, suporte e acessórios.	unid			RN								-	-	-			-	-	
1419	3	16	16.13	16.13.007	CLIMATIZAÇÃO	Fornecimento e instalação de gabinete de ventilação, centrífugo, filtro G4-1", faixa de vazão de ar de 25.000 a 36.000m³/h e altura manométrica na faixa de 30 a 50mmca, motor alto rendimento, 4 pólos, calços amortecedores, suporte, acessórios.	unid			RN								-	-	-			-	-	
1420	3	16	16.13	16.13.008	CLIMATIZAÇÃO	Fornecimento e instalação de gabinete de exaustão de fumaça, centrífugo/limit load, classe 400°C/2 horas, faixa de vazão de ar de 45.000 a 60.000m³/h e altura manométrica na faixa de 30 a 50mmca, motor alto rendimento, 4 pólos, calços amortecedores, suporte e acessórios.	unid			RN								-	-	-			-	-	
1421	3	16	16.13	16.13.009	CLIMATIZAÇÃO	Desembarque, transporte horizontal e vertical do ventilador até a sua base	unid			RN				3,00				-	-	-			-	-	
1422	2	16	16.14	16.14	CLIMATIZAÇÃO	Diversos				RN	YC	CM						-	-	-			-	-	
1423	3	16	16.14	16.14.001	CLIMATIZAÇÃO	Fornecimento de pasta encadernada contendo toda a documentação referente a instalação, projeto gráfico, manuais e certificados de garantia dos equipamentos, bem como orientações de funcionamento e manutenção do sistema	unid			RN	YC	CM		1,00				-	-	-			-	-	
1424	3	16	16.14	16.14.002	CLIMATIZAÇÃO	Treinamento operacional do sistema para o pessoal designado pela Renner	conj			RN				1,00				-	-	-			-	-	
1425	3	16	16.14	16.14.003	CLIMATIZAÇÃO	TABS - Testes, ajustes e balanceamento das instalações com a apresentação das planilhas padrão Renner	conj			RN				1,00				-	-	-			-	-	
1426	1	17	17.01	17	MOBILIÁRIO	MOBILIÁRIO				RN	YC	CM						-	-	-			-	-	
1427	2	17	17.01	17.01	MOBILIÁRIO	Letreiros e cortinas				RN	YC	CM						-	-	-			-	-	
1428	3	17	17.01	17.01.001	MOBILIÁRIO	Painel grande em ACM com letreiro "Youcom" em letra caixa med. 2,10x0,54m com face em acrílico e iluminação em led's.	unid				YC							-	-	-			-	-	
1429	3	17	17.01	17.01.002	MOBILIÁRIO	Luminoso pequeno Youcom iluminado med. 1,20x0,3m com aplicação de logotipo em acrílico recortado.	unid				YC							-	-	-			-	-	
1430	3	17	17.01	17.01.003	MOBILIÁRIO	Letreiro "Youcom" em MDF 18mm recortado med. 1,00x0,24m com acabamento em tinta automotiva. Fixação por fita dupla face.	unid				YC							-	-	-			-	-	
1431	3	17	17.01	17.01.004	MOBILIÁRIO	Placa provador "EXPERIMENTA" 100x28cm	unid				YC							-	-	-			-	-	
1432	3	17	17.01	17.01.005	MOBILIÁRIO	Letreiro "Camicado" em acrílico retroiluminado por led's med. 2290x500mm. Fixação através de fita dupla-face.	unid				YC							-	-	-			-	-	
1433	3	17	17.01	17.01.006	MOBILIÁRIO	Letreiro "Camicado" em acrílico vermelho, med. 780x170mm sem iluminação. Fixação através de fita dupla-face.	unid				YC							-	-	-			-	-	
1434	3	17	17.01	17.01.007	MOBILIÁRIO	B - Letreiro "Camicado" em acrílico vermelho, med. 920x200mm sem iluminação. Fixação através de fita dupla-face.	unid				YC							-	-	-			-	-	
1435	3	17	17.01	17.01.008	MOBILIÁRIO	Logotipo pequeno da fachada (pilarete) - Letreiro "Camicado" em acrílico vermelho, med. 695x150mm sem iluminação. Fixação através de fita dupla-face.	unid				YC							-	-	-			-	-	
1436	3	17	17.01	17.01.009	MOBILIÁRIO	Letreiro "Camicado" em acrílico vermelho, med. 920x200mm sem iluminação. Fixação através de fita dupla-face.	unid				YC							-	-	-			-	-	
1437	3	17	17.01	17.01.010	MOBILIÁRIO	Letreiro "www.camicado.com.br" em MDF de 18mm, med. 3500x200mm, com acabamento em pintura automotiva fixação através de fita dupla-face.	unid				YC							-	-	-			-	-	
1438	3	17	17.01	17.01.011	MOBILIÁRIO	Letreiro "Lista de Casamento" em MDF de 18mm, med. 1990x550mm, com acabamento em pintura automotiva. Fixação através de fita dupla-face.	unid				YC							-	-	-			-	-	
1439	3	17	17.01	17.01.012	MOBILIÁRIO	"Espaço Gourmet" med. 250x700mm com grafismos em mdf e letreiro em acrílico.	unid				YC							-	-	-			-	-	
1440	2	17	17.02	17.02	MOBILIÁRIO	EQUIPAMENTOS DE RETAGUARDA				RN	YC	CM						-	-	-			-	-	
1441	3	17	17.02	17.02.001	MOBILIÁRIO	Mesa Retaguarda	unid				YC							-	-	-			-	-	
1442	3	17	17.02	17.02.002	MOBILIÁRIO	Armário Alto	unid				YC							-	-	-			-	-	
1443	3	17	17.02	17.02.003	MOBILIÁRIO	Armário Baixo	unid				YC							-	-	-			-	-	
1444	3	17	17.02	17.02.004	MOBILIÁRIO	Prateleira Móvel	unid				YC							-	-	-			-	-	
1445	3	17	17.02	17.02.005	MOBILIÁRIO	Armário Baixo - Bebedouro	unid				YC							-	-	-			-	-	
1446	2	17	17.03	17.03	MOBILIÁRIO	EQUIPAMENTOS DE SOLO				RN	YC	CM						-	-	-			-	-	
1447	3	17	17.03	17.03.001	MOBILIÁRIO	Mesa Ponto focal Tripla 160x80x90cm	unid				YC							-	-	-			-	-	
1448	3	17	17.03	17.03.002	MOBILIÁRIO	Mesa Ponto focal 160x80x90cm	unid				YC							-	-	-			-	-	
1449	3	17	17.03	17.03.003	MOBILIÁRIO	Mesa de entrada 160x80x90cm	unid				YC							-	-	-			-	-	
1450	3	17	17.03	17.03.004	MOBILIÁRIO	Parede Cremalheira G 6 módulos 200x78x236cm	unid				YC							-	-	-			-	-	
1451	3	17	17.03	17.03.005	MOBILIÁRIO	Parede Cremalheira M 4 módulos 236x78x140cm	unid				YC							-	-	-			-	-	
1452	3	17	17.03	17.03.006	MOBILIÁRIO	Armário cabides e sacolas 120x55x110cm	unid				YC							-	-	-			-	-	
1453	3	17	17.03	17.03.007	MOBILIÁRIO	Armário rack de som 120x55x110cm	unid				YC							-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1454	3	17	17.03	17.03.008	MOBILIÁRIO	Caixa PDV 120x100x117cm	unid				YC							-	-	-			-	-	
1455	3	17	17.03	17.03.009	MOBILIÁRIO	Caixa PNE 120x66x85cm	unid				YC							-	-	-			-	-	
1456	3	17	17.03	17.03.010	MOBILIÁRIO	Cobertura caixa 240x240x230cm	unid				YC							-	-	-			-	-	
1457	3	17	17.03	17.03.011	MOBILIÁRIO	Banqueta Provador 120x55x110cm	unid				YC							-	-	-			-	-	
1458	3	17	17.03	17.03.012	MOBILIÁRIO	Cabideiro 120x55x110cm	unid				YC							-	-	-			-	-	
1459	3	17	17.03	17.03.013	MOBILIÁRIO	Base manequim 10	unid				YC							-	-	-			-	-	
1460	3	17	17.03	17.03.014	MOBILIÁRIO	Base manequim 20	unid				YC							-	-	-			-	-	
1461	3	17	17.03	17.03.015	MOBILIÁRIO	Base manequim 30	unid				YC							-	-	-			-	-	
1462	3	17	17.03	17.03.016	MOBILIÁRIO	Paralela Frontal Dupla	unid				YC							-	-	-			-	-	
1463	3	17	17.03	17.03.017	MOBILIÁRIO	Paralela Frontal Dupla modelo novo	unid				YC							-	-	-			-	-	
1464	3	17	17.03	17.03.018	MOBILIÁRIO	Paralela Frontal Dupla baixa	unid				YC							-	-	-			-	-	
1465	3	17	17.03	17.03.019	MOBILIÁRIO	Paralela Frontal Tripla	unid				YC							-	-	-			-	-	
1466	3	17	17.03	17.03.020	MOBILIÁRIO	Cobertura caixa P	unid				YC							-	-	-			-	-	
1467	3	17	17.03	17.03.021	MOBILIÁRIO	Pufe	unid				YC							-	-	-			-	-	
1468	3	17	17.03	17.03.022	MOBILIÁRIO	Caixa P	unid				YC							-	-	-			-	-	
1469	3	17	17.03	17.03.023	MOBILIÁRIO	Caixa P PNE	unid				YC							-	-	-			-	-	
1470	3	17	17.03	17.03.024	MOBILIÁRIO	Cobertura Vitrine Grande	unid				YC							-	-	-			-	-	
1471	3	17	17.03	17.03.025	MOBILIÁRIO	Cobertura Vitrine Média	unid				YC							-	-	-			-	-	
1472	3	17	17.03	17.03.026	MOBILIÁRIO	Cobertura Vitrine Pequena	unid				YC							-	-	-			-	-	
1473	3	17	17.03	17.03.027	MOBILIÁRIO	Parede Cremalheira P	unid				YC							-	-	-			-	-	
1474	3	17	17.03	17.03.028	MOBILIÁRIO	Parede Cremalheira Mono P	unid				YC							-	-	-			-	-	
1475	3	17	17.03	17.03.029	MOBILIÁRIO	Parede Cremalheira Mono M	unid				YC							-	-	-			-	-	
1476	3	17	17.03	17.03.030	MOBILIÁRIO	Parede Cremalheira Mono G	unid				YC							-	-	-			-	-	
1477	3	17	17.03	17.03.031	MOBILIÁRIO	Frontal para longos	unid				YC							-	-	-			-	-	
1478	3	17	17.03	17.03.032	MOBILIÁRIO	Movel devolução /Roller	unid				YC							-	-	-			-	-	
1479	3	17	17.03	17.03.033	MOBILIÁRIO	Frontal para cremalheira	unid				YC							-	-	-			-	-	
1480	3	17	17.03	17.03.034	MOBILIÁRIO	Barra paralela	unid				YC							-	-	-			-	-	
1481	3	17	17.03	17.03.035	MOBILIÁRIO	Barra paralela curta	unid				YC							-	-	-			-	-	
1482	3	17	17.03	17.03.036	MOBILIÁRIO	Frontal Para Barra Paralela	unid				YC							-	-	-			-	-	
1483	3	17	17.03	17.03.037	MOBILIÁRIO	Prateleira	unid				YC							-	-	-			-	-	
1484	3	17	17.03	17.03.038	MOBILIÁRIO	Prateleira com Paralela	unid				YC							-	-	-			-	-	
1485	3	17	17.03	17.03.039	MOBILIÁRIO	Gancho açougueiro	unid				YC							-	-	-			-	-	
1486	3	17	17.03	17.03.040	MOBILIÁRIO	Suporte de Preço para Tubo Retangular	unid				YC							-	-	-			-	-	
1487	3	17	17.03	17.03.041	MOBILIÁRIO	Suporte De preço Autoportante	unid				YC							-	-	-			-	-	
1488	3	17	17.03	17.03.042	MOBILIÁRIO	Pegboards para Barra Paralela	unid				YC							-	-	-			-	-	
1489	3	17	17.03	17.03.043	MOBILIÁRIO	Frontal Para Ponto Focal	unid				YC							-	-	-			-	-	
1490	3	17	17.03	17.03.044	MOBILIÁRIO	Prateleira Ponto Focal	unid				YC							-	-	-			-	-	
1491	3	17	17.03	17.03.045	MOBILIÁRIO	Prateleira com Paralela Ponto Focal	unid				YC							-	-	-			-	-	
1492	3	17	17.03	17.03.046	MOBILIÁRIO	Cubo P	unid				YC							-	-	-			-	-	
1493	3	17	17.03	17.03.047	MOBILIÁRIO	Cubo G	unid				YC							-	-	-			-	-	
1494	2	17	17.04	17.04	MOBILIÁRIO	EQUIPAMENTOS DE PAREDE				RN	YC	CM						-	-	-			-	-	
1495	3	17	17.04	17.04.001	MOBILIÁRIO	Ponto Focal	unid				YC							-	-	-			-	-	
1496	3	17	17.04	17.04.002	MOBILIÁRIO	Módulo de cremalheira 61x6x350m	unid				YC							-	-	-			-	-	
1497	3	17	17.04	17.04.003	MOBILIÁRIO	Módulo para acessórios com espelho	unid				YC							-	-	-			-	-	
1498	3	17	17.04	17.04.004	MOBILIÁRIO	Módulo para acessórios	unid				YC							-	-	-			-	-	
1499	3	17	17.04	17.04.005	MOBILIÁRIO	Módulo Espelho - Modelo Novo	unid				YC							-	-	-			-	-	
1500	3	17	17.04	17.04.006	MOBILIÁRIO	Painel de Vitrine - Grande	unid				YC							-	-	-			-	-	
1501	2	17	17.05	17.05	MOBILIÁRIO	VITRINE				RN	YC	CM						-	-	-			-	-	
1502	3	17	17.05	17.05.001	MOBILIÁRIO	Painel de Vitrine Média 2,17x1.80m	unid				YC							-	-	-			-	-	
1503	3	17	17.05	17.05.002	MOBILIÁRIO	Painel de Vitrine Grande	unid				YC							-	-	-			-	-	
1504	3	17	17.05	17.05.003	MOBILIÁRIO	Vitrine Cremalheira Grande	unid				YC							-	-	-			-	-	
1505	3	17	17.05	17.05.004	MOBILIÁRIO	Vitrine Cremalheira Média	unid				YC							-	-	-			-	-	
1506	3	17	17.05	17.05.005	MOBILIÁRIO	Vitrine Cremalheira Pequena	unid				YC							-	-	-			-	-	
1507	3	17	17.05	17.05.006	MOBILIÁRIO	Painel de Vitrine Pequena	unid				YC							-	-	-			-	-	
1508	2	17	17.06	17.06	MOBILIÁRIO	MOBILIÁRIO ÁREA GOURMET				RN	YC	CM						-	-	-			-	-	
1509	3	17	17.06	17.06.001	MOBILIÁRIO	Armário sobre a pia 205x40x70 em MDF espessura de 30mm, acabamento madeirado (REF. DURATEX TECA BALI)	unid					CM						-	-	-			-	-	
1510	3	17	17.06	17.06.002	MOBILIÁRIO	Pia de corian Glacier white e=30mm, incluindo testeira de corian glacier white e=20mm, frontão corian glacier white e=20mm e cuba retangular em corian glacier white e=20mm	m²					CM						-	-	-			-	-	
1511	3	17	17.06	17.06.003	MOBILIÁRIO	Bancada central - em MDF espessura de 30mm, acabamento madeirado (REF. DURATEX TECA BALI) 295x125x110	unid					CM						-	-	-			-	-	
1512	3	17	17.06	17.06.004	MOBILIÁRIO	Espelho 130x70	m²					CM						-	-	-			-	-	
1513	3	17	17.06	17.06.005	MOBILIÁRIO	Cooktop elétrico square touch 4EV60	unid					CM						-	-	-			-	-	
1514	3	17	17.06	17.06.006	MOBILIÁRIO	Forno elétrico Glass Brasil B60 F3	unid					CM						-	-	-			-	-	

	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID		Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações		
1515	3	17	17.06	17.06.007	MOBILIÁRIO	Forno Micro-ondas embutir 25L inox 60	unid						CM						-	-	-			-	-			
1516	3	17	17.06	17.06.008	MOBILIÁRIO	Geladeira conforme especificação Camicado	unid						CM						-	-	-			-	-			
1517	3	17	17.06	17.06.009	MOBILIÁRIO	Lousa conforme especificação Camicado	m²						CM						-	-	-			-	-			
1518	3	17	17.06	17.06.010	MOBILIÁRIO	coifa de ilha em aço inox. Acompanha a coida dois filtros de carvão ativado, dois filtros de alumínio e um tubo flexível para a saída do ar. MOD./FAB.: VETRO ISLA/TRAMONTINA	unid						CM						-	-	-			-	-			
1519	3	17	17.06	17.06.011	MOBILIÁRIO	Torneira de mesa para cozinha dina quadratta	unid						CM						-	-	-			-	-			
1520	3	17	17.06	17.06.012	MOBILIÁRIO	Armário sob a pia - com quatro gavetas e duas portas	unid						CM						-	-	-			-	-			
1521	3	17	17.06	17.06.013	MOBILIÁRIO	Bancada para microondas	unid						CM						-	-	-			-	-			
1522	1	18	18.001	18	OMISSOS	DESCRIPTIVO GERAL DE OMISSOS					RN	YC	CM						-	-	-			-	-			
1523	3	18	18.001	18.001	CIVIL	FACHADA RE+: Aluguel de Máquinas e Equipamentos	unid			X	RN				1,00				-	-	-			-	-			
1524	3	18	18.002	18.002	CIVIL	FACHADA RE+: Despesas de Viagens com a equipe	unid			X	RN				1,00				-	-	-			-	-			
1525	3	18	18.003	18.003	CIVIL	FACHADA RE+: Estrutura Gradil/Frame em Inox escovado	unid			X	RN				1,00				-	-	-			-	-			
1526	3	18	18.004	18.004	CIVIL	FACHADA RE+: Esquadrias e Vidros	unid			X	RN				1,00				-	-	-			-	-			
1527	3	18	18.005	18.005	CIVIL	FACHADA RE+: Revestimentos e Fachada	unid			X	RN				1,00				-	-	-			-	-			
1528	3	18	18.006	18.006	CIVIL	FACHADA RE+: Instalações Elétricas	unid			X	RN				1,00				-	-	-			-	-			
1529	3	18	18.007	18.007	CIVIL	Cobertura subestação / plataforma PNE - laje painel treliçado	m²				RN				25,38				-	-	-			-	-			
1530	3	18	18.008	18.008	CIVIL	Cobertura subestação / plataforma PNE - treliça + armadura complementar	kg				RN				113,00				-	-	-			-	-			
1531	3	18	18.009	18.009	CIVIL	Cobertura subestação / plataforma PNE - concreto estrutural fck ≥ 25 Mpa	m³				RN				3,05				-	-	-			-	-			
1532	3	18	18.010	18.010	CIVIL	Plataforma técnica + escada marinhoeiro - estrutura metálica	kg				RN				1.261,49				-	-	-			-	-			
1533	3	18	18.011	18.011	CIVIL	Mezanino - placa painel wall 1,2x2,5m e=4cm para laje do mezanino + recortes de placas + fixações na estrutura metálica - conforme paginação do projeto estrutural	unid				RN				116,00				-	-	-			-	-			
1534	3	18	18.012	18.012	CIVIL	Mezanino - placa painel wall 1,2x1,25m e=4cm para laje do mezanino + recortes de placas + fixações na estrutura metálica - conforme paginação do projeto estrutural	unid				RN				28,00				-	-	-			-	-			
1535	3	18	18.013	18.013	CIVIL	Mezanino - argamassa de regularização e=2cm da laje em painel wall	m³				RN				7,12				-	-	-			-	-			
1536	3	18	18.014	18.014	CIVIL	Salão de vendas - paredes drywall altas h=120cm (com perfil F530) em placas ST 120x240cm, instaladas na horizontal para máximo aproveitamento da placa a h=250cm do piso pronto do salão de vendas	m²				RN				153,20				-	-	-			-	-			
1537	3	18	18.015	18.015	CIVIL	Salão de vendas - paredes drywall baixas h=260cm face única (com perfil montante M70) em placas ST 120x260cm, instaladas na vertical para máximo aproveitamento	m²				RN				413,68				-	-	-			-	-			
1538	3	18	18.016	18.016	CIVIL	Guia de madeira 10x3cm para rigidez da sanca das paredes de perimetro dos salões de vendas	m				RN				170,00				-	-	-			-	-			
1539	3	18	18.017	18.017	CIVIL	DRYWALL COM PLACAS DE GESSO ACARTONADO ST e=12,5mm (02 PLACAS POR FACE), FACE DUPLA, ESTRUTURADA COM MONTANTES DE AÇO GALVANIZADO DE 70mm, COM CANTONEIRA DE ARREMATE, COM APLICAÇÃO DE CAMADA INTERNA ACÚSTICA EM LÃ DE VIDRO (DENS.≥10kg/m³) OU LÃ DE PET (DENS.≥20kg/m³) DO PISO AO TETO - ESP. TOTAL=12cm	m²				RN				212,31				-	-	-			-	-			
1540	3	18	18.018	18.018	CIVIL	DRYWALL COM PLACAS DE GESSO ACARTONADO ST e=12,5mm (01 PLACA POR FACE), FACE DUPLA, ESTRUTURADA COM MONTANTES DE AÇO GALVANIZADO DE 70mm, COM CANTONEIRA DE ARREMATE, COM APLICAÇÃO DE CAMADA INTERNA ACÚSTICA EM LÃ DE VIDRO (DENS.≥10kg/m³) OU LÃ DE PET (DENS.≥20kg/m³) DO PISO AO TETO - ESP. TOTAL=9,5cm	m²				RN				144,02				-	-	-			-	-			
1541	3	18	18.019	18.019	CIVIL	DIVISÓRIA e=18mm EM CHAPA ÚNICA DE MDF FIRE (FOGO RETARDANTE) REVESTIDA COM LAMINADO DECORATIVO DE ALTA PRESSÃO (AP) L166 COR ÁRTICO, LÂMINAS DE 120cm DE LARGURA, MARCA FÓRMICA. APLICAR 01 LÂMINA INTEIRA NO CENTRO DA DIVISÓRIA E FAIXAS DE 40cm NAS LATERAIS. EXECUTAR JUNTAS SECAS ENTRE AS LÂMINAS DE REVESTIMENTO	m²				RN				53,03				-	-	-			-	-			
1542	3	18	18.020	18.020	CIVIL	DIVISÓRIA e=6cm EM CHAPA e=9mm DUPLA DE MDF FIRE (FOGO RETARDANTE) REVESTIDA COM LAMINADO DECORATIVO DE ALTA PRESSÃO (AP) L166 COR ÁRTICO, LÂMINAS DE 120cm DE LARGURA MARCA FÓRMICA, ESTRUTURADA COM TUBOS METALON 2x4cm	m²				RN				106,48				-	-	-			-	-			
1543	3	18	18.021	18.021	CIVIL	REVESTIMENTO H=93cm DO PISO PRONTO EM CHAPA e=18mm DE MDF A DEFIRNIR	m²				RN				8,93				-	-	-			-	-			
1544	3	18	18.022	18.022	CIVIL	AZULEJO 30x60cm COLEÇÃO WHITE PLAIN MATTE BOLD MARCA PORTINARI, ASSENTADO NA HORIZONTAL	m²				RN				68,74				-	-	-			-	-			
1545	3	18	18.023	18.023	CIVIL	PC01 - 788x275cm - CORTINA DE ENROLAR METÁLICA COM MOVIMENTO AUTOMÁTICO, PERFIL TIPO TRANSVISION e=9,5cm EM AÇO GALVANIZADO COM MICROFURROS e=2mm E ACABAMENTO NATURAL	unid				RN				1,00				-	-	-			-	-			
1546	3	18	18.024	18.024	CIVIL	PC02 - 853x275cm - CORTINA DE ENROLAR METÁLICA COM MOVIMENTO AUTOMÁTICO, PERFIL TIPO TRANSVISION e=9,5cm EM AÇO GALVANIZADO COM MICROFURROS e=2mm E ACABAMENTO NATURAL	unid				RN				1,00				-	-	-			-	-			
1547	3	18	18.025	18.025	CIVIL	PF01 - 80x210cm - PORTA CEGA LISA DE 01 FOLHA DE ABRIR EM ESTRUTURA DE PERFIS "C" EM CHAPA DE AÇO Nº 14 (e=1,9mm) SOLDADOS REVESTIDA COM CHAPA DE AÇO BWG Nº 18 (e=1,52mm), BATENTE EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) DOBRADA, COM ACABAMENTO DE PERÍMETRO ENTRE O BATENTE DA PORTA E O MARCO EM CANTONEIRA 25mm DE ABAS IGUAIS EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) DOBRADA (LADO EXTERNO) E CHAPA DE AÇO BWG Nº 18 (e=1,52mm) LARGURA 25mm (LADO INTERNO). TODOS OS ELEMENTOS DE AÇO TERÃO ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO MARCA CORAL CORALIT. PORTA TERÁ DOBRADIÇA LINHA REFORÇADA MODELO 1535 MARCA PAPAIZ COM ACABAMENTO CROMADO, MAÇANETA (BLOQUEAR LINGUETA PARA QUE NÃO ATRAPALHE A ABERTURA DA PORTA) E FECHADURA (ENTREGUE COM CHAVE) LINHA INOXVITA MODELO MI 890 MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO, 01 FECHADURA ELÉTRICA HDL C90 INSTALADA NA FACE INTERNA DA PORTA (CONECTADO A BOTÃO DE DESTRABE), TECLADO COM SENHA PARA LIBERAÇÃO E MOLA AÉREA DORMA POTÊNCIA 2	unid				RN				1,00				-	-	-			-	-	-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações		
1548	3	18	18.026	18.026	CIVIL	PF02 - 80x210cm - PORTA CEGA LISA DE 01 FOLHA DE ABRIR EM ESTRUTURA DE PERFIS "C" EM CHAPA DE AÇO Nº 14 (e=1,9mm) SOLDADOS REVESTIDA COM CHAPA DE AÇO BWG Nº 18 (e=1,52mm), BATENTE EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) DOBRADA, COM ACABAMENTO DE PERÍMETRO ENTRE O BATENTE DA PORTA E O MARCO EM CANTONEIRA 25mm DE ABAS IGUAIS EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) DOBRADA (LADO EXTERNO) E CHAPA DE AÇO BWG Nº 18 (e=1,52mm) LARGURA 25mm (LADO INTERNO). TODOS OS ELEMENTOS DE AÇO TERÃO ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO MARCA CORAL CORALIT. PORTA TERÁ DOBRADIÇA LINHA REFORÇADA MODELO 1535 MARCA PAPAIZ COM ACABAMENTO CROMADO, MAÇANETA E FECHADURA (ENTREGUE COM CHAVE) LINHA INOXVITA MODELO MI 890 MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO, 02 FECHADURAS TIPO TETRA (UMA SUPERIOR E OUTRA INFERIOR) DE MESMA COMBINAÇÃO EM AÇO INÓX COM ACABAMENTO CROMADO ACETINADO E MOLA AÉREA DORMA POTÊNCIA 2	unid			RN				1,00				-	-	-	-	-		-	-		
1549	3	18	18.027	18.027	CIVIL	PF03 - 90x185cm - PORTA CEGA LISA DE 01 FOLHA DE ABRIR EM ESTRUTURA DE PERFIS "C" EM CHAPA DE AÇO Nº 14 (e=1,9mm) SOLDADOS REVESTIDA COM CHAPA DE AÇO BWG Nº 18 (e=1,52mm), BATENTE EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) DOBRADA, COM ACABAMENTO DE PERÍMETRO ENTRE O BATENTE DA PORTA E O MARCO EM CANTONEIRA 25mm DE ABAS IGUAIS EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) DOBRADA (LADO EXTERNO) E CHAPA DE AÇO BWG Nº 18 (e=1,52mm) LARGURA 25mm (LADO INTERNO). TODOS OS ELEMENTOS DE AÇO TERÃO ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR CINZA MARCA CORAL CORALIT. PORTA TERÁ DOBRADIÇA LINHA REFORÇADA MODELO 1535 MARCA PAPAIZ COM ACABAMENTO CROMADO, PUXADOR CURVO MODELO PI 500 MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO (01 EM CADA FACE), 01 FECHADURA ELÉTRICA HDL C90 INSTALADA NA FACE INTERNA DA PORTA (CONECTADO A BOTÃO DE DESTRABE E INTERFONE PARA LIBERAÇÃO) E MOLA AÉREA DORMA POTÊNCIA 2. PORTA ACÚSTICA Rw≥30db COM VEDAÇÃO PERIMÉTRICA EM GAXETA DE BORRACHA E SELO ACÚSTICO DE SOLEIRA.	unid			RN				1,00				-	-	-	-	-		-	-		
1550	3	18	18.028	18.028	CIVIL	PF04 - 335x240cm - PORTA DE 04 FOLHAS CEGAS DE CORRER EM AÇO COM TRILHOS INFERIOR E SUPERIOR DE AÇO QUE PERMITAM A LIVRE MOVIMENTAÇÃO DAS FOLHAS PARA A ABERTURA DE METADE DO VÃO DA PORTA E BATENTE EM TUBO RETANGULAR 100x30mm DE AÇO. PORTA TERÁ PORTA CADEADO DE FERRO GALVANIZADO E FECHO ZINCADO BRANCO DE PISO NAS FOLHAS LATERAIS E EM UMA DAS FOLHAS CENTRAIS (PARA TRAVAMENTO COMPLETO DAS FOLHAS). TODOS OS ELEMENTOS METÁLICOS DA PORTA TERÃO ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO MARCA CORAL CORALIT APLICADO SOBRE FUNDO EM PINTURA ANTI-CORROSIVA DE ZARCÃO	unid			RN				1,00				-	-	-	-	-	-	-			
1551	3	18	18.029	18.029	CIVIL	PF06 - 90x187cm - PORTA CEGA LISA DE 01 FOLHA DE ABRIR EM ESTRUTURA DE PERFIS "C" EM CHAPA DE AÇO Nº 14 (e=1,9mm) SOLDADOS REVESTIDA COM CHAPA DE AÇO BWG Nº 18 (e=1,52mm), BATENTE EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) DOBRADA, COM ACABAMENTO DE PERÍMETRO ENTRE O BATENTE DA PORTA E O MARCO EM CANTONEIRA 25mm DE ABAS IGUAIS EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) DOBRADA (LADO EXTERNO) E CHAPA DE AÇO BWG Nº 18 (e=1,52mm) LARGURA 25mm (LADO INTERNO). TODOS OS ELEMENTOS DE AÇO TERÃO ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO MARCA CORAL CORALIT. INSTALAR PERFIL DE BORRACHA EM TODO O PERÍMETRO DO BATENTE PARA VEDAÇÃO DA PORTA. PORTA TERÁ DOBRADIÇA LINHA REFORÇADA MODELO 1535 MARCA PAPAIZ COM ACABAMENTO CROMADO E MAÇANETA E FECHADURA (ENTREGUE COM CHAVE) LINHA INOXVITA MODELO MI 890 MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO	unid			RN				2,00				-	-	-	-	-	-	-	-	-	
1552	3	18	18.030	18.030	CIVIL	PF08 - 150x210cm - PORTA CEGA, 2 FOLHAS DE ABRIR DE 75cm CADA, DE AÇO, REVESTIDA EM ESMALTE CINZA, DOBRADIÇA PLANO PAPAIZ MODELO 1296 DE AÇO INOX 76x63mm ACETINADA, MAÇANETA PAPAIZ DESIGN 420 ACETINADA, COM BATES ENVOLVENTES E SOCO H=20cm. PORTA ACÚSTICA Rw≥30db COM VEDAÇÃO PERIMÉTRICA EM GAXETA DE BORRACHA E SELO ACÚSTICO DE SOLEIRA. REF. PORTA: FORNECEDOR SPEED DRY, UNIVERSO MÓVEIS OU INOVA ISOLAMENTO REF. SELO ACÚSTICO DE SOLEIRA: SHALL EX ULTRA FORNECIMENTO HAFELE OU ZERO INTERNACIONAL	unid			RN				2,00				-	-	-	-	-	-	-	-		
1553	3	18	18.031	18.031	CIVIL	PF10 - 185x210cm - PORTA CEGA, 2 FOLHAS DE ABRIR DE 75cm CADA, DE AÇO, REVESTIDA EM ESMALTE CINZA, DOBRADIÇA PLANO PAPAIZ MODELO 1296 DE AÇO INOX 76x63mm ACETINADA, MAÇANETA PAPAIZ DESIGN 420 ACETINADA, COM BATES ENVOLVENTES E SOCO H=20cm	unid			RN				1,00				-	-	-	-	-	-	-			
1554	3	18	18.032	18.032	CIVIL	PM01 - 80x210cm - PORTA CEGA LISA DE 01 FOLHA DE ABRIR EM MADEIRA COMPENSADA SEMI-OCA e=3,5cm COM ACABAMENTO LAMINADO EM FÓRMICA BRANCO REAL L515 TX, GUARNIÇÃO (AMBAS AS FACES) 5x1cm EM CEDRINHO COM ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO, MARCO E CONTRAMARCO EM MADEIRA CONFORME ESPESSURA DA PAREDE. PORTA TERÁ DOBRADIÇA 76,2x63,1mm MODELO 1296 MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO ACETINADO, MAÇANETA E FECHADURA (ENTREGUE COM CHAVE) LINHA DESIGN MODELO MZ 420 WAVE MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO ACETINADO E GRELHA DE RETORNO DE AC (CONFORME PROJETO DE CLIMATIZAÇÃO) EM ALUMÍNIO NATURAL	unid			RN				13,00				-	-	-	-	-	-	-	-		

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE+	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações		
1555	3	18	18.033	18.033	CIVIL	PM03 - 120x210cm - PORTA CEGA LISA DE 02 FOLHAS DE ABRIR (30cm E 90cm) EM MADEIRA COMPENSADA SEMI-OCA e=3,5cm COM REVESTIMENTO EM CHAPA DE AÇO COM ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO NA FACE VOLTADA PARA A RETAGUARDA E ACABAMENTO EM PINTURA EM TINTA ESMALTE SINTÉTICO REF. 44YY 65/034 COR TACO DE GOLFE MARCA CORAL NA FACE VOLTADA PARA O SALÃO DE VENDAS. GUARNIÇÃO (AMBAS AS FACES) 5x1cm EM CEDRINHO, SENDO A GUARNIÇÃO VOLTADA PARA A RETAGUARDA COM ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO, E A GUARNIÇÃO VOLTADA PARA O SALÃO DE VENDAS COM ACABAMENTO EM PINTURA EM TINTA ESMALTE SINTÉTICO REF. 44YY 65/034 COR TACO DE GOLFE MARCA CORAL. MARCO E CONTRAMARCO EM MADEIRA CONFORME ESPESSURA DA PAREDE.	unid			RN				1,00				-	-	-			-	-			
1556	3	18	18.034	18.034	CIVIL	PM08 - 82x210cm - PORTA CEGA LISA DE 01 FOLHA DE ABRIR EM MADEIRA COMPENSADA SEMI-OCA e=3,5cm COM ACABAMENTO LAMINADO EM FÓRMICA BRANCO REAL L515 TX, GUARNIÇÃO (AMBAS AS FACES) 5x1cm EM CEDRINHO COM ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO, MARCO E CONTRAMARCO EM MADEIRA CONFORME ESPESSURA DA PAREDE. PORTA TERÁ BATENTE INFERIOR NA FOLHA E GUARNIÇÕES (AMBAS AS FACES) COM ACABAMENTO EM FÓRMICA REF. AD-306 STEEL GRAY. PORTA TERÁ BARRA HORIZONTAL L=40cm EM AÇO INÓX NA FACE VOLTADA PARA O SANITÁRIO, DOBRADIÇA 76,2x63,1mm MODELO 1296 MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO ACETINADO, MAÇANETA E FECHADURA (ENTREGUE COM CHAVE) LINHA DESIGN MODELO MZ 420 WAVE MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO ACETINADO, MOLA AÉREA DORMA POTÊNCIA 2	unid			RN				2,00				-	-	-			-		-	-	
1557	3	18	18.035	18.035	CIVIL	PT02 - 160x210cm - PORTA DE 02 FOLHAS DE ABRIR EM TELA TIPO OTIS DE MALHA QUADRADA COM DIMENSÃO MÁXIMA DE 1.1/4" (31,75mm) FIXADA EM REQUADRO DE TUBO QUADRADO 1,5" DE FERRO GALVANIZADO, COM BATENTE EM CHAPA DE AÇO BWG Nº 18 (e=1,52mm) LARGURA 25mm SOLDADO EM TODO O PERÍMETRO DA FOLHA AONDE FICARÁ A MAÇANETA E MARCO EM TUBO QUADRADO 1,5" DE FERRO GALVANIZADO. TODOS OS ELEMENTOS COM ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR CINZA MARCA CORAL CORALIT APLICADO SOBRE FUNDO EM PINTURA ANTI-CORROSIVA DE ZARCÃO. PORTA TERÁ DOBRADIÇA LINHA REFORÇADA MODELO 1535 MARCA PAPAIZ COM ACABAMENTO CROMADO, MAÇANETA E FECHADURA (ENTREGUE COM CHAVE) LINHA STANDARD MODELO MZ 260 MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO E FECHO ZINCADO CINZA DE PISO NA FOLHA SEM MAÇANETA	unid			RN				1,00				-	-	-			-		-	-	
1558	3	18	18.036	18.036	CIVIL	PV01 - 60x120cm - ESQUADRIA DE VIDRO TEMPERADO E=8mm COM APLICAÇÃO DE ADESIVO JATEADO E QUADRO PERIMETRAL DE CANTONEIRA DE ALUMÍNIO COM ACABAMENTO COR BRANCO	unid			RN				2,00				-	-	-			-	-			
1559	3	18	18.037	18.037	CIVIL	PV02 - 80x210cm - PORTA DE 01 FOLHA DE ABRIR EM VIDRO LAMINADO DE SEGURANÇA INCOLOR e=10mm (5+5mm) FIXADA COM FERRAGENS ESPECÍFICAS PARA VIDRO EM ACABAMENTO CROMADO. PORTA TERÁ FECHADURA DE PISO COM ACABAMENTO CROMADO E 01 PUXADOR DUPLO TUBULAR H=50cm EM AÇO INOX COM ACABAMENTO ESCOVADO	unid			RN				1,00				-	-	-			-	-			
1560	3	18	18.038	18.038	CIVIL	AA01 - 66x66cm - PORTA ACÚSTICA Rw≥30Db DE 01 FOLHA DE ABRIR EM MADEIRA MACIÇA COM VEDAÇÃO PERIMÉTRICA EM GAXETA DE BORRACHA E SELO ACÚSTICO DE SOLEIRA. REF. PORTA: FORNECEDOR SPEED DRY, UNIVERSO MÓVEIS OU INOVA ISOLAMENTO REF. SELO ACÚSTICO DE SOLEIRA: SHALL EX ULTRA FORNECIMENTO HAFELE OU ZERO INTERNACIONAL PORTA TERÁ DOBRADIÇA 76,2x63,1mm MODELO 1296 MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO ACETINADO, MAÇANETA E FECHADURA (ENTREGUE COM CHAVE) LINHA DESIGN MODELO MZ 420 WAVE MARCA PAPAIZ EM AÇO INÓX COM ACABAMENTO CROMADO ACETINADO	unid			RN				1,00				-	-	-			-		-	-	
1561	3	18	18.039	18.039	CIVIL	PA02 - 90x210cm - PORTA ACÚSTICA Rw≥30Db DE 01 FOLHA DE ABRIR EM MADEIRA MACIÇA COM VEDAÇÃO PERIMÉTRICA EM GAXETA DE BORRACHA E SELO ACÚSTICO DE SOLEIRA. REF. PORTA: FORNECEDOR SPEED DRY, UNIVERSO MÓVEIS OU INOVA ISOLAMENTO REF. SELO ACÚSTICO DE SOLEIRA: SHALL EX ULTRA FORNECIMENTO HAFELE OU ZERO INTERNACIONAL	unid			RN				1,00				-	-	-			-	-			
1562	3	18	18.040	18.040	CIVIL	PP01 - 90x260cm - PORTA SEMI-OCA e=3,5cm EM MARCENARIA DE 01 FOLHA DE ABRIR + BANDEIRA FIXA SEMI-OCA e=3,5cm EM MARCENARIA, AMBAS EM ESTRUTURA DE CHAPAS HDF e=6mm REVESTIDAS COM LAMINADO L118 COR CINZA COBALTO MARCA FÓRMICA, COM APLICAÇÃO INTERNA DE MANTA ALUMINIZADA COMPOSTA POR MALHA DE RESINA TERMOPLÁSTICA RECOBERTA COM DUAS FACES DE LÂMINAS DE ALUMÍNIO PURO PARA PROTEÇÃO ELETROMAGNÉTICA DO SISTEMA DE RFID DA LOJA. PORTA TERÁ ABERTURA DA FOLHA COM 2 DOBRADIÇAS COM MOLA 89x76mm EM AÇO INOX COM ACABAMENTO CROMADO ACETINADO MARCA FERRAGENS PAGÉ OU SIMILAR, PUXADOR DUPLO (INTERNO E EXTERNO) EM AÇO ESCOVADO MODELO DF842 REF. PVI201 COM SEÇÃO QUADRADA H=392mm FORNECEDOR PUXADORES E CIA E TRANQUETA DE BANHO DE AÇO INOX 304 FOSCOREF. 902.53.272 MARCA HAFLE	unid			RN				4,00				-	-	-			-		-	-	
1563	3	18	18.041	18.041	CIVIL	NICHO EMBUTIDO NAS DIVISÓRIAS DAS CABINES SOCIAIS E PNE DO PROVADORES PARA INSTALAÇÃO DE EQUIPAMENTOS DE RFID, CONFORME DETALHAMENTO NA PRANCHA 702	unid			RN				4,00				-	-	-			-	-			
1564	3	18	18.042	18.042	CIVIL	FORRO EM PLACA STANDARD e=12,5mm DE GESSO ACARTONADO ESTRUTURADO COM PERFIS LONGITUDINAIS DE AÇO GALVANIZADO REF. F530 FIXADOS POR PENDURAIIS PRÓPRIOS COM PRESILHA F530, COM ACABAMENTO DE PERÍMETRO EM TABICA METÁLICA 48/40mm. ACABAMENTO DO FORRO EM PINTURA EM TINTA FOSCA REF. RM01 COR BRANCO NEVE MARCA SUVINIL	m²			RN				276,19				-	-	-			-	-			

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1565	3	18	18.043	18.043	CIVIL	FORRO DE GESSO ACARTONADO EM PLACA STANDARD e=12,5mm 1,20x2,00m COM PERFURAÇÕES ORDENADAS NO FORMATO QUADRADO DE 12mm, ÁREA DE PERFURAÇÃO = 23%, PESO DA PLACA = 7,5kg/m², MODELO RIGITONE 12/250 DA MARCA PLACO, COM ESTRUTURAÇÃO BIDIRECIONAL EM PERFIS F530, FIXADOS POR PENDURAIIS PRÓPRIOS COM PRESILHA F530 E ACESSÓRIO MULTIFUNÇÃO, COM ACABAMENTO DE PERÍMETRO EM GUIA UD 28. ACABAMENTO DO FORRO EM PINTURA EM TINTA FOSCA REF. RM01 COR BRANCO NEVE MARCA SUVINIL	m²			RN				231,87				-	-	-			-	-	
1566	3	18	18.044	18.044	CIVIL	REVESTIMENTO EM FORRO DE PAINEL DE LÃ DE VIDRO (DENS. ≥ 40 kg/m³) esp.: 50mm, FIXADOS POR PERFIS CARTOLA. REF.: "ISOSOUND TECIDO PRETO" DA SOLVER	m²			RN				167,82				-	-	-			-	-	
1567	3	18	18.045	18.045	CIVIL	REVESTIMENTO EM PAREDE DE PAINEL DE LÃ DE VIDRO (DENS. ≥ 40 kg/m³) esp.: 50mm, FIXADOS POR PERFIS CARTOLA. REF.: "ISOSOUND TECIDO PRETO" DA SOLVER	m²			RN				164,81				-	-	-			-	-	
1568	3	18	18.046	18.046	CIVIL	ISOLAMENTO ACÚSTICO EM LÃ DE VIDRO (DENS.≥10kg/m³) OU LÃ DE PET (DENS.≥20kg/m³) PARA PAREDES DRYWALL	m²			RN				356,64				-	-	-			-	-	
1569	3	18	18.047	18.047	CIVIL	PAINEL DE LÃ DE VIDRO, LÃ DE ROCHA OU PET RECICLADA (DENS. MÍN.=30kg/m³) ESP.=50mm, APLICADA SOBREPOSTA AS PLACAS DE GESSO COM PERFURAÇÕES	m²			RN				235,87				-	-	-			-	-	
1570	3	18	18.048	18.048	CIVIL	JATEAMENTO EM FIBRA DE CELULOSE (DENS= 60kg/m³) e=30mm REF. CELUJET DA TRATA ACÚSTICA	m²			RN				2.550,52				-	-	-			-	-	
1571	3	18	18.049	18.049	CIVIL	Testa de gesso acartonado em placa ST e=12,5mm	m²			RN				84,09				-	-	-			-	-	
1572	3	18	18.050	18.050	CIVIL	Sanca Perfil 7 - gesso acartonado, fixada em perfis longitudinais constituídos de chapas de aço galvanizado	m			RN				24,18				-	-	-			-	-	
1573	3	18	18.051	18.051	CIVIL	Tabica iluminada dos forros h=260cm do lounge e salão de vendas	m			RN				45,06				-	-	-			-	-	
1574	3	18	18.052	18.052	CIVIL	PINTURA EM TINTA ACRÍLICA SEMI-BRILHO COR TACO DE GOLFE REF. 44YY 65/034 MARCA CORAL	m²			RN				863,42				-	-	-			-	-	
1575	3	18	18.053	18.053	CIVIL	PINTURA EM TINTA ACRÍLICA FOSCO COR CINZA ZEPELIM REF. 30YY 46/036 MARCA CORAL	m²			RN				667,42				-	-	-			-	-	
1576	3	18	18.054	18.054	CIVIL	PINTURA EM TINTA LÁTEX PVA FOSCO COR CINZA ZEPELIM REF. 30YY 46/036 MARCA CORAL	m²			RN				2.550,52				-	-	-			-	-	
1577	3	18	18.055	18.055	CIVIL	PORCELANATO 80x80cm e=10,2mm LINHA DISTRITO COR SGR NATURAL (CINZA) COM ACABAMENTO ACETINADO RETIFICADO PEIS MARCA PORTINARI, JUNTA DE ASSENTAMENTO e=2mm COM REJUNTO COR CINZA OUTONO MARCA QUARTZOLIT	m²			RN				1.973,88				-	-	-			-	-	
1578	3	18	18.056	18.056	CIVIL	CIMENTO REGUADO e=2cm ALISADO COM ACABAMENTO EM PINTURA EM TINTA EPÓXI ESPECIAL PARA PISO COR CINZA CLARO. PREVER DIVISÃO DA SUPERFÍCIE DO PISO COM JUNTAS DE PLÁSTICO A CADA 120cm	m²			RN				117,20				-	-	-			-	-	
1579	3	18	18.057	18.057	CIVIL	PLACA VINÍLICA 47,5x47,5cm e=3mm LINHA AMBINETA COLEÇÃO STONE PADRÃO ROCK REF. 24034679 MARCA TARKETT	m²			RN				109,20				-	-	-			-	-	
1580	3	18	18.058	18.058	CIVIL	RODAPÉ H=10cm e=19mm EM COMPENSADO SARRAFIADO REVESTIDO COM FÓRMICA COR CINZA COBALTO OU EM (AP) REF. PP0095 MARCA PERTECH	m			RN				491,45				-	-	-			-	-	
1581	3	18	18.059	18.059	CIVIL	RODAPÉ H=30cm e=19mm EM COMPENSADO SARRAFIADO REVESTIDO COM FÓRMICA COR CINZA COBALTO	m			RN				51,70				-	-	-			-	-	
1582	3	18	18.060	18.060	CIVIL	RODAPÉ H=15cm e=19mm EM COMPENSADO SARRAFIADO REVESTIDO COM FÓRMICA PERTECH PP0095 COR CINZA	m			RN				147,53				-	-	-			-	-	
1583	3	18	18.061	18.061	CIVIL	RODAPÉ H=20cm EM PINTURA EM TINTA EPÓXI ESPECIAL PARA PISO COR CINZA CLARO	m			RN				77,23				-	-	-			-	-	
1584	3	18	18.062	18.062	CIVIL	VASO SANITÁRIO COM CAIXA ACOPLADA E DESCARGA DUPLA DE 2,6L E 4L COR BRANCA LINHA SENSE DA MARCA LEROY MERLIN REF. 89834395, ACOMPANHA ASSENTO SANITÁRIO NA COR BRANCO	unid			RN				3,00				-	-	-			-	-	
1585	3	18	18.063	18.063	CIVIL	TORNEIRA PARA LAVATÓRIOS DE MESA COM FECHAMENTO AUTOMÁTICO PRESSMATIC ALFA LEED (COM AREJADOR DE 1,8L/m INCORPORADO) MARCA DOCOL CÓD. 00592606	unid			RN				3,00				-	-	-			-	-	
1586	3	18	18.064	18.064	CIVIL	TORNEIRA DE PRESSÃO COM ALAVANCA PARA LAVATÓRIO DE MESA PRESSMATIC BENEFIT LEED (COM AREJADOR DE 1,8L/m INCORPORADO) MARCA DOCOL CÓD. 00592706	unid			RN				1,00				-	-	-			-	-	
1587	3	18	18.065	18.065	CIVIL	BARRA DE APOIO EM AÇO INOX ESCOVADO L=80cm Ø32mm	unid			RN				11,00				-	-	-			-	-	
1588	3	18	18.066	18.066	CIVIL	CESTO PARA PAPEL	unid			RN				3,00				-	-	-			-	-	
1589	3	18	18.067	18.067	CIVIL	CABIDE REDONDO, CROMADO, 90mmX 50mmX 44mm, LINHA NET- DECA	unid			RN				2,00				-	-	-			-	-	
1590	3	18	18.068	18.068	CIVIL	PURIFICADOR DE ÁGUA ELÉTRICO DE PAREDE MODELO PDF100 MARCA IBBL	unid			RN				1,00				-	-	-			-	-	
1591	3	18	18.069	18.069	CIVIL	PAINEL e=3mm EM ALUMÍNIO COMPOSTO (ACM) COM NÚCLEO EM POLIETILENO E ACABAMENTO EM PINTURA POLIÉSTER COR VERMELHO BANK PRO 128 FABRICAÇÃO PROJETO ALUMÍNIO, APLICADO SOBRE CHAPA DE MDF CRU e=15mm	m²			RN				102,09				-	-	-			-	-	
1592	3	18	18.070	18.070	CIVIL	PAINEL e=3mm EM ALUMÍNIO COMPOSTO (ACM) COM NÚCLEO EM POLIETILENO E ACABAMENTO EM PINTURA POLIÉSTER COR BRUSHED (AÇO ESCOVADO) PRO 132 FABRICAÇÃO PROJETO ALUMÍNIO, APLICADO SOBRE CHAPA DE MDF CRU e=15mm	m²			RN				42,08				-	-	-			-	-	
1593	3	18	18.071	18.071	CIVIL	PATTERN RENNER EM MÓDULOS DE PERFIS DE AÇO INOX COM ACABAMENTO ESCOVADO	m²			RN				22,46				-	-	-			-	-	
1594	3	18	18.072	18.072	CIVIL	PERFIL "U" 5x8x5cm EM AÇO INOX ESCOVADO PARA FIXAÇÃO DE PERÍMETRO DO PATTERN	m²			RN				8,95				-	-	-			-	-	
1595	3	18	18.073	18.073	CIVIL	MÓDULO FIXO DE VIDRO TEMPERADO INCOLOR e=10mm NOVO A INSTALAR. ACABAMENTO ENTRE MÓDULOS COM JUNTA SECA. FIXAÇÃO DE PERÍMETRO COM PERFIL "U" 2,5x1,5cm EM ALUMÍNIO NATURAL	m²			RN				37,39				-	-	-			-	-	
1596	3	18	18.074	18.074	CIVIL	LUMINOSO RENNER CONFORME DETALHAMENTO	m²			RN				1,96				-	-	-			-	-	
1597	3	18	18.075	18.075	CIVIL	PERFIL TUBULAR 25x5cm EM AÇO INOX COM ACABAMENTO ESCOVADO	m²			RN				9,90				-	-	-			-	-	
1598	3	18	18.076	18.076	CIVIL	PERFIL TUBULAR 8x4cm EM AÇO INOX COM ACABAMENTO ESCOVADO	m²			RN				21,43				-	-	-			-	-	
1599	3	18	18.077	18.077	CIVIL	PERFIL "U" 2x2x2cm EM AÇO INOX COM ACABAMENTO ESCOVADO	m²			RN				1,42				-	-	-			-	-	
1600	3	18	18.078	18.078	CIVIL	PERFIL TUBULAR 6x4cm EM AÇO INOX COM ACABAMENTO ESCOVADO	m²			RN				6,15				-	-	-			-	-	
1601	3	18	18.079	18.079	CIVIL	REVESTIMENTO EM CHAPA e=18mm DE MDF COM ACABAMENTO EM LAMINADO DECORATIVO COR ARGENTO MARCA BERNECK, COM APLICAÇÃO DE VERNIZ RETARDANTE DE CHAMAS CKC-VR MARCA CKC	m²			RN				8,49				-	-	-			-	-	
1602	3	18	18.080	18.080	CIVIL	GUARDA-CORPO METÁLICO H=110cm COM ACABAMENTO FINAL EM PINTURA ESMALTE COR CINZA SOBRE FUNDO PARA GALVANIZADOS	m			RN				7,40				-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1603	3	18	18.081	18.081	CIVIL	GUARDA-CORPO E CORRIMÃO METÁLICO 2 ALTURAS (H=70cm E H=92cm) COM ACABAMENTO EM PINTURA ESMALTE COR AMARELO	m			RN				22,70				-	-	-			-	-	
1604	3	18	18.082	18.082	CIVIL	REFORÇO NOS PILARES H=35cm E H=185cm PARA A FIXAÇÃO DO MOBILIÁRIO	m			RN				88,40				-	-	-			-	-	
1605	3	18	18.083	18.083	CIVIL	REFORÇO DE MADEIRA PARA FIXAÇÃO DE BARRAS DE APOIO NAS CABINES PNE DO PROVADOR	m			RN				4,00				-	-	-			-	-	
1606	3	18	18.084	18.084	CIVIL	TRILHO TRACK 1 PRETO. ACESSÓRIO TRACK 1 TAMPA ACABAMENTO PRETO, JUNÇÃO TRACK 1 RETA PRETO, ACESSÓRIO TRACK 1 PONTEIRA LIGAÇÃO PRETO - MÓDULO = 1,00m	unid			RN				16,00				-	-	-			-	-	
1607	3	18	18.085	18.085	CIVIL	TAPETE 250x151cm MODELO TRICOT NÁUTICO COR MESCLA ROCHA DE AREIA COLEÇÃO ÁGUA MARINHA FABRICANTE CIA DAS FIBRAS - FORNECIMENTO CONSTRUTORA	unid			RN				1,00				-	-	-			-	-	
1608	3	18	18.086	18.086	CIVIL	LIXEIRAS PARA COLETA SELETIVA COM CAPACIDADE PARA 120 LITROS - METAL / ORGÂNICO / PAPEL / PLÁSTICO / VIDRO	unid			RN				5,00				-	-	-			-	-	
1609	3	18	18.087	18.087	CIVIL	LIXEIRA MIX INOX 4 EM 1 - LIXEIRA PARA COLETA SELETIVA COM 04 DIVISÕES E CAPACIDADE PARA 50 LITROS REF. MIX50/4INOX FORNECEDOR NATURAL LIMP OU SIMILAR - DIVISÕES INTERNAS: AMARELA (METAIS), AZUL (PAPÉIS), VERMELHA (PLÁSTICOS) E VERDE (VIDROS)	unid			RN				15,00				-	-	-			-	-	
1610	3	18	18.088	18.088	CIVIL	FORNECIMENTO E INSTALAÇÃO DO PAINEL PARA TELA DE LED DO FUNDO DOS CAIXAS, CONFORME DETALHAMENTO DE MARCENARIA	unid			RN				1,00				-	-	-			-	-	
1611	3	18	18.089	18.089	CIVIL	EXECUÇÃO DE NICHOS 170x170cm NO FORRO DE GESSO PARA INSTALAÇÃO DE TENSOFLEX EMBUTIDO	unid			RN				4,00				-	-	-			-	-	
1612	3	18	18.090	18.090	CIVIL	CAIXA DE TOMADA EMBUTIDA NO REVESTIMENTO DE ACM, CONFORME DETALHAMENTO	unid			RN				1,00				-	-	-			-	-	
1613	3	18	18.091	18.091	CIVIL	PERFIL CANTONEIRA PARA GESSO REF. G1 FORNECEDOR CANTO METAL OU SIMILAR	m			RN				39,55				-	-	-			-	-	
1614	3	18	18.092	18.092	CIVIL	BANDA ACÚSTICA EM ESPELHO e=3mm AUTOADESIVA PARA PAREDES DRYWALL	m			RN				263,02				-	-	-			-	-	
1615	3	18	18.093	18.093	HIDRO	Chave de Fluxo com retardo pneumático	unid			RN				1,00				-	-	-			-	-	
1616	3	18	18.094	18.094	HIDRO	Válvula solenóide de duas vias, corpo em alumínio	unid			RN				7,00				-	-	-			-	-	
1617	3	18	18.095	18.095	HIDRO	Chuveiro automático Sprinkler 68°C, oculto, tipo lâmpada, 1/2"	unid			RN				25,00				-	-	-			-	-	
1618	3	18	18.096	18.096	ELÉTRICA / SOM / SEGURANÇA / AU	Eletrocalha em aço galvanizado - lisa - com tampa sob pressão - #16 - 50 x 50 mm - 3000mm comprimento	unid			RN				170,00				-	-	-			-	-	
1619	3	18	18.097	18.097	ELÉTRICA / SOM / SEGURANÇA / AU	Eletrocalha em aço galvanizado - lisa - com tampa sob pressão - #16 - 200 x 50 mm - 3000mm comprimento	unid			RN				8,00				-	-	-			-	-	
1620	3	18	18.098	18.098	ELÉTRICA / SOM / SEGURANÇA / AU	Perfilado zincado liso 38x38mm, chapa #18, incluindo acessórios e conexões	m			RN				1.968,00				-	-	-			-	-	
1621	3	18	18.099	18.099	ELÉTRICA / SOM / SEGURANÇA / AU	Caixa de tomadas múltiplas dos PDV's com 02 pontos de lógica, 03 pontos de energia normal e 06 pontos de energia estabilizada	unid			RN				1,00				-	-	-			-	-	
1622	3	18	18.100	18.100	ELÉTRICA / SOM / SEGURANÇA / AU	Botão de destrave	unid			RN				5,00				-	-	-			-	-	
1623	3	18	18.101	18.101	ELÉTRICA / SOM / SEGURANÇA / AU	Botão de pânico	unid			RN				3,00				-	-	-			-	-	
1624	3	18	18.102	18.102	ELÉTRICA / SOM / SEGURANÇA / AU	Infravermelho passivo	unid			RN				17,00				-	-	-			-	-	
1625	3	18	18.103	18.103	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor magnético de piso	unid			RN				4,00				-	-	-			-	-	
1626	3	18	18.104	18.104	ELÉTRICA / SOM / SEGURANÇA / AU	Sensor magnético	unid			RN				18,00				-	-	-			-	-	
1627	3	18	18.105	18.105	ELÉTRICA / SOM / SEGURANÇA / AU	Sirene	unid			RN				1,00				-	-	-			-	-	
1628	3	18	18.106	18.106	ELÉTRICA / SOM / SEGURANÇA / AU	Monitor	unid			RN				1,00				-	-	-			-	-	
1629	3	18	18.107	18.107	ELÉTRICA / SOM / SEGURANÇA / AU	Leitor biométrico	unid			RN				1,00				-	-	-			-	-	
1630	3	18	18.108	18.108	ELÉTRICA / SOM / SEGURANÇA / AU	Vergalhão de cobre Ø5,16mm	conj			RN				1,00				-	-	-			-	-	
1631	3	18	18.109	18.109	ELÉTRICA / SOM / SEGURANÇA / AU	Suporte para chave seccionadora ou base fusível	unid			RN				2,00				-	-	-			-	-	
1632	3	18	18.110	18.110	ELÉTRICA / SOM / SEGURANÇA / AU	Punho manobra	unid			RN				1,00				-	-	-			-	-	
1633	3	18	18.111	18.111	ELÉTRICA / SOM / SEGURANÇA / AU	Base tripolar para fusível HH 400A-15kV, com fusível HH32A	unid			RN				1,00				-	-	-			-	-	
1634	3	18	18.112	18.112	ELÉTRICA / SOM / SEGURANÇA / AU	Chave seccionadora tripolar para uso interno, sem carga, 300A-15kV	unid			RN				1,00				-	-	-			-	-	
1635	3	18	18.113	18.113	PPCI	Suporte batom para extintor de incêndio	unid			RN				8,00				-	-	-			-	-	
1636	3	18	18.114	18.114	PPCI	Luminária autônoma para sinalização de emergência Acrileds, ref. 15/16	unid			RN				29,00				-	-	-			-	-	
1637	3	18	18.115	18.115	PPCI	Luminária autônoma para sinalização de emergência Acrileds, ref. 17	unid			RN				4,00				-	-	-			-	-	
1638	3	18	18.116	18.116	PPCI	Luminária autônoma para sinalização de emergência Acrileds, ref. 22	unid			RN				1,00				-	-	-			-	-	
1639	3	18	18.117	18.117	PPCI	Placa fotoluminescente "EXTINTOR DE INCÊNDIO" conforme código E5 da NBR 16820:2020	unid			RN				31,00				-	-	-			-	-	
1640	3	18	18.118	18.118	PPCI	Placa fotoluminescente "ALARME SONORO" conforme código E1 da NBR 16820:2020	unid			RN				37,00				-	-	-			-	-	
1641	3	18	18.119	18.119	PPCI	Placa fotoluminescente "COMANDO MANUAL DE ALARME SONORO" conforme código E2 da NBR 16820:2020	unid			RN				11,00				-	-	-			-	-	
1642	3	18	18.120	18.120	PPCI	Placa fotoluminescente "ABRIGO DE MANGUEIRA E HIDRANTE" conforme código E7 da NBR 16820:2020	unid			RN				8,00				-	-	-			-	-	
1643	3	18	18.121	18.121	CLIMATIZAÇÃO	Instalação evaporador VRF 18,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN				1,00				-	-	-			-	-	
1644	3	18	18.122	18.122	CLIMATIZAÇÃO	Instalação evaporador VRF 28,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN				1,00				-	-	-			-	-	
1645	3	18	18.123	18.123	CLIMATIZAÇÃO	Instalação evaporador VRF 36,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN				2,00				-	-	-			-	-	
1646	3	18	18.124	18.124	CLIMATIZAÇÃO	Instalação condensador VRF 18,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN				1,00				-	-	-			-	-	
1647	3	18	18.125	18.125	CLIMATIZAÇÃO	Instalação condensador VRF 20,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN				1,00				-	-	-			-	-	
1648	3	18	18.126	18.126	CLIMATIZAÇÃO	Instalação condensador VRF 22,0 HP, incluindo calços amortecedores, ligação final frigorígena com acessórios, carga de gás R-410A, ligação final de força/comando/automação e dreno.	unid			RN				4,00				-	-	-			-	-	
1649	3	18	18.127	18.127	CLIMATIZAÇÃO	Fornecimento e instalação de gabinete de ventilação, centrifugo, filtro G4-1", faixa de vazão de ar de 9.001 a 11.000m³/h e altura manométrica na faixa de 25 a 45mmca, motor alto rendimento, 4 pólos, calços amortecedores, suporte e acessórios.	unid			RN				1,00				-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1650	3	18	18.128	18.128	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de temperatura, instalado em ambiente interno, incluindo cabos, eletrodutos e acessórios.	unid			RN				2,00				-	-	-			-	-	
1651	3	18	18.129	18.129	CLIMATIZAÇÃO	Fornecimento e instalação de sensor de umidade de ar, interno aos dutos, incluindo cabos, eletrodutos e acessórios.	unid			RN				1,00				-	-	-			-	-	
1652	3	18	18.130	18.130	CLIMATIZAÇÃO	Instalação de quadro elétrica de força (QEAC), ligações do quadro até as unidades evaporadoras VRF's, incluindo cabos, eletrodutos e acessórios, unidades evaporadoras VRF's ponto de força total de 187,5 kVA.	unid			RN				1,00				-	-	-			-	-	
1653	3	18	18.131	18.131	CLIMATIZAÇÃO	Instalação de quadro elétrica de força (QEAC), ligações do quadro até as unidades evaporadoras VRF's, incluindo cabos, eletrodutos e acessórios, unidades evaporadoras VRF's ponto de força total de 27,7 kVA.	unid			RN				1,00				-	-	-			-	-	
1654	3	18	18.132	18.132	CLIMATIZAÇÃO	Instalação de quadro elétrica de força (QEAC), ligações do quadro até as unidades evaporadoras VRF's, incluindo cabos, eletrodutos e acessórios, unidades evaporadoras VRF's ponto de força total de 26,5 kVA.	unid			RN				1,00				-	-	-			-	-	
1655	3	18	18.133	18.133	CLIMATIZAÇÃO	Módulo central de automação / Gateway Modbus (conversão do prtocolo fechado V.R.F. p/modbus RTU)	unid			RN				1,00				-	-	-			-	-	
1656	3	18	18.134	18.134	CLIMATIZAÇÃO	Controle remoto central para controle das evaporadorasparas do sistema V.R.F. - Ref: CCM30 ou similar	unid			RN				1,00				-	-	-			-	-	
1657	3	18	18.135	18.135	CLIMATIZAÇÃO	Painel de controle com sensor de temperatura embutido para sistema V.R.F.	unid			RN				5,00				-	-	-			-	-	
1658	3	18	18.136	18.136	CIVIL	PM02 - 120x210cm - PORTA CEGA USA DE 02 FOLHAS DE ABRIR (30cm E 90cm) EM MADEIRA COMPENSADA SEMI-OCA e=3,5cm COM REVESTIMENTO EM CHAPA DE AÇO COM ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO NA FACE EXTERNA E ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO NA FACE INTERNA. GUARNIÇÃO (AMBAS AS FACES) 5x1cm EM CEDRINHO COM ACABAMENTO EM PINTURA ESMALTE SINTÉTICO COR BRANCO. MARCO E CONTRAMARCO EM MADEIRA CONFORME ESPESSURA DA PAREDE.	unid			RN				2,00				-	-	-			-	-	
1659	3	18	18.137	18.137	CIVIL	CAMADA DE EPS TIPO 4 OU SUPERIOR - H=7cm	m³			RN				4,34				-	-	-			-	-	
1660	3	18	18.138	18.138	CIVIL	CAMADA DE EPS TIPO 4 OU SUPERIOR - H=13cm	m³			RN				4,99				-	-	-			-	-	
1661	3	18	18.139	18.139	CIVIL	CAMADA DE EPS TIPO 4 OU SUPERIOR - H=14cm	m³			RN				0,56				-	-	-			-	-	
1662	3	18	18.140	18.140	CIVIL	CAMADA DE NIVELAMENTO DA LAJE EXISTENTE À EXECUTAR - H=2cm	m³			RN				0,85				-	-	-			-	-	
1663	3	18	18.141	18.141	CIVIL	CAPA DE CONTRAPISO ARAMADO COM TELA Q92 DE MALHA QUADRADA - H=4cm	m³			RN				4,19				-	-	-			-	-	
1664	3	18	18.142	18.142	CIVIL	ALÇAPÃO 40x40cm EM FORRO DE GESSO E/OU TESTEIRA EM ACM	unid			RN				15,00				-	-	-			-	-	
1665	3	18	18.143	18.143	CIVIL	ÁREA SEM FORRO - LAJE DE CONCRETO EXISTENTE RECEBE NOVO ACABAMENTO EM PINTURA EM TINTA FOSCA COR CINZA ZEPELIM REF. 30YY 46/036 MARCA CORAL	m²			RN				1.536,10				-	-	-			-	-	
1666	3	18	18.144	18.144	CIVIL	PAINEL WALL ESP.=40mm + REFORÇO EM DUAS PLACAS DE GESSO TIPO ST ESP.=12,5mm CADA, COM ENTREFORRO ≥ 10cm PREENCHIDO COM LÃ DE VIDRO	m²			RN				363,19				-	-	-			-	-	
1667	3	18	18.145	18.145	CIVIL	RODAPÉ H=15cm e=19mm EM GRANITO NA COR CINZA CORUMBÁ	m²			RN				25,11				-	-	-			-	-	
1668	3	18	18.146	18.146	CIVIL	PAINEL e=3mm EM ALUMÍNIO COMPOSTO (ACM) COM NÚCLEO EM POLIETILENO E ACABAMENTO EM PINTURA POLIÉSTER COR BRANCO PORCELANA PRO 102 FABRICAÇÃO PROJETO ALUMÍNIO, APLICADO SOBRE CHAPA DE MDF CRU e=15mm	m²			RN				63,75				-	-	-			-	-	
1669	3	18	18.147	18.147	CIVIL	TAPETE 300x250cm MODELO TRICOT NÁUTICO COR MESCLA ROCHA DE AREIA COLEÇÃO ÁGUA MARINHA FABRICANTE CIA DAS FIBRAS - FORNECIMENTO CONSTRUTORA	unid			RN				1,00				-	-	-			-	-	
1670	3	18	18.148	18.148	CIVIL	TAPETE 450x151cm MODELO TRICOT NÁUTICO COR MESCLA ROCHA DE AREIA COLEÇÃO ÁGUA MARINHA FABRICANTE CIA DAS FIBRAS - FORNECIMENTO CONSTRUTORA	unid			RN				1,00				-	-	-			-	-	
1671	3	18	18.149	18.149	CIVIL	FORNECIMENTO E INSTALAÇÃO: - VASO DE POLIETILENO DA COLEÇÃO CUMBUCA LONGADO TAMANHO G 50cm(A)x50cm(L)x46cm(BOCA) COR CINZA CLARO, FORNECIMENTO VASAP DESIGN - PRATO DE POLIETILENO DA COLEÇÃO CUMBUCA LONGADO TAMANHO G COR CINZA CLARO, FORNECIMENTO VASAP DESIGN - VEGETAÇÃO DE GRANDE PORTE DA ESPÉCIE FICUS LYRATA - MATERIAL DE PLANTIO: MANTA, COMPOSTO ORGÂNICO E CINASITA (OU ARGILA EXPANDIDA) - MATERIAL DE COBERTURA/ACABAMENTO DA TERRA: CASCA DE PINUS POLITA - ALTURA DO CONJUNTO VASO + VEGETAÇÃO = 160cm	unid			RN				2,00				-	-	-			-	-	
1672	3	18	18.150	18.150	CIVIL	FORNECIMENTO E INSTALAÇÃO: - VASO DE POLIETILENO DA COLEÇÃO CUMBUCA LONGADO TAMANHO M 31cm(A)x27cm(L)x22cm(BOCA) COR CINZA CLARO, FORNECIMENTO VASAP DESIGN - PRATO DE POLIETILENO DA COLEÇÃO CUMBUCA LONGADO TAMANHO M COR CINZA CLARO, FORNECIMENTO VASAP DESIGN - VEGETAÇÃO DE MÉDIO PORTE DA ESPÉCIE PACOVÁ - MATERIAL DE PLANTIO: MANTA, COMPOSTO ORGÂNICO E CINASITA (OU ARGILA EXPANDIDA) - MATERIAL DE COBERTURA/ACABAMENTO DA TERRA: CASCA DE PINUS POLITA - ALTURA DO CONJUNTO VASO + VEGETAÇÃO = 75cm	unid			RN				9,00				-	-	-			-	-	
1673	3	18	18.151	18.151						RN								-	-	-			-	-	
1674	3	18	18.152	18.152						RN								-	-	-			-	-	
1675	3	18	18.153	18.153						RN								-	-	-			-	-	
1676	3	18	18.154	18.154						RN								-	-	-			-	-	
1677	3	18	18.155	18.155						RN								-	-	-			-	-	
1678	3	18	18.156	18.156						RN								-	-	-			-	-	
1679	3	18	18.157	18.157						RN								-	-	-			-	-	
1680	3	18	18.158	18.158						RN								-	-	-			-	-	
1681	3	18	18.159	18.159						RN								-	-	-			-	-	
1682	3	18	18.160	18.160						RN								-	-	-			-	-	
1683	3	18	18.161	18.161						RN								-	-	-			-	-	
1684	3	18	18.162	18.162						RN								-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1685	3	18	18.163	18.163						RN								-	-	-			-	-	
1686	3	18	18.164	18.164						RN								-	-	-			-	-	
1687	3	18	18.165	18.165						RN								-	-	-			-	-	
1688	3	18	18.166	18.166						RN								-	-	-			-	-	
1689	3	18	18.167	18.167						RN								-	-	-			-	-	
1690	3	18	18.168	18.168						RN								-	-	-			-	-	
1691	3	18	18.169	18.169						RN								-	-	-			-	-	
1692	3	18	18.170	18.170						RN								-	-	-			-	-	
1693	3	18	18.171	18.171						RN								-	-	-			-	-	
1694	3	18	18.172	18.172						RN								-	-	-			-	-	
1695	3	18	18.173	18.173						RN								-	-	-			-	-	
1696	3	18	18.174	18.174						RN								-	-	-			-	-	
1697	3	18	18.175	18.175						RN								-	-	-			-	-	
1698	3	18	18.176	18.176						RN								-	-	-			-	-	
1699	3	18	18.177	18.177						RN								-	-	-			-	-	
1700	3	18	18.178	18.178						RN								-	-	-			-	-	
1701	3	18	18.179	18.179						RN								-	-	-			-	-	
1702	3	18	18.180	18.180						RN								-	-	-			-	-	
1703	3	18	18.181	18.181						RN								-	-	-			-	-	
1704	3	18	18.182	18.182						RN								-	-	-			-	-	
1705	3	18	18.183	18.183						RN								-	-	-			-	-	
1706	3	18	18.184	18.184						RN								-	-	-			-	-	
1707	3	18	18.185	18.185						RN								-	-	-			-	-	
1708	3	18	18.186	18.186						RN								-	-	-			-	-	
1709	3	18	18.187	18.187						RN								-	-	-			-	-	
1710	3	18	18.188	18.188						RN								-	-	-			-	-	
1711	3	18	18.189	18.189						RN								-	-	-			-	-	
1712	3	18	18.190	18.190						RN								-	-	-			-	-	
1713	3	18	18.191	18.191						RN								-	-	-			-	-	
1714	3	18	18.192	18.192						RN								-	-	-			-	-	
1715	3	18	18.193	18.193						RN								-	-	-			-	-	
1716	3	18	18.194	18.194						RN								-	-	-			-	-	
1717	3	18	18.195	18.195						RN								-	-	-			-	-	
1718	3	18	18.196	18.196						RN								-	-	-			-	-	
1719	3	18	18.197	18.197						RN								-	-	-			-	-	
1720	3	18	18.198	18.198						RN								-	-	-			-	-	
1721	3	18	18.199	18.199						RN								-	-	-			-	-	
1722	3	18	18.200	18.200						RN								-	-	-			-	-	
1723	3	18	18.201	18.201						RN								-	-	-			-	-	
1724	3	18	18.202	18.202						RN								-	-	-			-	-	
1725	3	18	18.203	18.203						RN								-	-	-			-	-	
1726	3	18	18.204	18.204						RN								-	-	-			-	-	
1727	3	18	18.205	18.205						RN								-	-	-			-	-	
1728	3	18	18.206	18.206						RN								-	-	-			-	-	
1729	3	18	18.207	18.207						RN								-	-	-			-	-	
1730	3	18	18.208	18.208						RN								-	-	-			-	-	
1731	3	18	18.209	18.209						RN								-	-	-			-	-	
1732	3	18	18.210	18.210						RN								-	-	-			-	-	
1733	3	18	18.211	18.211						RN								-	-	-			-	-	
1734	3	18	18.212	18.212						RN								-	-	-			-	-	
1735	3	18	18.213	18.213						RN								-	-	-			-	-	
1736	3	18	18.214	18.214						RN								-	-	-			-	-	
1737	3	18	18.215	18.215						RN								-	-	-			-	-	
1738	3	18	18.216	18.216						RN								-	-	-			-	-	
1739	3	18	18.217	18.217						RN								-	-	-			-	-	
1740	3	18	18.218	18.218						RN								-	-	-			-	-	
1741	3	18	18.219	18.219						RN								-	-	-			-	-	
1742	3	18	18.220	18.220						RN								-	-	-			-	-	
1743	3	18	18.221	18.221						RN								-	-	-			-	-	
1744	3	18	18.222	18.222						RN								-	-	-			-	-	
1745	3	18	18.223	18.223						RN								-	-	-			-	-	
1746	3	18	18.224	18.224						RN								-	-	-			-	-	
1747	3	18	18.225	18.225						RN								-	-	-			-	-	
1748	3	18	18.226	18.226						RN								-	-	-			-	-	
1749	3	18	18.227	18.227						RN								-	-	-			-	-	
1750	3	18	18.228	18.228						RN								-	-	-			-	-	
1751	3	18	18.229	18.229						RN								-	-	-			-	-	
1752	3	18	18.230	18.230						RN								-	-	-			-	-	
1753	3	18	18.231	18.231						RN								-	-	-			-	-	
1754	3	18	18.232	18.232						RN								-	-	-			-	-	
1755	3	18	18.233	18.233						RN								-	-	-			-	-	
1756	3	18	18.234	18.234						RN								-	-	-			-	-	

ORD	NV	CT	SNV	Item	CATEGORIA LPU	DESCRIÇÃO	UNID	Certificação	RE-	RN	YC	CM	AS	Quant Orient (Escr. Proj)	Quant. Orçada (Construt)	VLR UNIT MDO	VLR UNIT MAT	TOTAL MDO + MAT	TOTAL MDO	TOTAL MAT	FAT DIRETO MDO (?)	FAT DIRETO MAT (?)	TOTAL GERAL (sem BDI)	TOTAL GERAL (com BDI)	Observações
1757	3	18	18.235	18.235						RN								-	-	-			-	-	
1758	3	18	18.236	18.236						RN								-	-	-			-	-	
1759	3	18	18.237	18.237						RN								-	-	-			-	-	
1760	3	18	18.238	18.238						RN								-	-	-			-	-	
1761	3	18	18.239	18.239						RN								-	-	-			-	-	
1762	3	18	18.240	18.240						RN								-	-	-			-	-	
1763	3	18	18.241	18.241						RN								-	-	-			-	-	
1764	3	18	18.242	18.242						RN								-	-	-			-	-	
1765	3	18	18.243	18.243						RN								-	-	-			-	-	
1766	3	18	18.244	18.244						RN								-	-	-			-	-	
1767	3	18	18.245	18.245						RN								-	-	-			-	-	
1768	3	18	18.246	18.246						RN								-	-	-			-	-	
1769	3	18	18.247	18.247						RN								-	-	-			-	-	
1770	3	18	18.248	18.248						RN								-	-	-			-	-	
1771	3	18	18.249	18.249						RN								-	-	-			-	-	
1772	3	18	18.250	18.250						RN								-	-	-			-	-	
1773	3	18	18.251	18.251						RN								-	-	-			-	-	
1774	3	18	18.252	18.252						RN								-	-	-			-	-	
1775	3	18	18.253	18.253						RN								-	-	-			-	-	
1776	3	18	18.254	18.254						RN								-	-	-			-	-	
1777	3	18	18.255	18.255						RN								-	-	-			-	-	
1778	3	18	18.256	18.256						RN								-	-	-			-	-	
1779	3	18	18.257	18.257						RN								-	-	-			-	-	
1780	3	18	18.258	18.258						RN								-	-	-			-	-	
1781	3	18	18.259	18.259						RN								-	-	-			-	-	
1782	3	18	18.260	18.260						RN								-	-	-			-	-	
1783	3	18	18.261	18.261						RN								-	-	-			-	-	
1784	3	18	18.262	18.262						RN								-	-	-			-	-	
1785	3	18	18.263	18.263						RN								-	-	-			-	-	
1786	3	18	18.264	18.264						RN								-	-	-			-	-	
1787	3	18	18.265	18.265						RN								-	-	-			-	-	
1788	3	18	18.266	18.266						RN								-	-	-			-	-	
1789	3	18	18.267	18.267						RN								-	-	-			-	-	
1790	3	18	18.268	18.268						RN								-	-	-			-	-	
1791	3	18	18.269	18.269						RN								-	-	-			-	-	
1792	3	18	18.270	18.270						RN								-	-	-			-	-	
1793	3	18	18.271	18.271						RN								-	-	-			-	-	
1794	3	18	18.272	18.272						RN								-	-	-			-	-	
1795	3	18	18.273	18.273						RN								-	-	-			-	-	
1796	3	18	18.274	18.274						RN								-	-	-			-	-	
1797	3	18	18.275	18.275						RN								-	-	-			-	-	
1798	3	18	18.276	18.276						RN								-	-	-			-	-	
1799	3	18	18.277	18.277						RN								-	-	-			-	-	
1800	3	18	18.278	18.278						RN								-	-	-			-	-	
1801	3	18	18.279	18.279						RN								-	-	-			-	-	
1802	3	18	18.280	18.280						RN								-	-	-			-	-	
1803	3	18	18.281	18.281						RN								-	-	-			-	-	
1804	3	18	18.282	18.282						RN								-	-	-			-	-	
1805	3	18	18.283	18.283						RN								-	-	-			-	-	
1806	3	18	18.284	18.284						RN								-	-	-			-	-	
1807	3	18	18.285	18.285						RN								-	-	-			-	-	
1808	3	18	18.286	18.286						RN								-	-	-			-	-	
1809	3	18	18.287	18.287						RN								-	-	-			-	-	
1810	3	18	18.288	18.288						RN								-	-	-			-	-	
1811	3	18	18.289	18.289						RN								-	-	-			-	-	
1812	3	18	18.290	18.290						RN								-	-	-			-	-	
1813	3	18	18.291	18.291						RN								-	-	-			-	-	
1814	3	18	18.292	18.292						RN								-	-	-			-	-	
1815	3	18	18.293	18.293						RN								-	-	-			-	-	
1816	3	18	18.294	18.294						RN								-	-	-			-	-	
1817	3	18	18.295	18.295						RN								-	-	-			-	-	
1818	3	18	18.296	18.296						RN								-	-	-			-	-	
1819	3	18	18.297	18.297						RN								-	-	-			-	-	
1820	3	18	18.298	18.298						RN								-	-	-			-	-	
1821	3	18	18.299	18.299						RN								-	-	-			-	-	
1822	3	18	18.300	18.300						RN								-	-	-			-	-	
1623	1	T				TOTAL GERAL DO ORÇAMENTO													-	-	-			-	-

A.4. CONSTRUCTION WORKS – CONSUMPTION REPORT



RNR 491 - PARK JACAREPAGUÁ

Consumo / Consumption



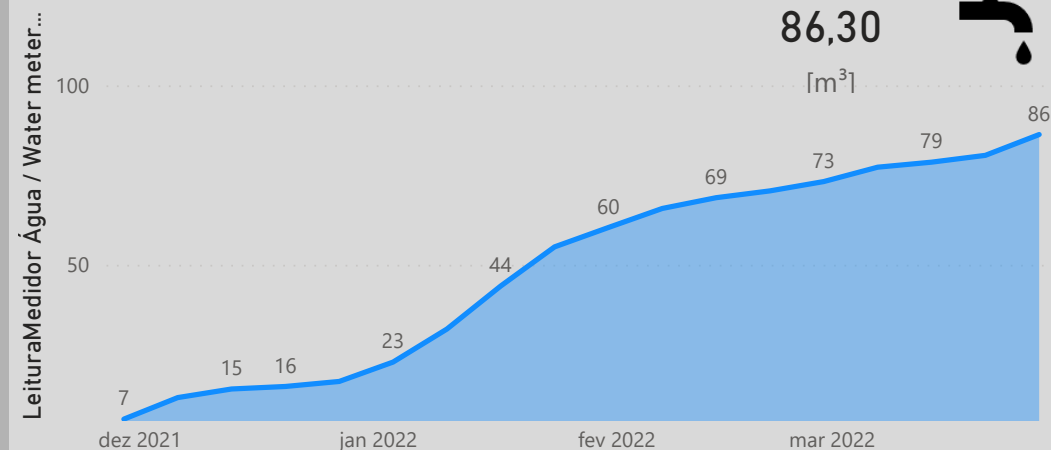
cts arquitetura engenharia e desenvolvimento imobiliário

Consumo de Água / Water Consumption [m³]

Total

86,30

[m³]

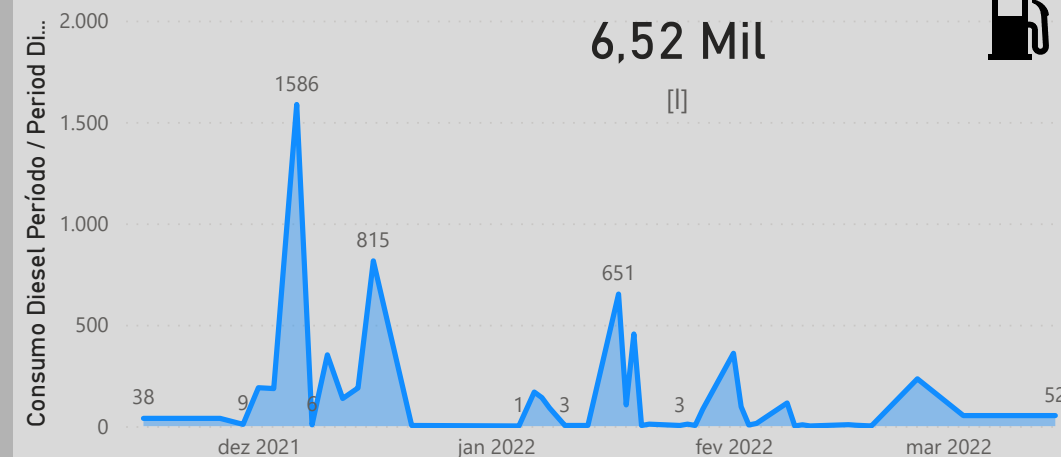


Consumo de Diesel / Diesel Consumption [l]

Total

6,52 Mil

[l]

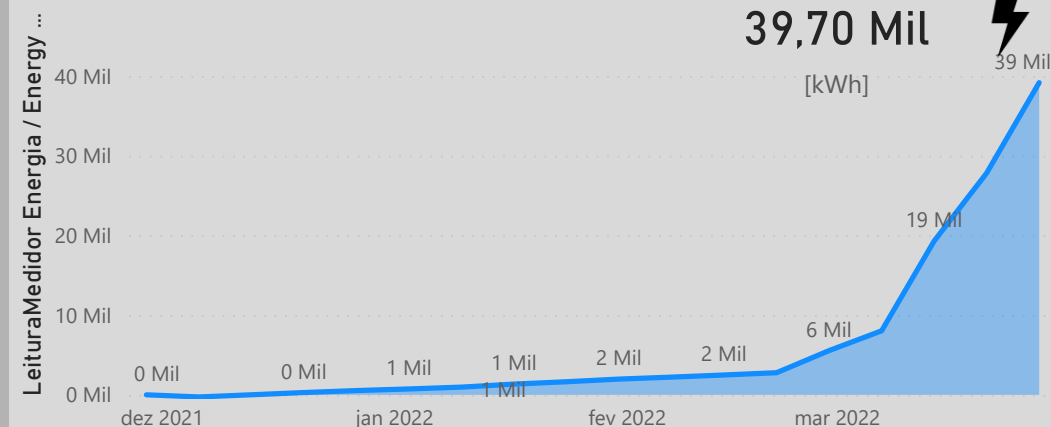


Consumo Energético / Energy Consumption [KWh]

Total

39,70 Mil

[kWh]

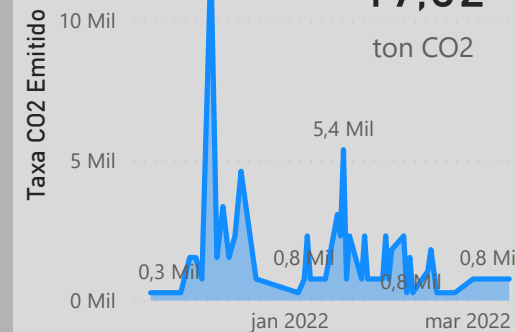


Taxa CO2 Emitido / Rate of CO2 Emitted [g/km]

Transport

17,52

ton CO2

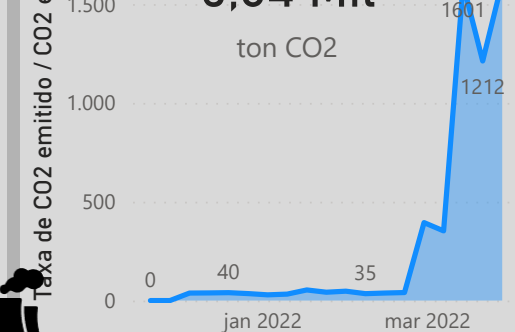


TOTAL CO2 Energia Consumida / Total of CO2 [g/km]

Enegy

5,64 Mil

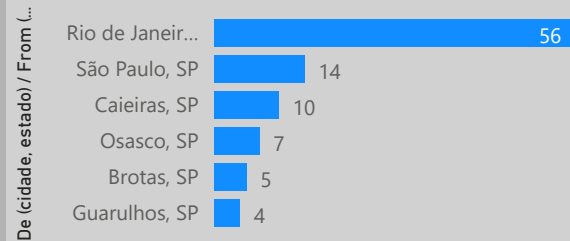
ton CO2





RNR 491 - PARK JACAREPAGUÁ

Emissão de CO2 / CO2 Emissions



Viagem / Trip



6,52 Mil

[l]



23,65 Mil

[Km]



17,52

ton [CO2]

MATERIAL / Material

Todos

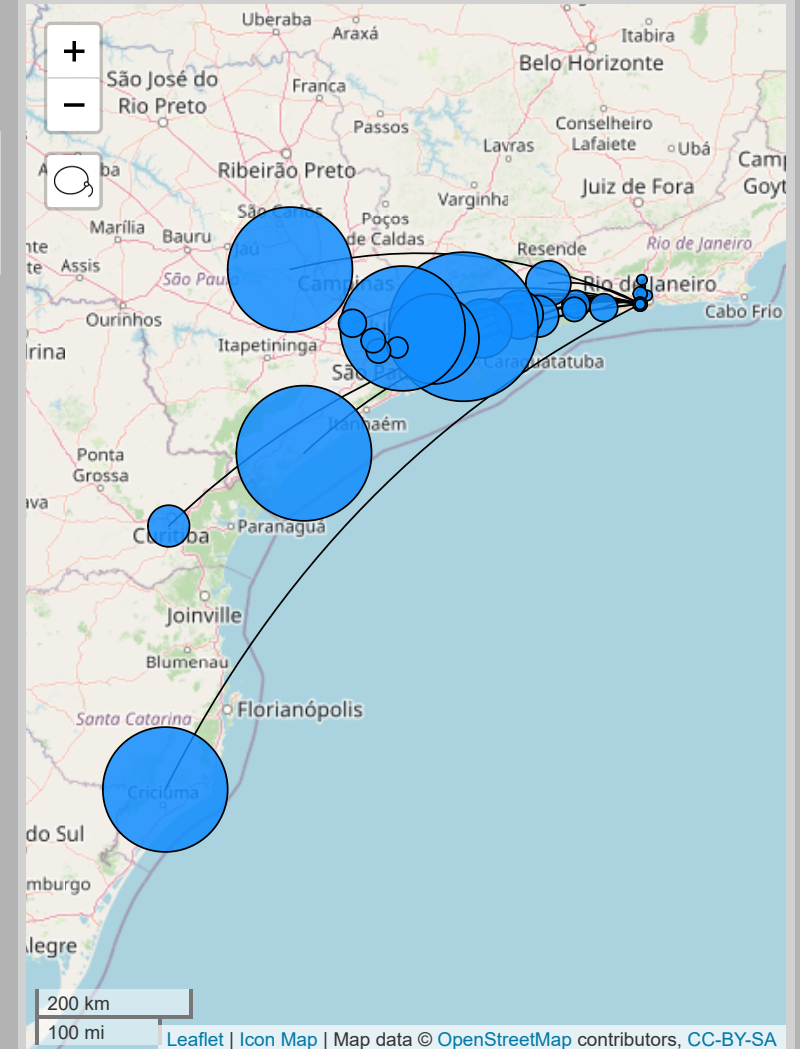
De (cidade, estado) / From (city, state)

Todos

TIPO DE VEÍCULO / Vehicle type

Todos

MATERIAL / Material	Consumo Diesel Período / Period Diesel Consumption	Distância Percorrida A - B / Travelled distanceA - B	Emissão de CO2 / CO2 emissions
METAL - PERFIS FINOS / Metal - steel framing	959,88	3.151,60	2,41
DIFUSOR / Diffuser	710,25	2.841,00	2,19
METAL - CHAPAS / Metal - sheets	734,02	2.604,00	2,00
CERÂMICA / CERAMICS	648,00	2.592,00	2,00
DUTO GALVANIZADO / Galvanized duct	670,59	2.571,00	1,98
FIOS E CABOS / FLEXIBLE CABLES	358,40	1.792,00	1,38
METAL - ESTRUTURA / Metal - structure	331,17	1.099,00	0,85
ARGAMASSAS / MORTAR	212,08	857,90	0,66
CIMENTO / Cement	194,30	783,00	0,60
PLASTICOS - PVC / plastics	143,58	731,80	0,55
METAL - TUBOS / Metal - ducts	320,50	720,10	0,23
GRELHA / Grid	168,00	672,00	0,52
MADEIRA / Timber	76,56	638,00	0,18
Total	6.523,13	23.652,20	17,52



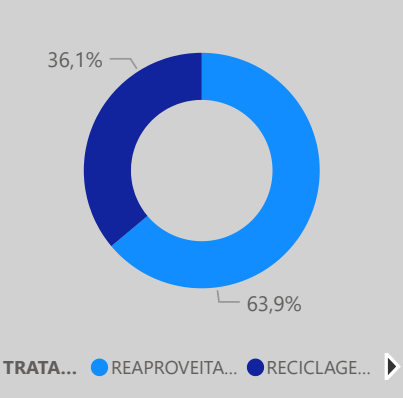


RNR 491 - PARK JACAREPAGUÁ

Destinação de Resíduos / Waste Destination



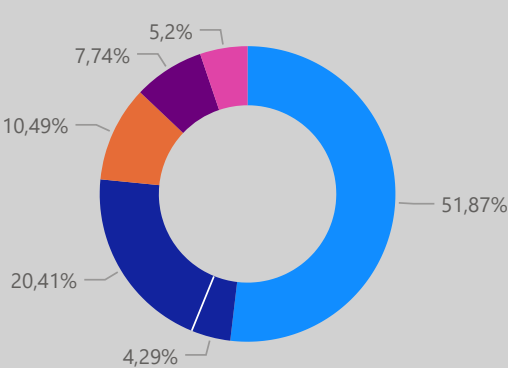
RESÍDUO / WASTE



TRATAMENTO / TREATMENT

APROVEITAMENTO DO RESÍDUO ...

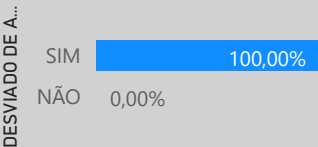
- Terraplanagem / Earthwork
- Reciclado / Recycled
- Biomassa / Biomass
- Adubo / Fertilizer
- Reúso / Reuse
- (Em branco)



TOTAL RESÍDUOS / WASTE (Kg)

30,68 ...

DESVIO DE ATERRO / LANDING DEVIATION



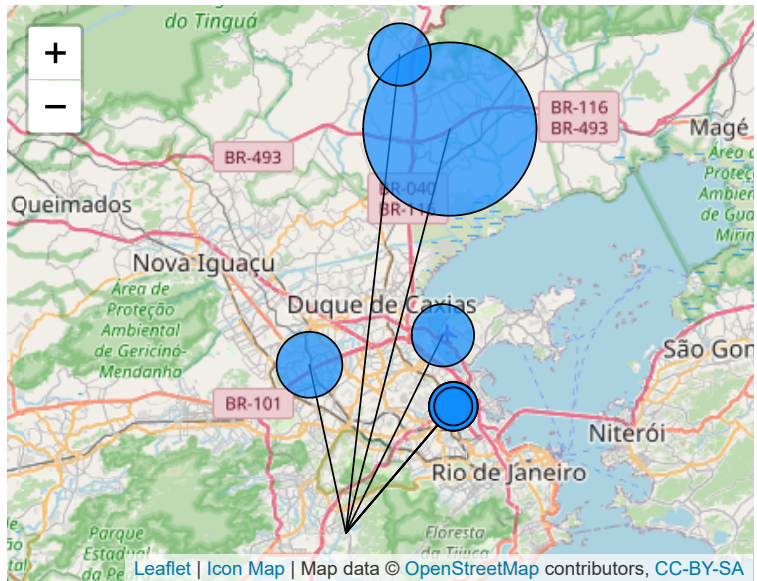
TOTAL RESÍDUOS (m³)

160,00

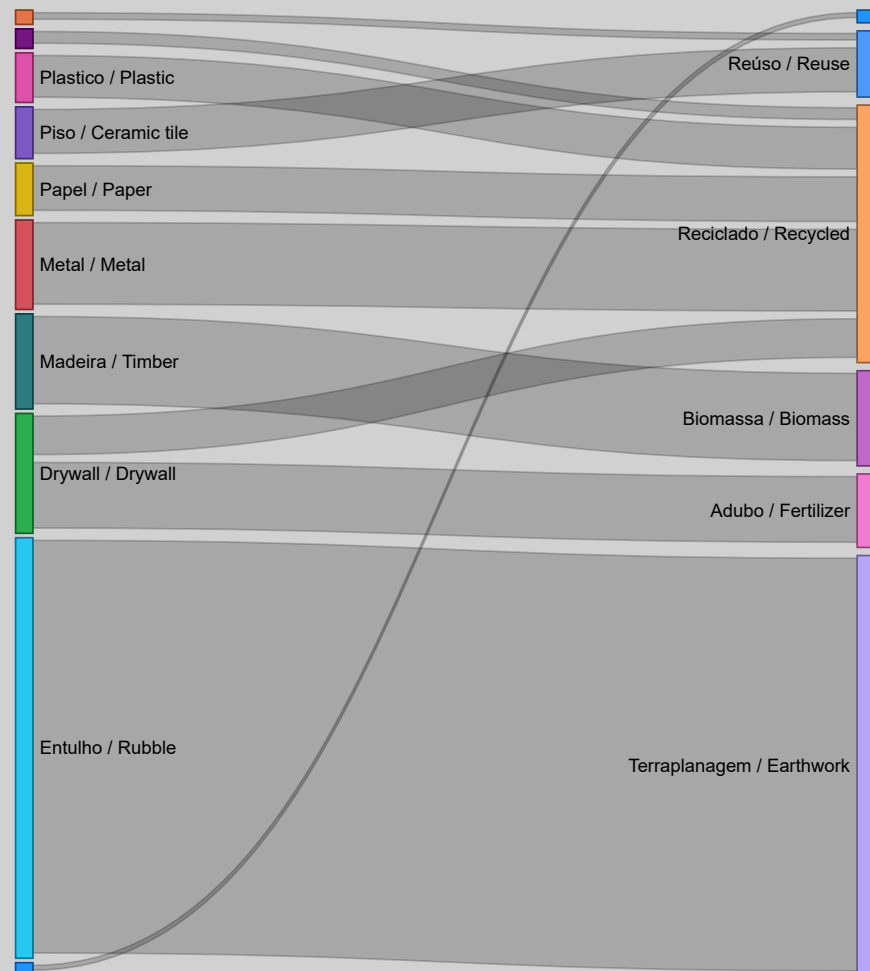
RESÍDUOS (Kg)/m² (Kg)

12,20

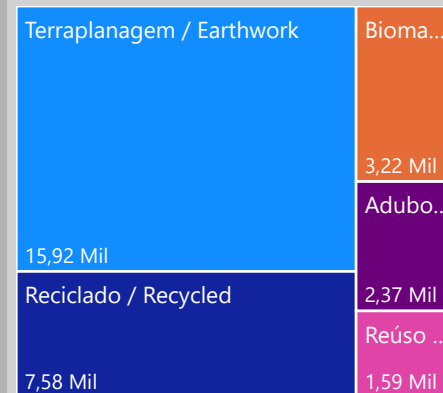
TIPO DE RESÍDUO / Type of waste	DESCRIÇÃO DO RESÍDUO / Waste description	TRATAMENTO DADO / Waste treatment	DESTINATÁRIO FINAL / Final destination	[m³]	[kg]	APROVEITAMENTO DO RESÍDUO / Use of Waste
CLASSE II A	Entulho / Rubble	REAPROVEITAMENTO / REUSE	Rh participações imobiliária LTDA	20,00	15.916,50	Terraplanagem / Earthwork
CLASSE II A	Madeira / Timber	RECICLAGEM / RECYCLE	GB cordeiro reciclagem	25,00	3.219,00	Biomassa / Biomass
CLASSE II A	Metal / Metal	RECICLAGEM / RECYCLE	Ambiental verde	25,00	2.997,50	Reciclado / Recycled
CLASSE II A	Drywall / Drywall	REAPROVEITAMENTO / REUSE	Organossolo	20,00	2.373,50	Adubo / Fertilizer
CLASSE II A	Papel / Paper	RECICLAGEM / RECYCLE	Ambiental verde	27,50	1.554,50	Reciclado / Recycled
CLASSE II A	Piso / Ceramic tile	RECICLAGEM / RECYCLE	Ambiental verde	2,50	1.527,50	Reúso / Reuse
CLASSE II A	Plástico / Plastic	RECICLAGEM / RECYCLE	Ambiental verde	27,50	1.441,25	Reciclado / Recycled
CLASSE II A	Dracena / Dracena	REAPROVEITAMENTO / REUSE	Organossolo	5,00	1.247,00	Reciclado / Recycled
Total				160,00	30.683,25	



DESTINAÇÃO DO RESÍDUO



DESTINAÇÃO DO RESÍDUO



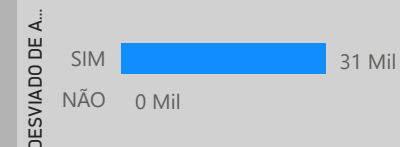
TOTAL RESÍDUOS / WASTE (Kg)

30,68 ...

TOTAL RESÍDUOS (m³)

160,00

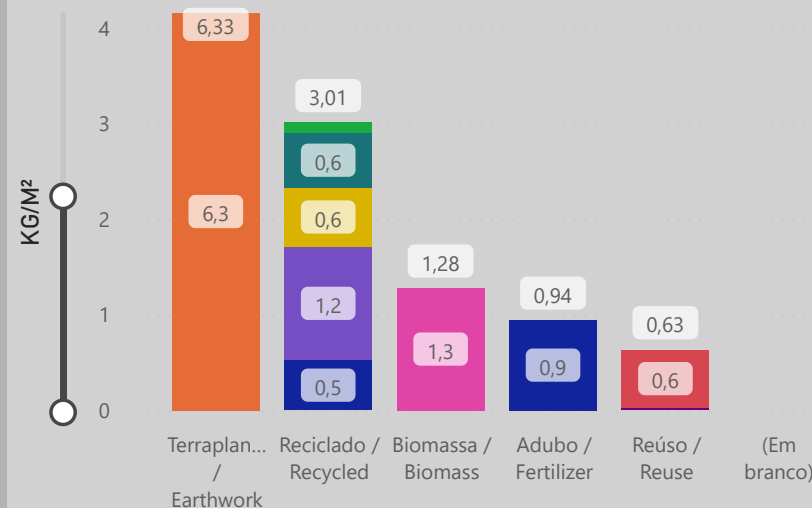
DESVIO DE ATERRO / LANDING DEVIATION



RESÍDUOS (Kg)/m² (Kg)

12,20

DESTINAÇÃO



Aproveitamento do Resíduo / Use of Waste

DESCRIÇÃO DO RESÍDUO / Wast...

- (Em branco)
- Drywall / Drywall
- Entulho / Rubble
- Lã de rocha / rock wool - insul...
- Madeira / Timber
- Metal / Metal
- Papel / Paper
- Piso / Ceramic tile
- Plástico / Plastic
- Produtos perigosos (tinta) / H...

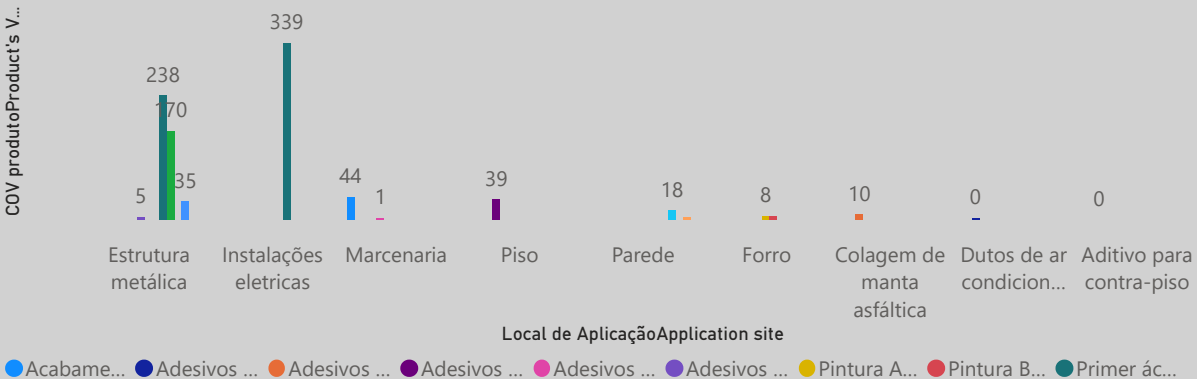


RNR 491 - PARK JACAREPAGUÁ

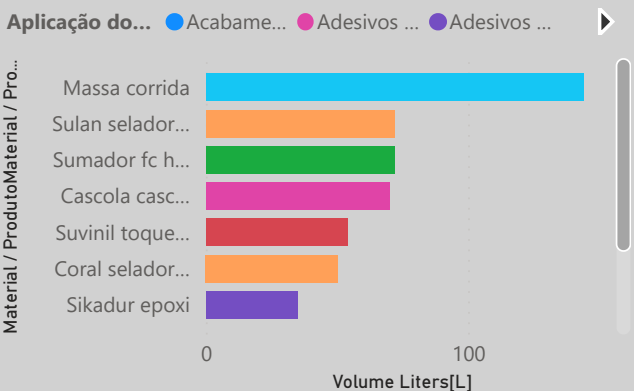
COV de Materiais / VOC of Materials



VALORES DE COV POR APLICAÇÃO



VOLUME APLICADO POR PRODUTOS



FabricanteM...

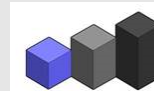
- ☐ Ckc
- ☐ Coral
- ☐ Henkel
- ☐ Powermatic
- ☐ Renner coatings
- ☐ Sherwin williams
- ☐ Sika
- ☐ Sulan
- ☐ Suvinil
- ☐ Tarkett
- ☐ Vedacit
- ☐ Viapol

CategoriaCategory	Local de AplicaçãoApplication site	Empresa Responsável pela Compra/ Uso do ProdutoResponsible for purchasing and product use	Material / ProdutoMaterial / Product	FabricanteManufac turer	COV produtoProduct' s VOC[g/l]	Limite COV [g/l] LEEDVOC LEED Reference [g/L]	Volume Liters[L]	Atendimento LEED?LEED Compliance?
Tintas Revestimentos (Paints Coatings)	Instalações elétricas	Colinas	Suvinil fundo para galvanizados	Suvinil	339,00	420	14,40	APROVADO
Tintas Revestimentos (Paints Coatings)	Estrutura metálica	Emofer	Sumador fc hs plus	Sherwin williams	135,00	150	72,00	APROVADO
Tintas Revestimentos (Paints Coatings)	Marcenaria	Lacerda	VERNIZ RETARDANTE DE CHAMAS CKC- VR	Ckc	43,94	275	5,00	APROVADO
Tintas Revestimentos (Paints Coatings)	Parede	Colinas	Coral rende muito	Coral	11,50	100	18,00	APROVADO
Tintas Revestimentos (Paints Coatings)	Forro	Colinas	Suvinil toque de seda	Suvinil	6,20	50	54,00	APROVADO
Tintas Revestimentos (Paints Coatings)	Parede	Colinas	Massa corrida	Coral	6,10	100	144,00	APROVADO
Adesivos Selantes	Estrutura metálica	Emofer	Sikadur epoxi	Sika	5,02	30	35,00	APROVADO
Total							534,80	



RNR 491 - PARK JACAREPAGUÁ

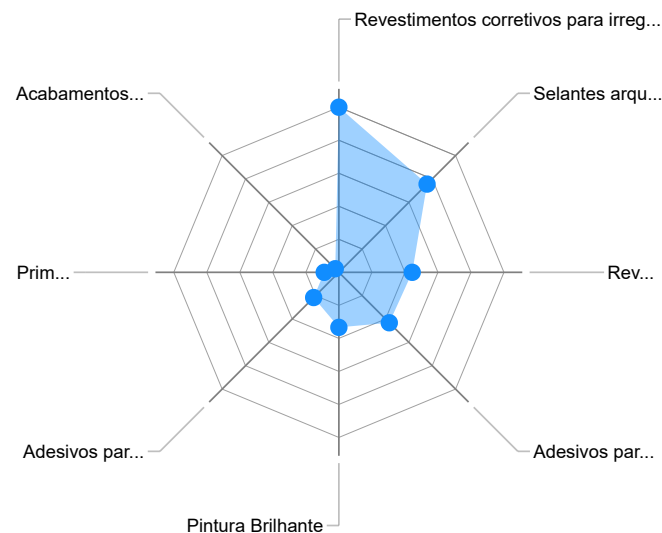
Aplicação de Materiais



cts arquitetura engenharia e desenvolvimento imobiliário

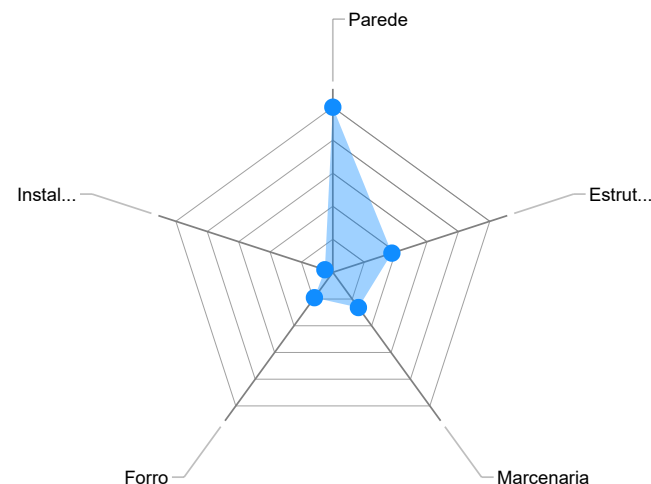
POR PRODUTO

● Volume Liters[L]



POR LOCAL DE APLICAÇÃO

● Volume Liters[L]



POR LOCAL DE APLICAÇÃO

● COV produtoProduct's VOC[g/l]



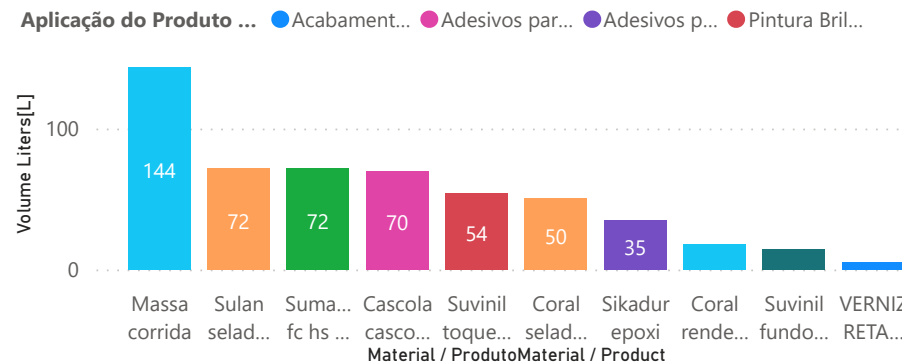
FabricanteMan...

- ☐ Ckc
- ☐ Coral
- ☐ Henkel
- ☐ Powermatic
- ☐ Renner coatings
- ☐ Sherwin williams
- ☐ Sika
- ☐ Sulan
- ☐ Suvinil
- ☐ Tarkett

CategoriaCategory, Material / Produ...

- ☐ Adesivos | Selantes (Adhesives | Sealant...
 - ☐ Bianco
 - ☐ Cascola cascorez extra
 - ☐ Coral selador acrílico
 - ☐ Ecoprimer
 - ☐ Globalfix – Adesivo Acrílico para De...
 - ☐ PU construção
 - ☐ Sikadur epoxi
 - ☐ Sulan selador acrílico
- ☐ Tintas | Revestimentos (Paints | Coatings)

VOLUME APLICADO POR PRODUTOS



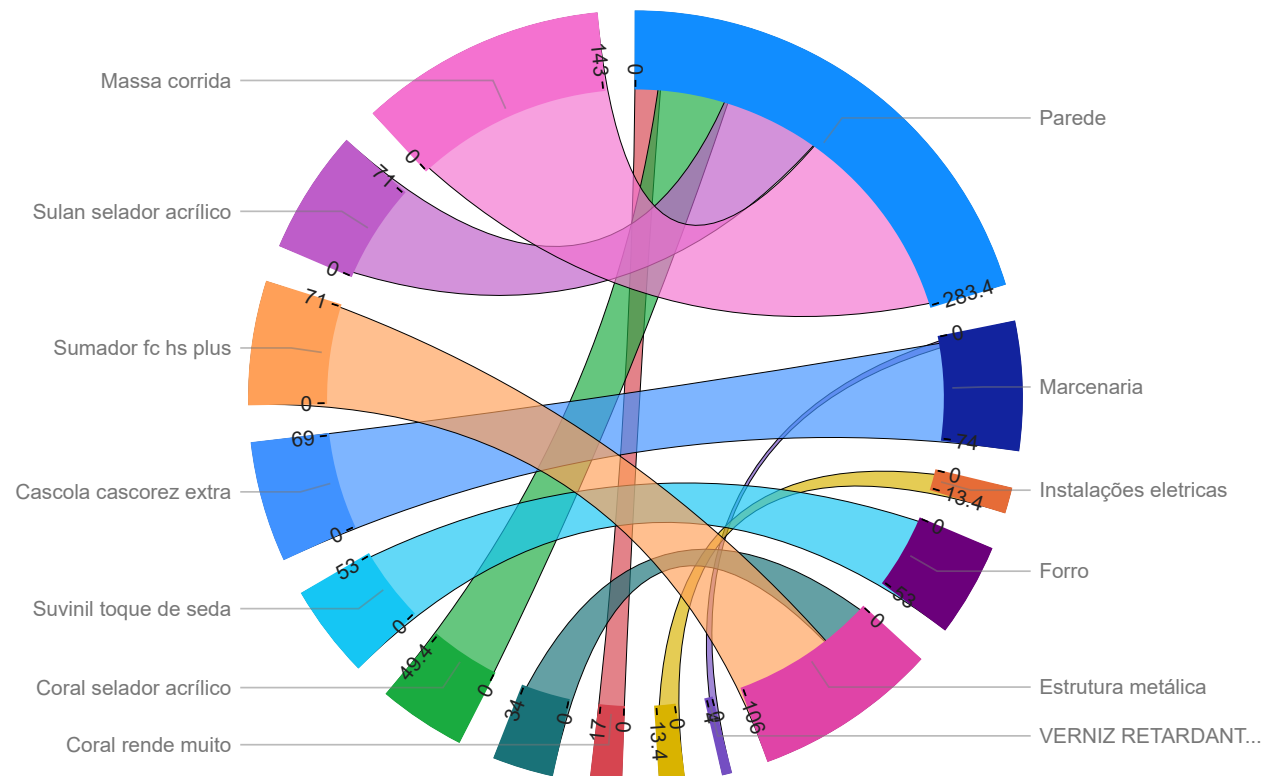
339,00

Máximo de COV produtoProd...

534,80

Volume Liters[L]

Volume Liters[L] por Material / ProdutoMaterial / Product e Local de AplicaçãoApplication site

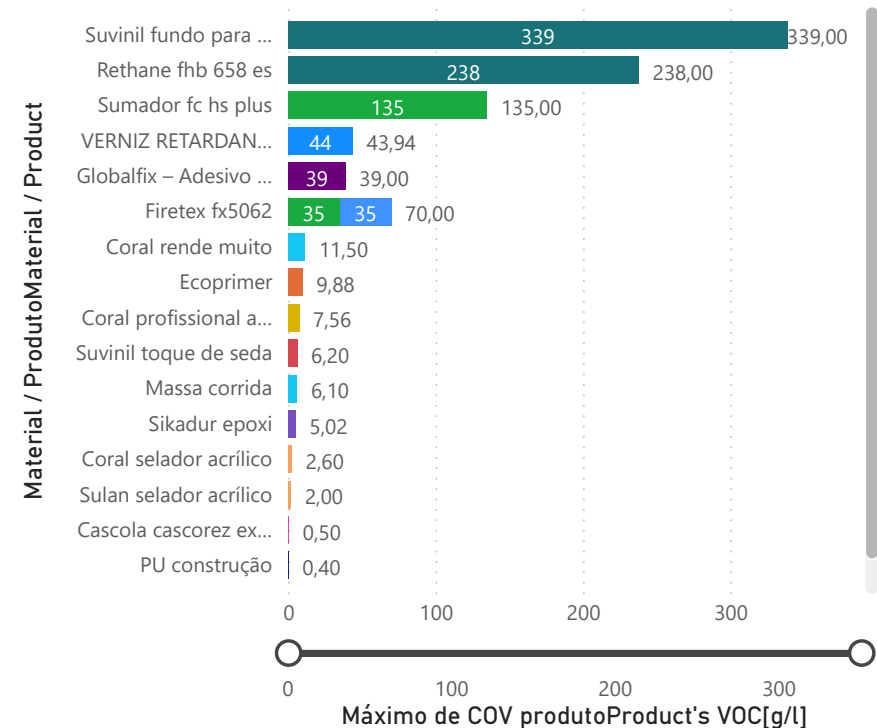


FabricanteManufacturer
Todos

CategoriaCategory, Material / ProdutoMaterial / Product
Todos

COV MÁX POR PRODUTO

Aplicação do Prod... Acabame... Adesivos ... Adesivos ... Adesivo...



534,80

Volume Liters[L]

339,00

Máximo de COV produtoProduct's...

A.5. LCA FIT-OUT AS IMPLEMENTED - DETAILED SCOPE

LCA FIT-OUT AS IMPLEMENTED - Structural Scope				
			SCOPE	
01 DESPESAS INDIRETAS			YES	NO
01.01	Serviços Preliminares	Preparation Services		X
01.01.01	Demolições e Tratamentos	Demolitions		x
01.01.02	Remoções	Removals		x
01.01.03	Desmontagens	Disassembly		x
01.01.04	Seguros, licenças e taxas	Insurance, Permits and Fees		x
01.02	Instalações Provisórias	Temporary Instalations		X
01.02.01	Instalações provisórias de canteiro de obra	Temporary construction site installations		x
01.02.02	Equipamentos de uso e segurança	Use and Safety equipment		x
01.03	Máquinas e Ferramentas	Machinery and Tools		X
01.04	Administração de Obra e Despesas Gerais	Administrativa Management and Expenses		X
01.04.01	Equipe técnica e administrativa da obra	Technical and Administrative Team		x
01.04.02	Consumos	Consumption		x
01.05	Limpeza e Entulhos	Construction Site cleaning and Rubish removal		X
01.06	Trabalhos em terra	Earthworks		X
01.07	Diversos	Others		X
02 CIVIL INFRAESTRUTURA			YES	NO
02.01	Fundações, blocos e vigas baldrames	Foundations, Blocks and Beams	X	
03 CIVIL SUPRAESTRUTURA			YES	NO
03.01	Supraestrutura de concreto	Concrete structures	X	
03.02	Estruturas metálicas	Metal structures	X	
03.03	Estruturas mistas	Mixed structures	X	
04 CIVIL PAREDES E PAINÉIS			YES	NO
04.01	Alvenarias	Masonry	X	
04.01.01	Alvenarias de blocos de concreto	Concrete blocks masonry	x	
04.01.02	Alvenarias de bloco cerâmico	Ceramic blocks masonry	x	
04.02	Divisórias	Partitions	X	
04.02.01	Paredes de gesso acartonado - dry wall	Dry-wall	x	
04.02.02	Divisórias leves	Light Partitions	x	
04.02.03	Elementos vazados	Hollow Elements for Partitions	x	
05 CIVIL ESQUADRIAS E SERRALHERIA			YES	NO
05.01	Esquadrias de madeira	Wood Windows and Doors	X	
05.02	Esquadrias metálicas	Metal Windows and Doors	X	
05.03	Esquadrias de vidro	Glass Windows and Doors	X	
05.04	Vidros, películas e espelhos	Glass and Mirrors	X	
05.05	Serralheria	Metal Works	X	
06 CIVIL COBERTURAS E PROTEÇÕES			YES	NO
06.01	Coverturas	Roofs	X	
06.02	Impermeabilizações	Insulation	X	
07 CIVIL REVESTIMENTOS, PINTURAS E TRATAMENTOS ESPECIAIS			YES	NO
07.01	Revestimentos internos	Internal Cladding	X	
07.02	Revestimentos externos e Elementos da fachada	External Claddings and Façades	X	
07.03	Forros e elementos decorativos	Ceilings	X	
07.04	Pinturas	Painting	X	
08 CIVIL PISOS E PAVIMENTAÇÕES			YES	NO
08.01	Pavimentações	Pavings and Floorings	X	
08.02	Soleiras, Rodapés, Tabeiras, Acessórios de piso	Acessories	X	
09 CIVIL APARELHOS E METAIS			YES	NO
09.01	Aparelhos	Equipments and Accessories	X	
09.02	Metais e acessórios	Metals and Accessories	X	
10 CIVIL PROPAGANDA E EQUIPAMENTOS			YES	NO
10.01	Mobiliários e equipamentos	Furniture and Equipments	X	
11 CIVIL ACESSIBILIDADE			YES	NO
11.01	Placas e adesivos	Signs	X	
11.02	Pavimentação	Special pavings	X	
11.03	Louças e metais PNE	Equipments and Metals for people with disabilities	X	
11.04	Complementos	Add-ons	X	
12 CIVIL LIMPEZA E SERVIÇOS COMPLEMENTARES			YES	NO
12.01	Calafete e limpeza	Finishing and Cleaning	X	
12.02	Serviços complementares	Services	X	
13 HIDRO INSTALAÇÕES HIDROSSANITÁRIAS			YES	NO
13.01	Tubos, conexões e complementos de água fria	Cold Water System pipes and joints		X
13.02	Tubos, conexões e acessórios de esgoto sanitário e pluvial	Sewage System pipes and joints		X
13.03	Diversos	Add-ons		X
14 ELÉTRICA, SOM, SEGURANÇA E AUTOMAÇÃO INSTALAÇÕES			YES	NO
14.01	Eletrodutos e Conexões	Conduits and Joints		X
14.02	Fios e Cabos para instalações de energia, iluminação, telefonia e lógica	Energy, Lighting, and Comunication Cables		X
14.03	Fios e Cabos para instalações de sonorização	Sound Cables		X
14.04	Fios e Cabos para instalações de segurança	Security Cables		X
14.05	Caixas e Quadros de Comando	Control Panels		X
14.06	Tomadas, disjuntores e interruptores	Circuit Breakers and Switches		X
14.07	Kits de Iluminação	Lighting kits		X
14.08	Subestação	Power Substation		X
14.09	Grupo Gerador	Power Generator		X
14.10	No-break	No-break		X

14.11	Equipamentos para instalações de Sonorização	Sound Equipments		X
14.12	Equipamentos para instalações de Segurança	Security Equipments		X
14.13	Diversos	Add-ons		X
14.14	Equipamentos para Automação	Automation Equipments		X
15 PPCI		FIRE PROTECTION	YES	NO
15.01	Tubos e Conexões	Pipes and Joints		X
15.02	Válvulas e registros	Valve		X
15.03	Chuveiros automáticos	Sprinklers		X
15.04	Hidrantes/Mangotinhos	Hydrant		X
15.05	Extintores	Fire Extinguishers		X
15.06	Detecção de alarme	Fire Alarm		X
15.07	Sinalizações	Signs		X
15.08	Diversos	Add-ons		X
16 CLIMATIZAÇÃO, INSTALAÇÕES DE CLIMATIZAÇÃO		HVAC, INSTALLATIONS	YES	NO
16.01	Resfriadores de Líquido (RL)	Chillers		X
16.02	Bombas de Água Gelada (BA)	Cold Water Pumps		X
16.03	Condicionadores de ar - Fan-coil (FCU)	Fan-coil System		X
16.04	Condicionadores de ar - Splitão (UE/UC)	Lage Split System		X
16.05	Condicionadores de ar - VRF (UE/UC)	Variant Refrigerant Flow (VRF) System		X
16.06	Válvulas de Controle e By-pass com atuador proporcional (VC)	Valves and By-passes		X
16.07	Condicionadores de Ar tipo Split System	Split System		X
16.08	Dispositivos de insuflação, retorno e regulagem do ar	Supply and Return air grille and Dumpers		X
16.09	Rede de dutos de insuflação, retorno, exaustão e ar exterior	Supply, Return, Exhaust, and Fresh Air duct network		X
16.10	Tubulações - Água gelada e Frigorígenas	Cold Water Pipes		X
16.11	Quadros Elétricos e de Controle/Automação	Control Panels		X
16.12	Interligações Elétricas de Força e Comando	Power and Control Electrical Interconnections		X
16.13	Ventiladores de ar exterior (VAE) e Ventiladores de exaustão (VEX)	Fresh air and Exhaust fans		X
16.14	Diversos	Add-ons		X
17 MOBILIÁRIO		FURNITURE AND EQUIPMENTS	YES	NO
17.01	Letreiros e cortinas	Signs and Curtains	X	
17.02	Equipamentos de Retaguarda	Backstage Furniture and Equipments	X	
17.03	Equipamentos de Solo	Selling area Furniture and Equipments - central elements	X	
17.04	Equipamentos de Parede	Selling area Furniture and Equipments - wall elements	X	
17.05	Vitrines	Shop-windows	X	
17.06	Mobiliário Área Gourmet	Gourmet Area Furniture	X	
18 OMISSOS		ADD-ONS	YES	NO
18.01-150	Enquadrável nas rubricas acima	Fitted accordingly to headings above	X	
18.01-150	Não Passíveis de enquadramento nas rubricas acima	Not Fitted accordingly to headings above		X

A.6. LCA FIT-OUT AS IMPLEMENTED – RESULTS FROM ONE CLICK LCA

Main > LCA Renner RE Jacarepaguá > As Is > Level(s) life-cycle assessment (EN15804 +A1)

 As Is - Level(s) life-cycle assessment (EN15804 +A1)

Level(s)

Project basic information

Result report: As Is



Project	LCA Renner RE Jacarepaguá - As Is
User	Marlon Braga - 31.07.2024
Tool	Level(s) life-cycle assessment (EN15804 +A1)
Details	Life-cycle assessment for Level(s) - overarching assessment tool 7: Cradle to cradle Life Cycle Assessment (LCA)
General information	
Type	Retail and wholesale buildings
Address	6069 Jacarepagua Rd., Rio de Janeiro, Brazil
Country	Brazil
Gross Floor Area (m²)	2577,25
Number of above ground floors	1
Frame type	existing
Certifications pursued	BREEAM International Renovation and Fit-Out 2015
Project number / code	
Investor / final client	
Year of construction (if refurbishment, original build year)	
Building function(s) distribution	
Technical, functional and qualitative properties	

Some inputs are still undefined: Building materials

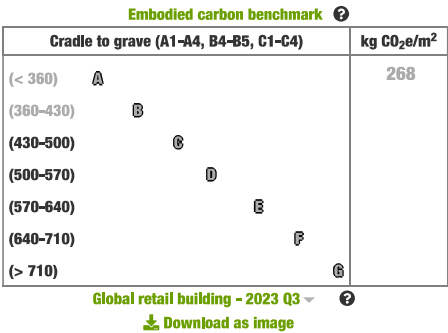
Commercial usage is forbidden, One Click LCA Student (International) Business + Carbon Designer 3D, EDUCATION, Marlon Braga 31.07.2024 13:20

 422 Tonnes CO₂e

 8.19 kg CO₂e / m² / year

 21 102 € Social cost of carbon

Carbon Heroes Benchmark



Results

Life-Cycle Assessment for Level(s) in compliancy with EN 15978 [Download Results Summary](#)

Result category		Global warming kg CO2e	Biogenic carbon storage kg CO2e bio	Ozone Depletion kg CFC11e	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Abiotic depletion potential (ADP-elements) for non fossil resources kg Sbe	Abiotic depletion potential (ADP-fossil fuels) for fossil resources MJ	
A1-A3	Construction Materials	2,84E+05	2,55E+04	1,23E-01	1,32E+03	2,73E+02	1,38E+02	6,04E+04	3,26E+06	Details
✚ A4	Transportation to site	3,37E+03		6,57E-04	1,46E+01	3,17E+00	2,22E-01	2,26E+01	9,23E+04	Details
✚ A5	Construction/installation process	3,24E+04		9,95E-03	1,26E+02	2,50E+01	1,02E+01	4,54E+03	3,47E+05	Details
✚ B1	Use phase	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	Details
✚ B3	Repair	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	Details
✚ B4-B5	Material replacement and refurbishment	4,79E+04		3,48E-03	2,77E+02	3,11E+01	5,73E+01	8,75E+00	6,86E+05	Details
B6	Energy consumption	4,63E+04		3,40E-03	2,59E+02	4,98E+01	1,08E+01	1,87E-01	6,77E+05	Details
B7	Water use	3,92E+03		2,81E-04	2,68E+01	6,25E+00	9,43E-01	1,18E-02	5,71E+04	Details
✚ C1-C4	End of life	4,21E+03		8,05E-04	2,27E+01	4,86E+00	4,41E-01	2,15E+01	1,03E+05	Details
✚ D	External impacts (not included in totals)	-9,26E+04		-5,22E-03	-4,11E+02	-5,46E+01	-5,07E+01	-7,26E-01	-1,24E+06	Details
Total		4,22E+05	2,55E+04	1,42E-01	2,05E+03	3,93E+02	2,18E+02	6,50E+04	5,22E+06	
Results per denominator										
Per gross internal floor area m2 / year		8,19E+00	4,95E-01	2,75E-06	3,98E-02	7,63E-03	4,23E-03	1,26E+00	1,01E+02	
Per gross internal floor area m2		1,64E+02	9,89E+00	5,51E-05	7,96E-01	1,53E-01	8,46E-02	2,52E+01	2,03E+03	

Indicators describing the usage of primary energy and water

Result category		Use of renewable primary energy resources as raw materials MJ	Total use of primary energy ex. raw materials MJ	Total use of renewable primary energy MJ	Total use of non renewable primary energy MJ	Use of net fresh water m3	
A1-A3	Construction Materials	2,22E+05	4,20E+06	6,69E+05	3,87E+06	2,19E+04	Details
A4	Transport to the building site	0,00E+00	9,26E+04	3,85E+02	9,22E+04	1,66E-01	Details
✚ A5	Construction/installation process	2,65E+04	5,43E+05	1,91E+05	3,88E+05	1,65E+03	Details
✚ B1	Use phase	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	Details
✚ B3	Repair	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	Details
✚ B4-B5	Material replacement and refurbishment	8,77E+04	8,42E+05	1,97E+05	8,11E+05	3,42E+03	Details
B6	Energy consumption	0,00E+00	1,33E+06	6,50E+05	6,77E+05	1,75E+02	Details
B7	Water use	0,00E+00	6,44E+04	7,31E+03	5,71E+04	2,29E+01	Details
✚ C1-C4	End of life	0,00E+00	1,04E+05	6,80E+02	1,04E+05	2,67E+00	Details
✚ D	External impacts (not included in totals)	0,00E+00	-1,42E+06	-1,07E+05	-1,32E+06	-1,01E+03	Details
Total		3,36E+05	7,17E+06	1,72E+06	6,00E+06	2,72E+04	
Results per denominator							

Result category	Use of renewable primary energy resources as raw materials MJ	Total use of primary energy ex. raw materials MJ	Total use of renewable primary energy MJ	Total use of non renewable primary energy MJ	Use of net fresh water m3
Per gross internal floor area m2 / year	6,52E+00	1,39E+02	3,33E+01	1,16E+02	5,27E-01
Per gross internal floor area m2	1,30E+02	2,78E+03	6,66E+02	2,33E+03	1,05E+01

Can also be used for VERDE credits *B 01 Uso de energía no renovable en los materiales de construcción & C 20 Impacto de los materiales de construcción distintos del consumo de energía* you need to consider roof, framework, slabs, façade, interior partitions, wall finishes, flooring, and foundation walls. Structural elements are only to be considered when it's possible to prove that they perform better than the average.

Site impacts (energy, water, transportation monitoring)

Result category	Global warming kg CO2e	Energy kWh	Water consumption m3	Distance traveled km	Fuel consumption litres
A5a1 Construction site energy use	9,74E+03	3,97E+04			Details
A5a2 Construction site water use	2,34E+01		8,63E+04		Details
A5b3 Construction waste transportation	2,84E+01			1,86E+01	9,76E+00 Details
A4c1 Transportation of construction materials	3,37E+03			2,34E+03	1,15E+03 Details
A4c2 Additional transportation					Hide empty

Completeness (%) and plausibility checker (-)

Most contributing materials (Global warming)

 Compare data (1)

No.	Resource	Cradle to gate impacts (A1-A3)	Of cradle to gate (A1-A3)	Sustainable alternatives	
1.	Structural steel profiles, generic, 20% recycled content, I, H, U, L, and T sections, S235, S275 and S355 	74 tonnes CO ₂ e	26.1 %	Show sustainable alternatives	Add to compare
2.	Floor screed mortar, cement screed, 1500 kg/m3, EPD coverage: > 1500 kg/m3 	40 tonnes CO ₂ e	13.9 %	Show sustainable alternatives	Add to compare
3.	Linear suspended emergency luminaires, diffuser optics, 6.599 kg/unit, 1500mm length 	20 tonnes CO ₂ e	7.1 %	Show sustainable alternatives	Add to compare
4.	Stainless steel long products, 7700-8100 kg/m3 	19 tonnes CO ₂ e	6.6 %	Show sustainable alternatives	Add to compare
5.	Porcelain glazed tile, 22 kg/m2 	15 tonnes CO ₂ e	5.4 %	Show sustainable alternatives	Add to compare
6.	Indoor luminescent accent lighting, P=13W à 18W 	15 tonnes CO ₂ e	5.2 %	Show sustainable alternatives	Add to compare
7.	LED strips and strips (power supply included), French average, P=20W 	11 tonnes CO ₂ e	3.7 %	Show sustainable alternatives	Add to compare
8.	Gypsum plaster board, regular, generic, 6.5-25 mm (0.25-0.98 in), 10.725 kg/m2 (2.20 lbs/ft2) (for 12.5 mm/0.49 in), 858 kg/m3 (53.6 lbs/ft3) 	10 tonnes CO ₂ e	3.5 %	Show sustainable alternatives	Add to compare
9.	LED luminaire, 1200 mm, 2 kg/unit 	5,8 tonnes CO ₂ e	2.1 %	Show sustainable alternatives	Add to compare
10.	Metal framing components for gypsum plasterboard, 0.4-1.0 mm, 7750 kg/m3 	5,5 tonnes CO ₂ e	1.9 %	Show sustainable alternatives	Add to compare
11.	Glass wool insulation in bats or rolls, unfaced, L = 0.034 W/mK, R = 1.47 m2K/W, 50 mm, 2.1 kg/m2, 42.5 kg/m3, (Range: 35-50kg/m3), 50% recycled glass content 	4,7 tonnes CO ₂ e	1.7 %	Show sustainable alternatives	Add to compare
12.	Self-levelling mortar (SLM), 2107.7 kg/m3, 3.01 Mpa, additive: polyfunctional plasticizer 	4,9 tonnes CO ₂ e	1.7 %	Show sustainable alternatives	Add to compare
13.	Epoxy-based reactive resin, aqueous, 1050-1100 kg/m3 	4 tonnes CO ₂ e	1.4 %	Show sustainable alternatives	Add to compare
14.	Medium density fiberboard (MDF), uncoated, 19 mm, 760 kg/m3 	3,7 tonnes CO ₂ e	1.3 %	Show sustainable alternatives	Add to compare
15.	Aluminium composite panels for interior application, 3 mm (panel), 0.3 mm (aluminium layer), 4.24 kg/m2 	3,3 tonnes CO ₂ e	1.2 %	Show sustainable alternatives	Add to compare

No.	Resource	Cradle to gate impacts (A1-A3)	Of cradle to gate (A1-A3)	Sustainable alternatives	
16.	Water-based paint, for interior application, 1,47 kg/L, 10 - 12 m2/L (single layer)  ?	3,1 tonnes CO ₂ e	1.1 %	Show sustainable alternatives	Add to compare
17.	Chipboard, hollow core, biogenic CO2 not subtracted, 23-60 mm, 900-2090x600-1200 mm, 272 kg/m3  ?	3,1 tonnes CO ₂ e	1.1 %	Show sustainable alternatives	Add to compare
18.	Interior metal door with metal frame, biogenic CO2 not subtracted (for CML), 44.23 kg/m2  ?	3 tonnes CO ₂ e	1.0 %	Show sustainable alternatives	Add to compare
19.	Interior LED projector, P= 14 à 30 W  ?	2,7 tonnes CO ₂ e	1.0 %	Show sustainable alternatives	Add to compare
20.	Straight steel staircase, Larg. 80 cm  ?	2,7 tonnes CO ₂ e	0.9 %	Show sustainable alternatives	Add to compare
21.	Steel roller door, 1000x2000 - 12000x8000 mm, installation depth 500 mm, 11 kg/m2  ?	2,4 tonnes CO ₂ e	0.8 %	Show sustainable alternatives	Add to compare
22.	Water-based paint, for interior application, 1,47 kg/L, 10 - 12 m2/L (single layer)  ?	2,2 tonnes CO ₂ e	0.8 %	Show sustainable alternatives	Add to compare
23.	Luxury vinyl flooring tile, 2,5 mm, 4.3 kg/m2, wear layer: 0.5 mm ?	2,4 tonnes CO ₂ e	0.8 %	Show sustainable alternatives	Add to compare
24.	Polyurethane mastics joinery sealants, 0.25-0.32 kg/ml  ?	1,8 tonnes CO ₂ e	0.6 %	Show sustainable alternatives	Add to compare
25.	Medium density fibreboard (MDF), standard, melamine coated, 18 mm, 13 kg/m2, 722 kg/m3, 7% moisture content, E0 and E1 formaldehyde emissions class  ?	1,8 tonnes CO ₂ e	0.6 %	Show sustainable alternatives	Add to compare

Graphs

Overview	Bubble	Sankey	Treemap	Life-cycle stages	Annual	Spidergram	Stages - stacked	Materials - stacked	Classifications	All graphs
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Life-cycle overview of Global warming



Show data table:

☐ Global warming kg CO₂e - Life-cycle stages

☐ Global warming kg CO₂e - Classifications

☐ Global warming kg CO₂e - Resource types

☐ Mass kg - Classifications

Global warming kg CO₂e - Life-cycle stages

Item	Value	Unit	Percentage %
A1-A3 Materials	280 000	kg CO ₂ e	67.29 %
A4 Transport	3 400	kg CO ₂ e	0.8 %
A5 Construction	32 000	kg CO ₂ e	7.67 %
B4-B5 Replacement	48 000	kg CO ₂ e	11.36 %
B6 Energy	46 000	kg CO ₂ e	10.96 %
B7 Water	3 900	kg CO ₂ e	0.93 %
C2 Waste transport	3 000	kg CO ₂ e	0.7 %
C3 Waste processing	98	kg CO ₂ e	0.02 %
C4 Waste disposal	1 100	kg CO ₂ e	0.27 %

Global warming kg CO₂e - Classifications

Item	Value	Unit	Percentage %
1.2 Load bearing structural frame	78 000	kg CO ₂ e	18.56 %
1.2.2 Upper floors	49 000	kg CO ₂ e	11.72 %
1.3.1 Ground floor slab	16 000	kg CO ₂ e	3.73 %

1.3.2 Internal walls, partitions and doors	51 000	kg CO ₂ e	12.17 %
2.1 Fittings and furnishings	40 000	kg CO ₂ e	9.36 %
2.1.3 Ceilings	16 000	kg CO ₂ e	3.86 %
2.1.5 Floor coverings and finishes	35 000	kg CO ₂ e	8.27 %
2.2 In-built lighting system	54 000	kg CO ₂ e	12.85 %
Electricity use	46 000	kg CO ₂ e	10.96 %
Other classifications	36 000	kg CO ₂ e	8.51 %

Global warming kg CO₂e - Resource types

Item	Value	Unit	Percentage %
Structural steel and steel profiles	78 000	kg CO ₂ e	18.56 %
Electricity	56 000	kg CO ₂ e	13.27 %
Leveling screeds (for floors)	53 000	kg CO ₂ e	12.66 %
Lighting	43 000	kg CO ₂ e	10.31 %
Stainless steel	36 000	kg CO ₂ e	8.59 %
Paints, coatings and lacquers	21 000	kg CO ₂ e	4.98 %
Wall and floor tiles	18 000	kg CO ₂ e	4.37 %
Regular gypsum board	12 000	kg CO ₂ e	2.83 %
Electrification components and systems	11 000	kg CO ₂ e	2.55 %
Other resource types	92 000	kg CO ₂ e	21.89 %

Mass kg - Classifications

Item	Value	Unit	Percentage %
1.2 Load bearing structural frame	31 000	kg	4.5 %
1.2.2 Upper floors	320 000	kg	46.45 %
1.3.1 Ground floor slab	32 000	kg	4.6 %
1.3.2 Internal walls, partitions and doors	67 000	kg	9.68 %
2.1 Fittings and furnishings	17 000	kg	2.46 %
2.1.3 Ceilings	14 000	kg	2.06 %
2.1.5 Floor coverings and finishes	77 000	kg	11.22 %
Water consumption	86 000	kg	12.49 %
Construction waste	27 000	kg	3.92 %
Other classifications	18 000	kg	2.62 %

Data sources

A.7. 9R FRAMEWORK FOR CIRCULAR DESIGN APPLICATION

9R STRATEGY FOR CIRCULAR RETAIL FIT-OUT, Application					
FIT-OUT SYSTEM HOTSPOT	Structure, Mezanine and Stairs HS1. Structural steel profiles, generic, 20% recycled content, I, H, U, L, and T sections, S235, S275 and S355 HS2. Straight steel staircase, Larg. 80 cm HS3. Chipboard, hollow core, biogenic CO2 not subtracted, 23-60 mm, 900-2090x600-1200 mm, 272 kg/m3 HS4. HS5. HS6.				
STRATEGY	CRITERIA	IDEATION			
		HS1	HS2	HS3	HS4
R0/R1. DEMATERIALIZATION	- Optimise resource effectiveness by reducing the mass or material types in the product; - Avoid overdimensioning; - Adopt stiffening profiles; - Minimise thickness and weight; - Design for compactness; - Design integrated functions products to serve different needs; - Virtualise physical products; - Use digital tools for design, modelling and prototyping.	According to the structural solution Defined in the structural project Same as above Same as above Same as above Not applicable Not applicable Project developed in BIM	According to the structural solution Defined in the structural project Same as above Same as above Same as above Not applicable Not applicable Project developed in BIM	Available products are variations of the same material type Not applicable Defined in the structural project Same as above Same as above Not applicable Not applicable Project developed in BIM	
R2. RESPONSIBLE SOURCING	- Avoid materials, additives and surface treatments that are toxic; - Use renewable and bio-based materials; - Use recyclable/reused materials, with recycled content and/or sourced from byproducts/waste streams; - Use regional materials from local suppliers; - Use products/materials with environmental certification (e.g. EPD, C2C); - Promote manufacturing using renewable energy; - Incorporate power-off mechanisms; - Set default status at lower energy consumption.	Not available for wood structures in Brazil Change metal structure for wood Current product (metal) is compliant Same as above Same as above No information available Not applicable Not applicable	Not available for wood structures in Brazil Change metal structure for wood Current product (metal) is compliant Same as above Same as above No information available Not applicable Not applicable	Not applicable Market standard (wood based products) Market standard (wood based products) Industry regionally concentrated Availability in Brazil to be confirmed No information available Not applicable Not applicable	
R3. PERFORMANCE PROCUREMENT	- Consider implementing products' leasing for services continuous access over a defined period of time; - Design product/services for sharing use rather than individual ownership; - Integrate methods for used product collection.	Not applicable Not applicable Applicable if compliant with the structural project	Not applicable Not applicable Applicable if compliant with the structural project	Not applicable Not applicable Applicable if compliant with the structural project	
R4. DESIGN FOR DURABILITY	- High quality and easily repairable materials; - Provide incentives through performance-based contracts that promote the optimal design of the product; - Simulate different scenarios of durability and compare costs; - Use construction techniques that facilitate maintenance and repairs to different parts to enhance product durability; - Standardised components manufactured off-site to higher quality control standards can reduce long-term maintenance requirements.	Not applicable Not applicable Currently part of procurement process Evaluate the adoption of modular pre-fabricated solution Same as above	Not applicable Not applicable Currently part of procurement process Evaluate the adoption of modular pre-fabricated solution Same as above	Not viable after screed application Not applicable Currently part of procurement process Not viable after screed application Market standard (wood based products)	
R4. DESIGN FOR REPAIR	- Information and guidelines help achieve proper maintenance and repair; - Modular components and parts standardisation facilitate disassembly and replacement; - Integrate monitoring systems, Internet of Things (IoT) and big data to identify, locate, track and communicate need of maintenance, repair - Regular self-testing, error recognition and notification; - Ensure access to all parts and connections for easy repair and maintenance; - Components should not be integrated to such a degree as to make individual replacement of functional components impossible; - Place quickly worn parts towards exterior.	Not applicable Evaluate the adoption of modular pre-fabricated solution Not applicable Not applicable Evaluate the adoption of modular solution Evaluate the adoption of modular solution and/or assembling with screws (not welding) Not applicable	Not applicable Evaluate the adoption of modular pre-fabricated solution Not applicable Not applicable Evaluate the adoption of modular solution Evaluate the adoption of modular solution and/or assembling with screws (not welding) Not applicable	Not applicable Not viable after screed application Not applicable Not viable after screed application Not viable after screed application Not applicable	

R5. DESIGN FOR ADAPTABILITY & FLEXIBILITY	- Anticipate with consideration of need of the present and changes in requirements in future (e.g. periodic/frequent reconfiguration); - Adopt innovative approaches that allow the product to adapt to a user's changing needs as time passes; - Design for modularity; - Dry assembly and layering help in change only selected elements.	Not applicable	Not applicable	Not applicable
		Evaluate the adoption of modular solution	Not applicable	Not applicable
		Same as above	Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Not applicable
		Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Same as above	Not viable after screed application
R6. DESIGN FOR REMANUFACTURE	- High potential for disassembly; - Design products to be redeployed as modules; - Kit of parts designed to be reused in same or different environment; - Design high-demand components with standard dimensions and specifications.	Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Not viable after screed application
		Same as above	Same as above	Not viable after screed application
		Same as above	Same as above	Not viable after screed application
		Same as above	Same as above	Market standard (wood based products)
R7. DESIGN FOR MANUFACTURING & ASSEMBLING	- Minimise number of components/materials and production steps; - Avoid excess cutting and jointing of components/materials; - Optimise shape and dimension according to production constraints to minimise manufacturing waste and scraps; - Eliminate unique parts wherever possible, by preferring standard components; - Decreasing the amount of labour required for assembly; - Make parts multi-functional to reduce complexity; - Facilitate parts handling that does not require special tooling or fixturing for assembly; - Where possible make parts identifiable and symmetric; - Design tolerances to meet process capability.	Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Defined in the structural project
		Same as above	Same as above	Same as above
		Same as above	Same as above	Same as above
		Same as above	Same as above	Same as above
		Same as above	Same as above	Same as above
		Same as above	Same as above	Same as above
		Same as above	Same as above	Same as above
		Same as above	Same as above	Same as above
		Same as above	Same as above	Same as above
		This system use to have very low tolerances	This system use to have very low tolerances	Same as above
R7. DESIGN FOR MODULARITY	- Increase communication between the design teams working on complex products and systems; - Use standard components where possible; - Reduce number of parts and components enhance modularity; - Design parts as separate, selfcontained modules.	Business as usual in na Integrated Project Delivery context of project	Business as usual in na Integrated Project Delivery context of project	Business as usual in na Integrated Project Delivery context of project
		Evaluate the adoption of modular solution	Evaluate the adoption of modular solution	Market standard (wood based products)
		Same as above	Same as above	Not applicable
		Same as above	Same as above	Not applicable
R8. DESIGN FOR RECYCLABILITY	- Limit the number of material types and composites; - Make use of easy to dismount elements and products; - Limit use of adhesives, dyes, paints and coatings; - Limit or eliminate hazardous materials and contamination; - When optimising product recyclability consider product types and geographies; - Partner with end-of-life resource management companies to integrate the appropriate product features and facilitate end-of-life - Prescribe in procurement contracts that waste should be separated on site to facilitate recycling; - Clearly marked or permanently label products, showing their inherent properties and date of manufacture to enable reuse.	Evaluate the adoption of modular solution	Evaluate the adoption of modular solution	Not viable after screed application
		Same as above	Same as above	Not viable after screed application
		Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Not applicable
		Possible to be implemented	Possible to be implemented	Not applicable
		As part of procurement process	As part of procurement process	As part of procurement process
		Current product is compliant	Current product is compliant	Viable as part of procurement process
		Viable as part of procurement process	Viable as part of procurement process	Viable as part of procurement process
		Evaluate the creation of a material bank	Evaluate the creation of a material bank	Not applicable
R9. DESIGN FOR DISASSEMBLY	- Ensure comprehensive disassembly plan and product disassembly instruction, illustrating how elements should be deconstructed and - Design for reused number of parts, components and fasteners to speed up disassembly; - Screws are faster to unfasten than nuts and bolts; - Glues should be avoided; - Design compact and lightweight product to be manually handled to allow onsite assembly/disassembly; - Avoid mixed use of incompatible materials and connections if not separable and manipulated as individual parts; - Adopt reversible and compatible joints and connections.	Possible with the assembling plan	Possible with the assembling plan	Not viable after screed application
		Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Not viable after screed application
		Same as above	Same as above	Not viable after screed application
		Same as above	Same as above	Not applicable
		Not viable	Not viable	Market standard (wood based products)
		Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Evaluate the adoption of modular solution and/or assembling with screws (not welding)	Not viable after screed application
		Same as above	Same as above	Not viable after screed application

● Evaluation or comment

● New Circular Design strategy possible to be applied

9R STRATEGY FOR CIRCULAR RETAIL FIT-OUT, Application							
FIT-OUT SYSTEM HOTSPOT	Flooring						
	HS1. Floor screed mortar, cement screed, 1500 kg/m3, EPD coverage: > 1500 kg/m3						
	HS2. Porcelain glazed tile, 22 kg/m2						
	HS3. Self-levelling mortar (SLM), 2107.7 kg/m3, 3.01 Mpa, additive: polyfunctional plasticizer						
	HS4. Epoxy-based reactive resin, aqueous, 1050-1100 kg/m3						
	HS5. Luxury vinyl flooring tile, 2.5 mm, 4.3 kg/m2, wear layer: 0.5 mm						
	HS6. Polyurethane mastics joinery sealants, 0.25-0.32 kg/ml						

STRATEGY	CRITERIA	IDEATION					
		HS1	HS2	HS3	HS4	HS5	HS6
R0/R1. DEMATERIALIZATION	• Optimise resource effectiveness by reducing the mass or material types in the product;	Use of lightweight aggregate	Not applicable	Use of lightweight aggregate	Not applicable	Not applicable	Not applicable
	• Avoid overdimensioning;	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Adopt stiffening profiles;	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Minimise thickness and weight;	Adoption of polystyrene foam	Not applicable	Adoption of polystyrene foam	Not applicable	Viable if associated with renovation plan.	Not applicable
	• Design for compactness;	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Design integrated functions products to serve different needs;	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Virtualise physical products;	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Use digital tools for design, modelling and prototyping.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
R2. RESPONSIBLE SOURCING	• Avoid materials, additives and surface treatments that are toxic;	Not available	Possible, by changing material	Not available	Low VOC ink available	Not viable	Not viable
	• Use renewable and bio-based materials;	Not available	Possible, by changing material. For instance, adoption of wood flooring	Not available	Not applicable	Current product is compliant	Available, but not in Brazil
	• Use recyclable/reused materials, with recycled content and/or sourced from byproducts/waste streams;	Some options with CDW composition	Possible, by changing material. For instance, adoption porcelain tile with high recycled	Some options with CDW composition	Not applicable	Current product is compliant	Not applicable
	• Use regional materials from local suppliers;	Not applicable	Industry regionally concentrated	Not applicable	Not applicable	Viable	Not applicable
	• Use products/materials with environmental certification (e.g. EPD, C2C);	Available, but not in Brazil	Possible, by changing material	Available, but not in Brazil	There is a PPG option, but not available in Brazil	Viable, there are products available in Brazil	Available, but not in Brazil
	• Promote manufacturing using renewable energy;	No information available	No information available	No information available	No information available	No information available	Not info available
	• Incorporate power-off mechanisms;	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Set default status at lower energy consumption.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
R3. PERFORMANCE PROCUREMENT	• Consider implementing products' leasing for services continuous access over a defined period of time;	Not applicable	Not available in Brazil	Not applicable	Not applicable	Not available in Brazil	Not applicable
	• Design product/services for sharing use rather than individual ownership;	Not applicable	Nota applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Integrate methods for used product collection.	Not applicable	Not applicable considering fist occupancy	Not applicable	Not applicable	Not available in Brazil	Not applicable
R4. DESIGN FOR DURABILITY	• High quality and easily repairable materials;	Not applicable	Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Current product is compliant	Not applicable
	• Provide incentives through performance-based contracts that promote the optimal design of the product;	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Simulate different scenarios of durability and compare costs;	Currently part of procurement process	Currently part of procurement process	Currently part of procurement process	Currently part of procurement process	Currently part of procurement process	Not representative in cost
	• Use construction techniques that facilitate maintenance and repairs to different parts to enhance product durability;	Not applicable	Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Sectorize the application into independent areas	Current product is compliant	Not applicable
	• Standardised components manufactured off-site to higher quality control standards can reduce long-term maintenance requirements.	Not applicable	Market standard	Not applicable	Not applicable	Current product is compliant	Not applicable
R4. DESIGN FOR REPAIR	• Information and guidelines help achieve proper maintenance and repair;	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual
	• Modular components and parts standardisation facilitate disassembly and replacement;	Not applicable	Possible, by changing material. For instance, adoption of not glued flooring	Not applicable	Not applicable	Current product is compliant	Not applicable
	• Integrate monitoring systems, Internet of Things (IoT) and big data to identify, locate, track and communicate need of maintenance, repair	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Regular self-testing, error recognition and notification;	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Ensure access to all parts and connections for easy repair and maintenance;	Not applicable	Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Sectorize the application into independent areas	Current product is compliant	Current product is compliant
	• Components should not be integrated to such a degree as to make individual replacement of functional components impossible;	Not applicable	Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Current product is compliant	Not applicable
	• Place quickly worn parts towards exterior.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
R5. DESIGN FOR ADAPTABILITY & FLEXIBILITY	• Anticipate with consideration of need of the present and changes in requirements in future (e.g. periodic/frequent reconfiguration);	Not applicable	Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Not applicable	Not applicable
	• Adopt innovative approaches that allow the product to adapt to a user's changing needs as time passes;	Not applicable	Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Not applicable	Not applicable

	• Design for modularity;	Not applicable	Not applicable	Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Current product is compliant	Not applicable
	• Dry assembly and layering help in change only selected elements.	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Not applicable	Not applicable
R6. DESIGN FOR REMANUFACTURE	• High potential for disassembly;	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Adoption of a floor not glued	Not applicable
	• Design products to be redeployed as modules;	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Adoption of a floor not glued	Not applicable
	• Kit of parts designed to be reused in same or different environment;	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Adoption of a floor not glued	Not applicable
	• Design high-demand components with standard dimensions and specifications.	Not applicable		Market standard	Not applicable	Not applicable	Current product is compliant	Not applicable
R7. DESIGN FOR MANUFACTURING & ASSEMBLING	• Minimise number of components/materials and production steps;	Market standard (ready to use)		Not applicable	Market standard (ready to use)	Market standard (ready to use)	Market standard	Not applicable
	• Avoid excess cutting and jointing of components/materials;	Not applicable		Depends on material type	Not applicable	Not applicable	Possible, by performing flooring design studies	Not applicable
	• Optimise shape and dimension according to production constraints to minimise manufacturing waste and scraps;	Not applicable		Possible, by performing flooring design studies	Not applicable	Not applicable	Not applicable	Not applicable
	• Eliminate unique parts wherever possible, by preferring standard components;	Not applicable		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Decreasing the amount of labour required for assembly;	Products with workability additives		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Products with workability additives	Not applicable	Adoption of a floor not glued	Not applicable
	• Make parts multi-functional to reduce complexity;	Not applicable		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Facilitate parts handling that does not require special tooling or fixturing for assembly;	Not applicable		Not applicable	Not applicable	Not applicable	Market standard	Not applicable
	• Where possible make parts identifiable and symmetric;	Not applicable		Market standard	Not applicable	Not applicable	Market standard	Not applicable
	• Design tolerances to meet process capability.	Not applicable		Not applicable	Not applicable	Not applicable	Market standard	Not applicable
R7. DESIGN FOR MODULARITY	• Increase communication between the design teams working on complex products and systems;	Business as usual in an Integrated Project Delivery context of project		Business as usual in na Integrated Project Delivery context of project	Business as usual in na Integrated Project Delivery context of project	Business as usual in na Integrated Project Delivery context of project	Business as usual in na Integrated Project Delivery context of project	Business as usual in na Integrated Project Delivery context of project
	• Use standard components where possible;	Not applicable		Market standard	Not applicable	Not applicable	Market standard	Not applicable
	• Reduce number of parts and components enhance modularity;	Not applicable		Market standard	Not applicable	Not applicable	Market standard	Not applicable
	• Design parts as separate, selfcontained modules.	Not applicable		Market standard	Not applicable	Not applicable	Current product is compliant	Not applicable
R8. DESIGN FOR RECYCLABILITY	• Limit the number of material types and composites;	Not applicable		Not applicable	Not applicable	Not applicable	Current product is compliant	Not applicable
	• Make use of easy to dismount elements and products;	Not applicable		Not applicable	Not applicable	Not applicable	Adoption of a floor not glued	Not applicable
	• Limit use of adhesives, dyes, paints and coatings;	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Adoption of a floor not glued	Not viable
	• Limit or eliminate hazardous materials and contamination;	Adoption of low cement product (not available in Brazil)		Depends on material type	Adoption of low cement product (not available in Brazil)	Not applicable	Adoption of a floor not glued	Available, but not in Brazil
	• When optimising product recyclability consider product types and geographies;	Ordinary CDW		Ordinary CDW	Ordinary CDW	Not applicable	Not applicable	Not applicable
	• Partner with end-of-life resource management companies to integrate the appropriate product features and facilitate end-of-life	Not applicable		Not available	Not applicable	Not applicable	Few suppliers offer returning programs	Not applicable
	• Prescribe in procurement contracts that waste should be separated on site to facilitate recycling;	Not applicable		In course	Not applicable	Not applicable	Current practice of this client	Not applicable
	• Clearly marked or permanently label products, showing their inherent properties and date of manufacture to enable reuse.	Not applicable		Not applicable	Not applicable	Not applicable	Current product is compliant	Not applicable
R9. DESIGN FOR DISASSEMBLY	• Ensure comprehensive disassembly plan and product disassembly instruction, illustrating how elements should be deconstructed and	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Not applicable	Not applicable
	• Design for reused number of parts, components and fasteners to speed up disassembly;	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Adoption of a floor not glued	Not applicable
	• Screws are faster to unfasten than nuts and bolts;	Not applicable		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	• Glues should be avoided;	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Adoption of a floor not glued	Not applicable
	• Design compact and lightweight product to be manually handled to allow onsite assembly/disassembly;	Not applicable		Market standard	Not applicable	Not applicable	Market standard	Not applicable
	• Avoid mixed use of incompatible materials and connections if not separable and manipulated as individual parts;	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Adoption of a floor not glued	Not applicable
	• Adopt reversible and compatible joints and connections.	Not applicable		Possible, by changing material. For instance, adoption of not glued flooring (floating floor)	Not applicable	Not applicable	Adoption of a floor not glued	Not applicable

 Evaluation or comment

 New Circular Design strategy possible to be applied

9R STRATEGY FOR CIRCULAR RETAIL FIT-OUT, Application							
FIT-OUT SYSTEM HOTSPOT		Internal Walls and Partitions					
		HS1. Gypsum plaster board, regular, generic, 6.5-25 mm (0.25-0.98 in), 10.725 kg/m2 (for 12.5 mm/0.49 in), 858 kg/m3					
		HS2. Metal framing components for gypsum plasterboard, 0.4-1.0 mm, 7750 kg/m3					
		HS3. Glass wool insulation, unfaced, L = 0.034 W/mK, R = 1.47 m2K/W, 50 mm, 2.1 kg/m2, 42.5 kg/m3, 50% recyc.					
		HS4. Medium density fiberboard (MDF), uncoated, 19 mm, 760 kg/m3					
		HS5. Water-based paint, for interior application, 1.47 kg/L, 10 - 12 m2/L (single layer)					
STRATEGY	CRITERIA	IDEATION					
		HS1	HS2	HS3	HS4	HS5	HS6
R0/R1. DEMATERIALIZATION	• Optimise resource effectiveness by reducing the mass or material types in the product; • Avoid overdimensioning; • Adopt stiffening profiles; • Minimise thickness and weight; • Design for compactness; • Design integrated functions products to serve different needs; • Virtualise physical products; • Use digital tools for design, modelling and prototyping.	Not viable. Project follow design solution and budget limitations	Evaluate a change for woodframe	Viable under consideration of other materialities	Viable under consideration of other materialities	Not applicable	
		Solution follows technical design	Solution follows technical design	Same as above	Same as above	Same as above	
		Same as above	Same as above	Not applicable	Same as above	Same as above	
		Same as above	Same as above	Viable under consideration of other materialities	Same as above	Same as above	
		Not applicable	Not applicable	Same as above	Not applicable	Same as above	
		Not applicable	Not applicable	Not applicable	Not applicable	Same as above	
		Not applicable	Not applicable	Not applicable	Not applicable	Same as above	
		Project developed in BIM	Project developed in BIM	Not applicable	Project developed in BIM	Same as above	
R2. RESPONSIBLE SOURCING	• Avoid materials, additives and surface treatments that are toxic; • Use renewable and bio-based materials; • Use recyclable/reused materials, with recycled content and/or sourced from byproducts/waste streams; • Use regional materials from local suppliers; • Use products/materials with environmental certification (e.g. EPD, C2C); • Promote manufacturing using renewable energy; • Incorporate power-off mechanisms; • Set default status at lower energy consumption.	Not viable. Project follow design solution and budget limitations	Evaluate a change for woodframe	Availability in Brazil to be explored	Viable under consideration of other materialities	Viable under consideration of other materialities or products	
		Same as above	Evaluate a change for woodframe	Same as above	Market standard (for wood based products)	Same as above	
		Same as above	Same as above	Same as above	Same as above	Same as above	
		Available nationwide	Available nationwide	Same as above	Industry regionally concentrated	Products commonly found in specialized retail	
		Availability in Brazil to be confirmed	Availability in Brazil to be confirmed	Same as above	Availability in Brazil to be confirmed	Availability in Brazil to be confirmed	
		No information available	No information available	No information available	No information available	No information available	
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
R3. PERFORMANCE PROCUREMENT	• Consider implementing products' leasing for services continuous access over a defined period of time; • Design product/services for sharing use rather than individual ownership; • Integrate methods for used product collection.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
R4. DESIGN FOR DURABILITY	• High quality and easily repairable materials; • Provide incentives through performance-based contracts that promote the optimal design of the product; • Simulate different scenarios of durability and compare costs; • Use construction techniques that facilitate maintenance and repairs to different parts to enhance product durability; • Standardised components manufactured off-site to higher quality control standards can reduce long-term maintenance requirements.	Product standard (dry-wall products)	Product standard (galvanized or woodframe)	Not applicable	Current design and fabrication process is partially enabling	Viable under consideration of other materialities or products	
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
		Currently part of procurement process	Currently part of procurement process	Not applicable	Currently part of procurement process	Currently part of procurement process	
		Product standard (dry-wall products)	Product standard (galvanized or woodframe)	Not applicable	Screw fixing	Not applicable	
		Product standard (dry-wall products)	Product standard (galvanized or woodframe)	Business as usual (product in sheets or rolls)	Not applicable	Not applicable	
R4. DESIGN FOR REPAIR	• Information and guidelines help achieve proper maintenance and repair; • Modular components and parts standardisation facilitate disassembly and replacement; • Integrate monitoring systems, Internet of Things (IoT) and big data to identify, locate, track and communicate need of maintenance, repair • Regular self-testing, error recognition and notification; • Ensure access to all parts and connections for easy repair and maintenance; • Components should not be integrated to such a degree as to make individual replacement of functional components impossible; • Place quickly worn parts towards exterior.	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	
		Product standard (dry-wall products)	Product standard (dry-wall products)	Business as usual (product in sheets or rolls)	Not applicable	Not applicable	
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
		Product standard (dry-wall products)	Product standard (galvanized or woodframe)	Not applicable	Current design and fabrication process is partially enabling	Not applicable	
		Not viable for the current solution	Same as above	Not viable	Same as above	Not applicable	
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
R5. DESIGN FOR ADAPTABILITY & FLEXIBILITY	• Anticipate with consideration of need of the present and changes in requirements in future (e.g. periodic/frequent reconfiguration); • Adopt innovative approaches that allow the product to adapt to a user's changing needs as time passes; • Design for modularity;	Product standard (dry-wall products)	Product standard (galvanized or woodframe)	Not applicable	Not applicable	Not applicable	
		Same as above	Same as above	Not applicable	Not applicable	Not applicable	
		Same as above	Same as above	Not applicable	Solution follows technical design	Not applicable	

	• Dry assembly and layering help in change only selected elements.	Current design and construction process is partially enabling	Current design and construction process is partially enabling	Business as usual (product in sheets or rolls)	Not applicable	Not applicable
R6. DESIGN FOR REMANUFACTURE	• High potential for disassembly;	Current design and construction process is partially enabling	Current design and construction process is partially enabling	Not applicable	Current design and fabrication process is partially enabling	Not applicable
	• Design products to be redeployed as modules;	Same as above	Same as above	Business as usual (product in sheets or rolls)	Same as above	Not applicable
	• Kit of parts designed to be reused in same or different environment;	Same as above	Same as above	Same as above	Same as above	Not applicable
	• Design high-demand components with standard dimensions and specifications.	Product standard (dry-wall products)	Product standard (galvanized or woodframe)	Same as above	Solution follows technical design	Not applicable
R7. DESIGN FOR MANUFACTURING & ASSEMBLING	• Minimise number of components/materials and production steps;	Product standard (dry-wall products)	Product standard (galvanized or woodframe)	Business as usual (product in sheets or rolls)	Not applicable	Not applicable
	• Avoid excess cutting and jointing of components/materials;	Current design and construction process is partially enabling	Current design and construction process is partially enabling	Not applicable	Solution follows technical design	Not applicable
	• Optimise shape and dimension according to production constraints to minimise manufacturing waste and scraps;	Same as above	Same as above	Not applicable	Same as above	Not applicable
	• Eliminate unique parts wherever possible, by preferring standard components;	Same as above	Same as above	Business as usual (product in sheets or rolls)	Same as above	Not applicable
	• Decreasing the amount of labour required for assembly;	Same as above	Same as above	Not applicable	Same as above	Not applicable
	• Make parts multi-functional to reduce complexity;	Same as above	Same as above	Not applicable	Same as above	Not applicable
	• Facilitate parts handling that does not require special tooling or fixturing for assembly;	Same as above	Same as above	Business as usual (product in sheets or rolls)	Current design and fabrication process is partially enabling	Not applicable
	• Where possible make parts identifiable and symmetric;	Same as above	Same as above	Same as above	Solution follows technical design	Not applicable
	• Design tolerances to meet process capability.	Same as above	Same as above	Not applicable	Same as above	Not applicable
R7. DESIGN FOR MODULARITY	• Increase communication between the design teams working on complex products and systems;	Business as usual in an Integrated Project Delivery context of project	Business as usual in an Integrated Project Delivery context of project	Business as usual in an Integrated Project Delivery context of project	Business as usual in an Integrated Project Delivery context of project	Not applicable
	• Use standard components where possible;	Current design and construction process is partially enabling	Current design and construction process is partially enabling	Business as usual (product in sheets or rolls)	Solution follows technical design	Not applicable
	• Reduce number of parts and components enhance modularity;	Same as above	Same as above	Same as above	Same as above	Not applicable
	• Design parts as separate, selfcontained modules.	Not applicable	Not applicable	Same as above	Same as above	Not applicable
R8. DESIGN FOR RECYCLABILITY	• Limit the number of material types and composites;	Current design and construction process is partially enabling	Current design and construction process is partially enabling	Business as usual (product in sheets or rolls)	Current design and fabrication process is partially enabling	Not applicable
	• Make use of easy to dismount elements and products;	Same as above	Same as above	Not applicable	Same as above	Not applicable
	• Limit use of adhesives, dyes, paints and coatings;	Not viable	Same as above	Not applicable	Same as above	Not applicable
	• Limit or eliminate hazardous materials and contamination;	Not viable	Not viable	Viable under consideration of other materialities	Same as above	Viable under consideration of other materialities or products
	• When optimising product recyclability consider product types and geographies;	Not applicable	Not applicable	Not applicable	Ordinary CWD	Same as above
	• Partner with end-of-life resource management companies to integrate the appropriate product features and facilitate end-of-life	Viable as part of procurement process	Viable as part of procurement process	Viable as part of procurement process	Viable as part of procurement process	Not applicable
	• Prescribe in procurement contracts that waste should be separated on site to facilitate recycling;	Viable as part of procurement process	Viable as part of procurement process	Viable as part of procurement process	Same as above	Not applicable
R9. DESIGN FOR DISASSEMBLY	• Clearly marked or permanently label products, showing their inherent properties and date of manufacture to enable reuse.	Not applicable	Evaluate the creation of a material bank	Evaluate the creation of a material bank	Not applicable	Not applicable
	• Ensure comprehensive disassembly plan and product disassembly instruction, illustrating how elements should be deconstructed and	Not viable	Current design and construction process is partially enabling	Not applicable	Current design and fabrication process is partially enabling	Not applicable
	• Design for reused number of parts, components and fasteners to speed up disassembly;	Not applicable	Same as above	Not applicable	Same as above	Not applicable
	• Screws are faster to unfasten than nuts and bolts;	Not applicable	Same as above	Not applicable	Same as above	Not applicable
	• Glues should be avoided;	Not viable	Same as above	Business as usual	Same as above	Not applicable
	• Design compact and lightweight product to be manually handled to allow onsite assembly/disassembly;	Current design and fabrication process is partially enabling	Same as above	Same as above	Same as above	Not applicable
	• Avoid mixed use of incompatible materials and connections if not separable and manipulated as individual parts;	Not viable	Same as above	Same as above	Partially applicable	Not applicable
	• Adopt reversible and compatible joints and connections.	Not viable	Same as above	Not applicable	Same as above	Not applicable

● Evaluation or comment

● New Circular Design strategy possible to be applied

9R STRATEGY FOR CIRCULAR RETAIL FIT-OUT, Application	
FIT-OUT SYSTEM HOTSPOT	Fitting and Furnishing HS1. Stainless steel long products, 7700-8100 kg/m3 HS2. Medium density fibreboard (MDF), standard, melamine coated, 18 mm, E0 and E1 HS3. HS4. HS5. HS6.

STRATEGY	CRITERIA	IDEATION					
		HS1	HS2	HS3	HS4	HS5	HS6
R0/R1. DEMATERIALIZATION	• Optimise resource effectiveness by reducing the mass or material types in the product; • Avoid overdimensioning; • Adopt stiffening profiles; • Minimise thickness and weight; • Design for compactness; • Design integrated functions products to serve different needs; • Virtualise physical products; • Use digital tools for design, modelling and prototyping.	Not viable. Project follow design solution Same as above Same as above Same as above Same as above Not applicable Not applicable Project developed in BIM and submitted to the industrialization process	Viable under consideration of other materialities Same as above Same as above Same as above Same as above Not applicable Not applicable Project developed in BIM and submitted to the industrialization process				
R2. RESPONSIBLE SOURCING	• Avoid materials, additives and surface treatments that are toxic; • Use renewable and bio-based materials; • Use recyclable/reused materials, with recycled content and/or sourced from byproducts/waste streams; • Use regional materials from local suppliers; • Use products/materials with environmental certification (e.g. EPD, C2C); • Promote manufacturing using renewable energy; • Incorporate power-off mechanisms; • Set default status at lower energy consumption.	Current product is compliant Consider the change of metal structure for wood Current design is compliant Same as above Same as above No information available Not applicable Not applicable	Viable under consideration of other materialities Market standard (for wood based products) Same as above Industry regionally concentrated Availability in Brazil to be confirmed No information available Not applicable Not applicable				
R3. PERFORMANCE PROCUREMENT	• Consider implementing products' leasing for services continuous access over a defined period of time; • Design product/services for sharing use rather than individual ownership; • Integrate methods for used product collection.	Not applicable Not applicable Not applicable	Not applicable Not applicable Not applicable				
R4. DESIGN FOR DURABILITY	• High quality and easily repairable materials; • Provide incentives through performance-based contracts that promote the optimal design of the product; • Simulate different scenarios of durability and compare costs; • Use construction techniques that facilitate maintenance and repairs to different parts to enhance product durability; • Standardised components manufactured off-site to higher quality control standards can reduce long-term maintenance requirements.	Current design and fabrication process is partially enabling Not applicable Currently part of procurement process Current design and fabrication process is partially enabling Current design is compliant	Current design and fabrication process is partially enabling Not applicable Currently part of procurement process Current design and fabrication process is partially enabling Not viable. Project follow design solution				
R4. DESIGN FOR REPAIR	• Information and guidelines help achieve proper maintenance and repair; • Modular components and parts standardisation facilitate disassembly and replacement; • Integrate monitoring systems, Internet of Things (IoT) and big data to identify, locate, track and communicate need of maintenance, repair • Regular self-testing, error recognition and notification; • Ensure access to all parts and connections for easy repair and maintenance; • Components should not be integrated to such a degree as to make individual replacement of functional components impossible; • Place quickly worn parts towards exterior.	This content is already included in the Owner's Manual Current design is compliant Not applicable Not applicable Current design and fabrication process is partially enabling Same as above Not applicable	This content is already included in the Owner's Manual Current design and fabrication process is partially enabling Not applicable Not applicable Current design and fabrication process is partially enabling Same as above Not applicable				
R5. DESIGN FOR ADAPTABILITY & FLEXIBILITY	• Anticipate with consideration of need of the present and changes in requirements in future (e.g. periodic/frequent reconfiguration); • Adopt innovative approaches that allow the product to adapt to a user's changing needs as time passes; • Design for modularity;	Not applicable Not applicable Current design and fabrication process is partially enabling	Not applicable Not applicable Current design and fabrication process is partially enabling				

	• Dry assembly and layering help in change only selected elements.	Current design is compliant	Current design is compliant
R6. DESIGN FOR REMANUFACTURE	• High potential for disassembly; • Design products to be redeployed as modules; • Kit of parts designed to be reused in same or different environment; • Design high-demand components with standard dimensions and specifications.	Current design and fabrication process is partially enabling Same as above Same as above Not viable. Project follow design solution	Current design and fabrication process is partially enabling Same as above Same as above Same as above
R7. DESIGN FOR MANUFACTURING & ASSEMBLING	• Minimise number of components/materials and production steps; • Avoid excess cutting and jointing of components/materials; • Optimise shape and dimension according to production constraints to minimise manufacturing waste and scraps; • Eliminate unique parts wherever possible, by preferring standard components; • Decreasing the amount of labour required for assembly; • Make parts multi-functional to reduce complexity; • Facilitate parts handling that does not require special tooling or fixturing for assembly; • Where possible make parts identifiable and symmetric; • Design tolerances to meet process capability.	Current design and fabrication process is partially enabling Same as above Current design and fabrication process is partially enabling Not viable. Project follow design solution Not viable. Project follow design solution Not viable. Project follow design solution Current design and fabrication process is partially enabling Same as above Not viable. Project follow design solution This system use to have very low tolerances	Current design and fabrication process is partially enabling Same as above Not viable. Project follow design solution Same as above Current design and fabrication process is partially enabling Same as above Same as above Same as above Same as above
R7. DESIGN FOR MODULARITY	• Increase communication between the design teams working on complex products and systems; • Use standard components where possible; • Reduce number of parts and components enhance modularity; • Design parts as separate, selfcontained modules.	Business as usual in na Integrated Project Delivery context of project Current design and fabrication process is partially enabling Same as above Same as above	Business as usual in an Integrated Project Delivery context of project Current design and fabrication process is partially enabling Same as above Same as above
R8. DESIGN FOR RECYCLABILITY	• Limit the number of material types and composites; • Make use of easy to dismount elements and products; • Limit use of adhesives, dyes, paints and coatings; • Limit or eliminate hazardous materials and contamination; • When optimising product recyclability consider product types and geographies; • Partner with end-of-life resource management companies to integrate the appropriate product features and facilitate end-of-life • Prescribe in procurement contracts that waste should be separated on site to facilitate recycling; • Clearly marked or permanently label products, showing their inherent properties and date of manufacture to enable reuse.	Current design and fabrication process is partially enabling Same as above Same as above Same as above Exhibitors and Displays are produced by a homologated supplier Viable as part of procurement process Same as above Evaluate the creation of a material bank	Current design and fabrication process is partially enabling Same as above Same as above Same as above Exhibitors and Displays are produced by a homologated supplier Viable as part of procurement process Same as above Business as usual
R9. DESIGN FOR DISASSEMBLY	• Ensure comprehensive disassembly plan and product disassembly instruction, illustrating how elements should be deconstructed and • Design for reused number of parts, components and fasteners to speed up disassembly; • Screws are faster to unfasten than nuts and bolts; • Glues should be avoided; • Design compact and lightweight product to be manually handled to allow onsite assembly/disassembly; • Avoid mixed use of incompatible materials and connections if not separable and manipulated as individual parts; • Adopt reversible and compatible joints and connections.	Current design and fabrication process is partially enabling Same as above Same as above Same as above Same as above Same as above Same as above Same as above	Current design and fabrication process is partially enabling Same as above Same as above Same as above Same as above Same as above Same as above Same as above

● Evaluation or comment

● New Circular Design strategy possible to be applied

9R STRATEGY FOR CIRCULAR RETAIL FIT-OUT, Application					
FIT-OUT SYSTEM HOTSPOT	Façade and Internal Doors				
	HS1. Aluminium composite panels for interior application, 3 mm (panel), 0.3 mm (aluminium layer), 4.24 kg/m2				
	HS2. Steel roller door, 1000x2000 - 12000x8000 mm, installation depth 500 mm, 11 kg/m2				
	HS3. Interior metal door with metal frame, biogenic CO2 not subtracted (for CML), 44.23 kg/m2				
	HS4.				
	HS5.				
	HS6.				
STRATEGY	CRITERIA	IDEATION			
		HS1	HS2	HS3	HS4HS5HS6
R0/R1. DEMATERIALIZATION	• Optimise resource effectiveness by reducing the mass or material types in the product;	Not viable. Project follows design solution and budget limitations	Not applicable considering security demands	Not applicable	
	• Avoid overdimensioning;	Same as above	Same as above	Same as above	
	• Adopt stiffening profiles;	Same as above	Same as above	Same as above	
	• Minimise thickness and weight;	Same as above	Same as above	Same as above	
	• Design for compactness;	Same as above	Same as above	Same as above	
	• Design integrated functions products to serve different needs;	Same as above	Same as above	Same as above	
	• Virtualise physical products;	Not applicable	Same as above	Same as above	
	• Use digital tools for design, modelling and prototyping.	Project developed in BIM and submitted to the industrialization process	Same as above	Same as above	
R2. RESPONSIBLE SOURCING	• Avoid materials, additives and surface treatments that are toxic;	Not viable. Project follows design solution and budget limitations	Not applicable	Viable under consideration of other materialities or products	
	• Use renewable and bio-based materials;	Same as above	Same as above	Same as above	
	• Use recyclable/reused materials, with recycled content and/or sourced from byproducts/waste streams;	Same as above	Same as above	Same as above	
	• Use regional materials from local suppliers;	Products commonly found in specialized retail, available nationwide	Products commonly found in specialized retail, available nationwide	Products commonly found in specialized retail, available nationwide	
	• Use products/materials with environmental certification (e.g. EPD, C2C);	Availability in Brazil to be confirmed	Availability in Brazil to be confirmed	Availability in Brazil to be confirmed	
	• Promote manufacturing using renewable energy;	No information available	No information available	No information available	
	• Incorporate power-off mechanisms;	Not applicable	Not applicable	Not applicable	
	• Set default status at lower energy consumption.	Not applicable	Not applicable	Not applicable	
R3. PERFORMANCE PROCUREMENT	• Consider implementing products' leasing for services continuous access over a defined period of time;	Not applicable	Not applicable	Not applicable	
	• Design product/services for sharing use rather than individual ownership;	Not applicable	Not applicable	Not applicable	
	• Integrate methods for used product collection.	Not applicable	Not applicable	Not applicable	
R4. DESIGN FOR DURABILITY	• High quality and easily repairable materials;	Current design and fabrication process is partially enabling	Market standard (for metallic rolling doors)	Market standard (for metallic doors)	
	• Provide incentives through performance-based contracts that promote the optimal design of the product;	Not applicable	Not applicable	Not applicable	
	• Simulate different scenarios of durability and compare costs;	Currently part of procurement process	Currently part of procurement process	Currently part of procurement process	
	• Use construction techniques that facilitate maintenance and repairs to different parts to enhance product durability;	Possible under design improvements	Not applicable	Not applicable	
	• Standardised components manufactured off-site to higher quality control standards can reduce long-term maintenance requirements.	Not applicable	Not applicable	Not applicable	
R4. DESIGN FOR REPAIR	• Information and guidelines help achieve proper maintenance and repair;	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	This content is already included in the Owner's Manual	
	• Modular components and parts standardisation facilitate disassembly and replacement;	Not applicable	Not applicable	Not applicable	
	• Integrate monitoring systems, Internet of Things (IoT) and big data to identify, locate, track and communicate need of maintenance, repair	Not applicable	Not applicable	Not applicable	
	• Regular self-testing, error recognition and notification;	Not applicable	Not applicable	Not applicable	
	• Ensure access to all parts and connections for easy repair and maintenance;	Not applicable	Market standard (for metallic rolling doors)	Current design and fabrication process is partially enabling	
	• Components should not be integrated to such a degree as to make individual replacement of functional components impossible;	Not applicable	Same as above	Same as above	
	• Place quickly worn parts towards exterior.	Not applicable	Not applicable	Not applicable	
R5. DESIGN FOR ADAPTABILITY & FLEXIBILITY	• Anticipate with consideration of need of the present and changes in requirements in future (e.g. periodic/frequent reconfiguration);	Not applicable	Not applicable	Not applicable	
	• Adopt innovative approaches that allow the product to adapt to a user's changing needs as time passes;	Not applicable	Not applicable	Not applicable	
	• Design for modularity;	Not applicable	Not applicable	Not applicable	

	• Dry assembly and layering help in change only selected elements.	Current design and fabrication process is partially enabling	Not applicable	Not applicable
R6. DESIGN FOR REMANUFACTURE	• High potential for disassembly;	Not applicable	Market standard (for metallic rolling doors)	Not applicable
	• Design products to be redeployed as modules;	Not applicable	Not applicable	Not applicable
	• Kit of parts designed to be reused in same or different environment;	Not applicable	Not applicable	Not applicable
	• Design high-demand components with standard dimensions and specifications.	Possible under design improvements	Not applicable	Not applicable
R7. DESIGN FOR MANUFACTURING & ASSEMBLING	• Minimise number of components/materials and production steps;	Current design and fabrication process is partially enabling	Not applicable	Current design and fabrication process is partially enabling
	• Avoid excess cutting and jointing of components/materials;	Same as above	Not applicable	Not applicable
	• Optimise shape and dimension according to production constraints to minimise manufacturing waste and scraps;	Same as above	Not applicable	Not applicable
	• Eliminate unique parts wherever possible, by preferring standard components;	Same as above	Not applicable	Current design and fabrication process is partially enabling
	• Decreasing the amount of labour required for assembly;	Same as above	Not applicable	Not applicable
	• Make parts multi-functional to reduce complexity;	Same as above	Not applicable	Not applicable
	• Facilitate parts handling that does not require special tooling or fixturing for assembly;	Same as above	Not applicable	Not applicable
	• Where possible make parts identifiable and symmetric;	Same as above	Not applicable	Not applicable
	• Design tolerances to meet process capability.	Same as above	Not applicable	Not applicable
R7. DESIGN FOR MODULARITY	• Increase communication between the design teams working on complex products and systems;	Business as usual in an Integrated Project Delivery context of project	Not applicable	Not applicable
	• Use standard components where possible;	Not applicable	Not applicable	Current design and fabrication process is partially enabling
	• Reduce number of parts and components enhance modularity;	Not applicable	Not applicable	Not applicable
	• Design parts as separate, selfcontained modules.	Not applicable	Not applicable	Not applicable
R8. DESIGN FOR RECYCLABILITY	• Limit the number of material types and composites;	Not applicable	Not applicable	Not applicable
	• Make use of easy to dismount elements and products;	Possible under design improvements	Not applicable	Current design and fabrication process is partially enabling
	• Limit use of adhesives, dyes, paints and coatings;	Unfeasible without loss of finishing quality	Not applicable	Same as above
	• Limit or eliminate hazardous materials and contamination;	Possible under design improvements	Not applicable	Not applicable
	• When optimising product recyclability consider product types and geographies;	Not applicable	Not applicable	Not applicable
	• Partner with end-of-life resource management companies to integrate the appropriate product features and facilitate end-of-life	Viable as part of procurement process	Viable as part of procurement process	Viable as part of procurement process
	• Prescribe in procurement contracts that waste should be separated on site to facilitate recycling;	Viable as part of procurement process	Viable as part of procurement process	Viable as part of procurement process
	• Clearly marked or permanently label products, showing their inherent properties and date of manufacture to enable reuse.	Not applicable	Evaluate the creation of a material bank	Evaluate the creation of a material bank
R9. DESIGN FOR DISASSEMBLY	• Ensure comprehensive disassembly plan and product disassembly instruction, illustrating how elements should be deconstructed and	Not applicable	Not applicable	Current design and fabrication process is partially enabling
	• Design for reused number of parts, components and fasteners to speed up disassembly;	Possible under design improvements	Not applicable	Not applicable
	• Screws are faster to unfasten than nuts and bolts;	Unfeasible without loss of finishing quality	Not applicable	Current design and fabrication process is partially enabling
	• Glues should be avoided;	Not applicable	Not applicable	Same as above
	• Design compact and lightweight product to be manually handled to allow onsite assembly/disassembly;	Possible under design and fabrication improvements	Market standard (for metallic rolling doors)	Same as above
	• Avoid mixed use of incompatible materials and connections if not separable and manipulated as individual parts;	Same as above	Not applicable	Same as above
	• Adopt reversible and compatible joints and connections.	Same as above	Not applicable	Same as above

● Evaluation or comment

● New Circular Design strategy possible to be applied

B

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