Title: **Vertical Densification: The Architecture of the Structural System of the BBVA Tower Mexico City**

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Vertical Densification: The Architecture of the Structural System of the BBVA Tower Mexico City | 垂直致密化：墨西哥BBVA塔的结构系统设计

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Dirk Krolikowski is a lecturer in Innovative Technology and Design at the Bartlett School of Architecture, University College London. For more than a decade he worked for Rogers Stirk Harbour + Partners on projects such as The Leadenhall Building in London, where he was in charge of the design, development and delivery of the unique external structural stability system. Furthermore Krolikowski was involved in high-rise designs in New York, Sydney, Taipei, and the BBVA Tower in Mexico City, where he was responsible for the design development of the structural system working in close collaboration with ARUP.

Dirk Krolikowski是英国伦敦大学学院巴特特建筑学院创新技术和设计课程讲师。他在RSH+P建筑事务所工作10余年，参与设计的项目包括伦敦Leadenhall大楼，并负责该项目的设计、开发和独特的外部结构稳定系统的交付。此外，Krolikowski也参与了纽约、悉尼、台北的高层建筑项目以及墨西哥城BBVA 商业银行项目的设计，在项目中他与奥雅纳工程顾问公司密切合作，负责BBVA 商业银行结构系统的设计开发。

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Mark Gorton is an architect and photographer and currently an associate at RSH+P in London. Having joined the practice in 2007, Gorton has been involved in the design of a wide range of building types in countries including Italy, Lebanon, Switzerland, the US, and the UK. During his nine years at RSH+P, he has worked on a number of high profile projects, most notably The Leadenhall Building in London, Geneva Airport in Switzerland, and BBVA Bancomer Headquarters in Mexico, where he was part of a satellite based team working with co-architects Legorreta + Legorreata in Mexico City.

Mark Gorton是一位建筑师和摄影师，目前也是伦敦RSH+P的助理建筑师。自2007年参加实习，Gorton参与了意大利、黎巴嫩、瑞士、美国和英国各种不同类型建筑的设计工作。他在RSH+P工作的九年里参与了大量备受关注的项目，其中最知名的是伦敦的兰特荷大厦、瑞士日内瓦机场和墨西哥BBVA银行总部。在BBVA银行总部项目中，他是卫星研究团队的一员，和墨西哥城的Legorreta ＋ Legorreata事务所共同合作。

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James joined Rogers Stirk Harbour + Partners in 1993 and has worked on various projects throughout the world. A highly experienced architect with a great track record for delivering major projects. He has worked on the National Assembly for Wales, T4 at Barajas Airport in Madrid and the Las Arenas Bullring conversion in Barcelona.After his time in Spain James moved to Mexico, where he worked as project architect for RSHP on the detailed design and delivery of the BBVA tower. James became an Associate Partner in 2016 and is currently working on the International Spy Museum in Washington DC.

James于1953年进入Rogers Stirk Harbour ＋ Partners事务所参加工作，他参与的各种项目遍布世界各地。他是一个经验丰富的建筑师，有着交付重大项目的伟大记录。他曾参与威尔士议会大厦、马德里巴拉哈斯T4国际机场和巴塞罗那拉斯阿雷纳斯斗牛场改建项目。之后James从西班牙迁往墨西哥，在那里他作为RSH+P的项目建筑师从事深化设计，兼顾BBVA塔的交付工作。James在2016年成为事务所副合伙人，最近正在参与华盛顿国际间谍博物馆项目。

Abstract | 摘要

The objective of the paper is to describe the findings throughout the architectural design process of the structural system of the Torre BBVA Bancomer in Mexico City, which reached completion in early 2016. One focus of investigation will be on how key aspects like seismic design and intumescent fire coating technology enable an architectural language that emphasizes legibility within the system and its components. Also, downstream aspects will be explored, such as how local fabrication, construction culture, and constraints inform the architectural decision making process, and the emergence of a tectonic language that exposes the steelwork within the assembly. Further investigation will be carried out into how the structural megaframe enables an architecture with multi-story garden spaces as a notion of vertical realm and urban densification. The paper will conclude with observations on the building as a tested prototype representing a new generation of urban substance.

Keywords: BIM, Culture, Design Process, High-Rise Construction, Mega-Frame Structural System, Urbanization

本文旨在描述墨西哥城BBVA大楼结构体系的建筑设计过程及相关研究，该塔已于2016年初竣工。研究的重点之一即防震设计和膨胀防火技术等关键环节如何使用建筑语言，强调了建筑语言在系统及组成部分可读性的重要意义。同时，后期诸如当地制造和施工文化及建筑决策过程进展通知会受到限制等问题，以及在组装钢结构的过程中出现的建构语言和暴露的细节仍需讨论。对于如何构造巨型框架结构仍需进一步调查，以确保多层花园空间建筑引用垂直领域和城市致密化这个概念。本文所研究建筑作为测试蓝本标志着步入城市意义重大的新阶段。

关键词：建筑信息模型（BIM）、文化、设计过程、高层建筑、巨型框架结构体系、都市化

The Project

The Torre BBVA Bancomer in Mexico City reached completion in early 2016 and was the result of an international competition won in 2007. It is located on the gateway to the Paseo de la Reforma from Chapultepec Park. The new high-rise is the result of a collaboration between architectural practices Rogers Stirk Harbour + Partners and Legorreta +Legorreta with ARUP as structural consultants (Figure 1).

The 50 stories of office space for the new headquarters accumulates to an overall height of 235m and 78,800m² of prime office space for BBVA Bancomer, and can accommodate approximately 4,500 employees.

Further amenities such as social spaces for employees and a large carpark with access ramp are located in separate annexed buildings, which are part of the development next to the main tower building.

The tower has an open, accessible 12m high reception space, which is partly open

项目工程

墨西哥城的BBVA商业银行大楼已于2016年初完工，这是其设计团队于2009年在国际竞赛中拿到设计批准之后的实际成果。该建筑坐落于改革大道查普尔特佩克公园大门前，由斯特克合伙人建筑事务所、莱戈雷塔和莱戈雷塔建筑事务所合作设计，奥雅纳公司任工程顾问（图1）。

BBVA商业银行新总部的办公区有50层，整体高度共计235米，占地面积78,800平方米，位于黄金地段，可容纳约4500名员工。

紧邻主楼的是一个带有入口坡道的大型停车场，以及供员工使用的如社交空间之类的便利设施，后者位于单独的附属建筑物内。

大楼内有一个高12米、部分对公众开放的市级接待处，其顶部还有一个可供高管进入的直升机停机坪。楼内包括中央软件核心设施，用于控制电梯和其他机电服务，也包括一个独立的“脐带”中心，服务于培育空间和垂直运输。

Figure 1. The External steelwork system – the so called Megaframe – is clearly legible form outside, as are are the garden spaces formed by the structure. (Source: Mark Gorton, Rogers Stirk Harbour+Partners)
图1. 外部钢架系统，即巨型框架结构，外部形态清晰可辨，这种结构也形成了花园空间。（来源：Mark Gorton, Rogers Stirk Harbour+Partners）

to the public and carries a helicopter pad for executive access on top. The in-plan organization comprises a soft core in the central main area, with lift and mechanical services as well a separate "umbilical" core containing further raiser space and vertical transportation.

The façade is a lattice with sun shading panels that allow for varying levels of light penetration to manage solar gain and glare. The shading screen is a hung lattice that carries perforated and colored screens. These shades resemble local traditional sun screens and are seen as a modern interpretation and method of contextualization. The building achieved LEED Gold through its exceptional environmental strategies and performance (Figures 2 & 3).

Cultural Drivers and the Architecture of the Structural System

During the development of the building it became clear that the building design must respond to local construction culture in Mexico. This meant that the team had to be sensitive to local constraints of building technology and preferred methods of construction as well as delivery. Demonstrating flexibility and a willingness for the design team to reinvent themselves was key to dealing with a range of specific technical issues, such as seismic design and fire protection particular to the context of a high-rise building. This building typology is still rare in Mexico City, and there is little experience in the local market. The team had to adapt to those constraints and use them to create maximum value and innovative solutions while placing strong emphasis on buildability and constructability. Mexico's construction culture is heavily influenced by the United States. Codes are generally derived from American codes such as the IBC, which is a direct derivation of the American NBC. However, this is not only true for the code aspects of the design, but also for preferred methods of construction. The heavy bias of the North American building industry towards welding on site, and subsequently the local preference, meant that the design team had to engage with this technology as a fundamental constituent of the architecture. Parameters like these had a considerable influence on construction sequencing, tolerance strategy, buildability, safety considerations, and, foremost, architectural approach.

The main stability system is formed by a trussed steel tube with a hexagonal plan and interior columns. Drivers for the plan geometry were considerations of optimal office layout, site constraints and structural necessities. The stability system, the so called megaframe, is subdivided into 17 megalevels of 12.90m each. The short faces of the hexagon are braced by K-shaped bracing elements, which allow for protruding office spaces to the north, while they are part of access and connection to the umbilical core to the south, which carries lifts and services.

它的立面是带有遮阳板的格子状结构、可透射不同频谱的光线，积聚太阳能并发出强光。遮光屏是带有穿孔和彩屏的挂格。这些屏幕类似于当地传统的防晒屏障，被视为对传统建筑的新诠释和归化。该建筑因其特定的环保策略和成效获得了LEED金牌认证（图2、3）。

文化驱动力和结构体系的建筑风格

在该建筑的开发过程中，人们意识到新设计必须与墨西哥当地的建筑文化相一致。这意味着，设计团队需要在建筑技术、首选施工方法和运输方面谨慎地应对当地可能出现的问题。在高层建筑的设计背景下，解决抗震设计和预防火灾等一系列特

Figure 2. Typical floor plan showing the hexagonal trussed tube with internal columns. The soft core and umbilical core are not part of the structural stability system but supply all services. Sky Gardens occur every 9 levels. (Source: Rogers Stirk Harbour+Partners)
图2. 典型的建筑平面图，展示了有内柱的六桁架筒。软核和脐带中心对系统的稳定性虽无作用，却能提供所有服务。每9层建有一个有空中花园。（来源：Rogers Stirk Harbour+Partners）

Figure 3. At ground floor, entrance and reception areas tie into the urban fabric with a garden that is partially accessible to the public, offering break out spaces (Source: Rogers Stirk Harbour+Partners)
图3. 一楼入口处和接待处通过花园与城市网相连，花园的部分地区开放为公众休息空间。（来源：Rogers Stirk Harbour+Partners）

The annexed core itself does not contribute to the stability of the system, but only gains lateral strength from the main trussed tube. The four 50m long sides of the hexagonal tube are braced on each megalevel.

Every megalevel contains five office levels, which at mid span are hung off the upper horizontal mega beam. Each floor plate compromises a soft core in the center of the building, which again does not contribute to the building's stability system.

Early studies of the structural system showed that it would be ideally located on the outside of the building to be most effective, which led to the frame becoming a main element of the architectural expression of the building, clearly visible. The subdivision and hierarchy of the overall system elements could become a legible part of the architecture, which can be experienced by the user and the passer-by, but also as a graphic architectural element on the skyline of Mexico City.

Intumescent Fire Protection as Key Technology.

The architectural language of the structural elements was dependent on further drivers, which, in the case of passive fire protection, were code related. They required in-depth investigation by the design team. Previous experience by RSHP employing two-component epoxy-intumescent systems led to extensive studies toward the possibility of transferring gained insights onto the project in the South American context.

Intumescent coatings as part of a passive fire protection system undergo a chemical change when exposed to heat and foam up into a dense insulating and heat-deflecting cellular char. Therefore, paint can replace cladding to achieve fire protection. During RSHP's design and development of the The Leadenhall Building, a high-rise development of similar height in the City of London (United Kingdom), extensive research into the applicability of the technology in an architectural context was carried out.

Traditionally, these high-end passive fire protection systems did not reach architectural standards particularly in external applications. Advances in two-component intumescent systems that are not hygroscopic and have a sufficient design life have been made in the last decade, particularly for their application in offshore oil-industry projects. During the making of The Leadenhall Building, many application procedures and off-site handling standards were developed to implement external application of intumescent coating as an architecturally sound system that was proven to have reached technological maturity. Fire classes up to 120 can be achieved with a high-quality architectural finish if considered thoroughly. The existing trust in the technology enabled the team to convince all stakeholders of the maturity of the approach, and in turn enabled the team to develop and directly express the tectonics of the steel frame forming a highly visible and important part of the architecture. If a traditional approach would have been taken, the structural system would have been clad to achieve required fire protection and an expression of an architectural language directly derived from material and fabrication logic would not have been possible.

Expression of the Seismic Fuse and the Emergence of a Tectonic Language

Unlocked by the design team's experience in the application of intumescent technology on the large scale project in the United Kingdom, further aspects of the architecture of the structure could be explored. One of the main aspects of developing a unified tectonic language for the project – rooted in material and process logic of the employed technologies – was to enhance the legibility of the workings of the structure and make them a prominent part of the architecture of building. The structural assembly and its individual constituents now could be expressed and clearly articulated.

One overarching technical parameter was the seismic activity of the Mexico Valley together with its particular geology. Mexico City is built on the former basin of Lake Texoco, which was a natural lake within the Valley of Mexico. Through causes like artificial drainage, the lake is not in existence anymore but forms the base of the city. The proximity of Mexico City to one of the most active tectonic trenches in the world, the middle-American trench, means that Mexico City is in a highly active seismic region, with about 100 recorded tremors. In addition, the geology of the former lake bed further amplifies the impact of seismic shaking, resulting in a quite unique and challenging seismic profile. To deal with impact of tremors, the engineering approach utilizes the capacity of steel to absorb seismic energy with elastic and even plastic deformation. The bracing system of the aforementioned long megaframe flanks spans over the typical megalevel height and incorporates an eccentricity at the theoretical node out. In fact, diagonals are not noding

定技术问题的关键是是要发挥团队的灵活性和积极性。该类高层建筑在墨西哥城仍然罕见，当地建筑市场也无前例可循。因此，设计团队必须克服困难，在重点关注可建性和施工性的同时，还要提出创新性的解决方案，用该大楼创造最大价值。墨西哥的建筑文化深受美国影响，建筑规范通常源自美国，如IBC即是从美国NBC直接引入的。除了设计规范，首选的施工方法也深受美国的影响。北美建筑业十分偏爱现场焊接技术，随后当地也逐渐开始模仿，迫使设计团队不得不将这一技术视为建筑设计的重要因素。诸如此类的因素会对施工顺序、容错策略、建筑能力、安全考虑和一些极为重要的建筑方法等产生巨大的影响。

主稳定系统主要由有内柱的六桁架筒构成。办公布局优化、场所限制问题和结构性因素都需要考虑几何设计图。该稳定系统，即所谓的巨型框架结构，被划分为17大层，每层高12.90米。六边形短面支撑的K形支撑元件在北边延伸出办公间，在南边留出与脐带核之间的出入口和连接处，便于运载电梯和机电服务。附核本身对系统的稳定性并无作用，但能在横向上支撑着主桁架筒。四个50米长的六角管道支撑着两侧的巨型平面。

每个巨型平面包含5个办公平面，在平面中间悬挂着更高的巨型平面。建筑中央的每层地板都有一个软核，这些软核也不利于建筑物系统的稳定。

关于结构体系的早期研究表明，将框架完美地置于建筑结构的外部是最有效的，这也导致框架成为建筑表达的主要部分是清晰可见的。完整系统的分支和层次可能是建筑最直观的部分，用户和路人皆可体验，同时这也是墨西哥城天际线超级生动的部分。

膨胀型防火是关键技术

结构元素的建筑语言将依赖于深层驱动器，该驱动器是用于被动防火进行相关编码的。设计团队需要进行深入的调查。以往的建筑事务所广泛采用双组环氧基树脂膨胀系统促使人们将研究得出的诸多见解用于到南美环境下的工程中。

膨胀型防火涂料作为被动防火系统的一部分，温度升高时将引发化学变化成为致密绝缘体或是热偏转的蜂窝炭，由此，可用油漆替代覆盖层结构，实现防火保护。RSHP事务所设计并开发的位于英国伦敦兰的特荷大厦（The Leadenhall Building）与本文所述建筑的高度相似。该大厦对此项防火技术在建筑方面的适用性已进行了广泛研究。从传统意义上讲，这些高端的被动防火系统并未达到建筑标准，尤其在外部应用方面。双组分型系统

out, but are 2.5m off-set and connected via a so called "Fuse." In case of an earthquake this element experiences high stresses due to the aforementioned eccentricity of the bracing system. The induced stresses are transferred in elastic – and depending on their magnitude – plastic deformation of the fuse element, which ultimately absorbs the seismic energy and thus protects the structure from damage. Architecturally, it was seen as important to express the "Fuse" element as a legible part of the structure of the building. By narrowing the fuse-zone of the mega-horizontal, clear articulation of the energy absorbing element could be achieved. Expression of this key element could be further emphasized by thoughtful arrangement of stiffeners of the incoming bracing diagonals and beam horizontals (Figure 4).

The same architectural approach has been taken for the connections of the floor plate ring beam to the megaframe. The floorplate itself is in-set and only engages with the outer stability system at clearly defined connections in the corners of the megacolumns (in the case of the intermediate floors). The geometry and stiffener arrangement of these connections underwent as much architectural as structural investigation and played a part in coining the term "Crocodile Clamp." The tectonic of the connection clearly expresses

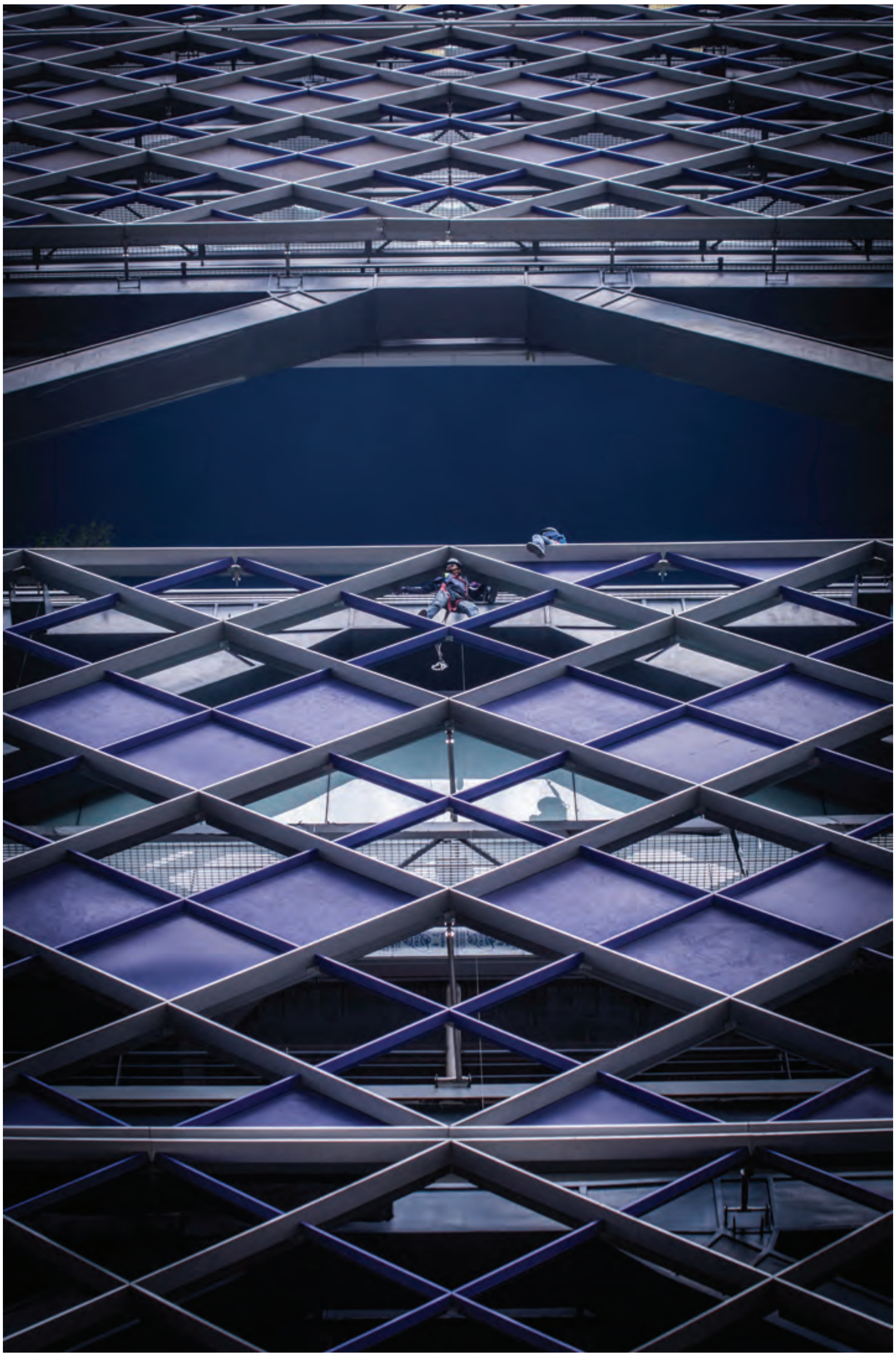

Figure 4. The "Fuse." Expression of this key element could be accomplished by thoughtful arrangement of stiffeners of the oncoming bracing diagonals and beam horizontals. (Source: Rogers Stirk Harbour+Partners)
图4. "保险"问题，这个关键部分要求设计周到缜密，以加强筋支撑对角线和横梁。（来源：Rogers Stirk Harbour+Partners）

的不吸湿性和设计寿命的有效性等两方面的进步已在近十年里得到了进一步的发展，尤其是在海洋石油工业方面。在兰特荷大厦的建造过程中，许多应用程序和非现场处理标准已证实了膨胀技术在外部应用结构上是合理的，制造技术也已成熟。如准备充足，甚至可高质量地完成高达120级的防火建筑工程。对现有技术的信任使设计团队去说服股东选此方案，相应地，这也让团队能够开发并直接使用钢结构框架，使该部分建筑具有高度辨识性。为实现消防保护，如果传统方法使得所采纳的结构系统被覆盖，那么建筑语言的表达直接来源于材料和制造的逻辑也是不成立的。

抗震保险的表达和构造语言的出现

通过在英国大型工程项目中采用膨胀技术，设计团队可继续开展结构体系方面的深入研究。为项目开发一种统一的构造语言，植根于所采用技术的材料和过程逻辑，这是研究的主要方面之一，其目的在于提高建筑运作的易读性，并使其成为建筑结构的突出部分。现在，结构组件和各个组成部分的连接都已清晰明了。

其中一个重要的技术参数是考虑墨西哥流域的地震活动，包括其特定的地质条件。墨西哥城建于墨西哥流域自然形成的特斯科科湖前方的盆地上。湖泊因人工排水而早已干涸，于是形成了城市的地基。墨西哥城位于世界上最活跃的地质沟槽——中美洲海沟附近，这意味着墨西哥城是一个有着约100次震颤记录的地震频发区。此外，进一步被放大的地震震动使得前湖床位置的地质情况十分特殊。为应对震动冲击，该工程方法使得钢材的弹性和塑性变形能力都变得更强，以便更好地吸收地震能量。前面支撑系统提到的硕长的巨型结构为侧面横跨于水平高度之上，在理论上的节点处采用了偏心的方法。实际上，对角线并没有偏心，但有2.5米的偏移，并与所谓的"保险"连接。由于支撑系统的偏心，地震这个因素使建筑仍处于高应力状态。诱导应力的弹性被转移——取决于体积大小——塑性变形的保险因素，最终吸收地震能量以保护结构免受损坏。作为建筑结构的可视部分，架构上的"保险"因素也很重要。巨型水平关节吸收能量，通过缩小其保险区域可以实现架构上的需要。这个关键部分要求设计周到缜密，以加强筋支撑对角线和横梁（图4）。

同样的建筑方法也适用于巨型框架，例如铺板环梁的连接。铺板本身插在巨型柱的角落里（在中间层），只和外部稳定系统清晰可见的接口处相连接。几何图形和这些连接处加强筋的布置需要尽可能多地对建筑结构进行调查，之后在创造术语"鳄鱼夹"的过程中也有所贡献。连接处的构

Figure 5. The "Crocodile Clamp" shown here during construction. The tectonic of the connection clearly express the flow of forces and "bites" into the main column. It is a legible part of the system. (Source: Rogers Stirk Harbour+Partners)
图5. 施工中展示的“鳄鱼夹”。连接处的构造清楚地表达出力量的流动性和主柱的“啮合”。这是系统清晰可辨的一部分。（来源：Rogers Stirk Harbour+Partners）

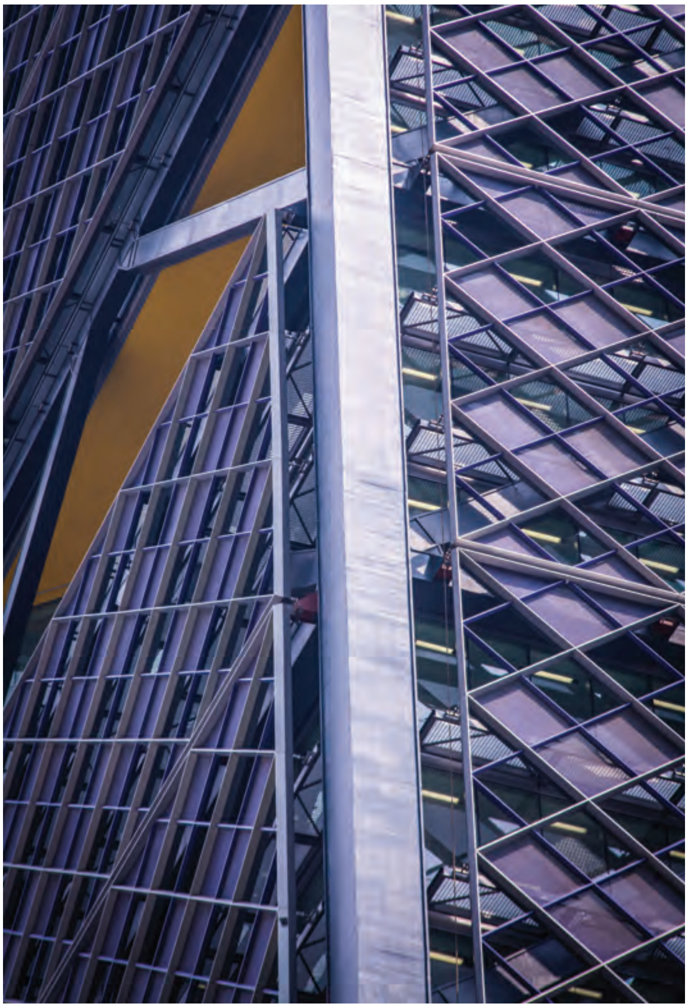

Figure 6. The V-Shaped main column assembly with a sharp edge. In plan, the 1.8m megacolumns are intersecting V-shapes as an architectural response to the requirements of welding. (Source: Rogers Stirk Harbour+Partners)
图6. V型主柱由锋刃构成。计划中的1.8米巨型柱和相交的V型焊接都需要与建筑相对应。（来源：Rogers Stirk Harbour+Partners）

the flow of forces and "bites" into the main column. It is a legible part of the system (Figure 5).

Further considerations also evolved around welding technology (i.e., preferred weld-types and their impact on the architecture.) For example, the in-plan plate arrangement of the main columns was designed to allow for simple fillet welds while allowing for a desired sharp edge of the component. In plan, the 1.8m megacolumns are intersecting V-shapes as an architectural response to the requirements of welding (Figure 6).

All given parameters and constraints led to new and unprecedented solutions that, enabled by key technologies, unified architecture and engineering logic in a carefully considered tectonic language. Sculpted by forces, materials, and welding process logic, the architecture of the structural system enabled an emphasis on a kit-of-part approach that interrogates and defines every component of the system.

At this point it should be mentioned that a key part of the approach was the early stage integration of sophisticated digital technologies that were not yet integrated or even known within the Mexican market. These technologies, like digital prototyping, have been used to validate design decisions. The quality of conception and development of the tectonics of the structure was dependent on RSHP's use of digital technologies to forecast design issues related to the engineering and fabrication aspects of the project. A holistic digital prototype, built and maintained by the London-based design team, ensured quality of development and information, which also had a significant impact on the final delivery of the actual building. It played a pivotal role in helping to deliver results faster, better and with a clear understanding of all processes involved. The success of the digital strategy on this project even helped to further RSHP's robust in-house workflows and standards, initially developed for The Leadenhall Building. It enabled the team to deliver the highest quality of design information allowable to engage in a comprehensive and interdisciplinary dialogue with significant,

造清楚地表达了力量的流动和主柱的“啮合”。这是系统清晰可辨的一部分（图5）。

也需进一步考虑当地诸如优选的焊接类型等焊接技术对建筑的影响。例如，在主柱平面图设计中，不仅将简单的填角焊接考虑在内，还包括所需的锋利边缘组件。计划中的1.8米巨型柱和相交的V型焊接都需要与建筑相对应（图6）。

考虑到所有因素及限制条件，设计团队提出了无比新颖的解决方案，仔细思考后形成了关键技术、统一的体系结构和工程逻辑等构造语言。为查询和界定各组成部分，雕塑力量、材料与焊接过程的逻辑和建筑结构系统强调了工具包使用方法的重要性。

此处应提及的方法，其关键部分是早期阶段先进数字技术的整合，而墨西哥市场尚未整合。这些技术，如数字原型，已被用来验证设计决策。结构构造概念和开发质量取决于RSHP使用的数字技术，目的是预测项目的工程和制造方面的相关设计问题。为确保开发的质量和数据的准确，伦敦的设计团队建立并维护好全面数字样机

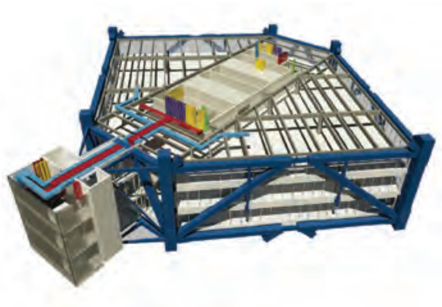

Figure 7. 3D Digital Prototype testing architectural decisions and the mechanical services strategy. A holistic digital prototype, built and maintained by the London-based design team, ensured speed and quality of design development. (Source: Rogers Stirk Harbour+Partners)
图7. 三维数字样机测试建筑的决定和机械服务策略。为确保开发的质量和数据的准确，伦敦的设计团队建立并维护了全面数字样机。（来源：Rogers Stirk Harbour+Partners）

positive impact on quality of architecture, construction speed, risk management, and value while helping to bridge cultural barriers (Figure 7).

The Structure Creating Garden Spaces

The structural system of the building further enabled the implementation of very early design concepts. The building is seen as an exploration and innovation of traditional office organization. It offers flexibility for modern working but also acknowledges the importance of less formal spaces like sky gardens. These full-megalevel-height garden spaces occur every nine floors. They bare similarity to the ground floor, where entrance and reception areas tie into the urban fabric with a garden that is partially accessible to the public and offers break out spaces. As such the gardens encourage quality internal working culture, but also contribute to the quality of vertical urban space and densification. At the heart of the concept is the idea that gardens cater to office villages that are social subdivisions of the larger community, embracing a rich public life and an inherent value in Mexican culture, where the outside is an important aspect of public interaction facilitated by the climate.

The color treatment of the soffits of these spaces, clearly visible from the street level, is meant to add another layer of urban contextualization and cultural relevance (Figures 8 & 9).

Conclusion

The project exemplifies the importance of a cultural context that is urban as much it is technological. RSHP's experience in high-rise projects covers buildings across five continents, and the practice has proven sensitivity to local constraints of building technology and preferred methods of construction as well as delivery. While dealing with a range of specific technical issues (including the requirements of

对最终交付的实际建筑有着很大的影响。这个数字原型可以更快、更好、更清晰地了解项目进展的全过程，起到了举足轻重的作用。数字战略的成功甚至可以帮助RSHP进一步强化内部工作的流程和标准，该战略最初是在兰特荷大厦（The Leadenhall Building）项目中开发出来的。它能确保团队提出最优质的设计信息，可以进行全面和跨学科之间对话，对建筑质量、施工速度、风险管理和建筑价值具有显著的积极影响，同时还能够弥合文化障碍（图7）。

创造空间花园结构

建筑结构体系进一步启用了较早期贯彻的设计概念。该建筑被视为传统办公室结构的探索和创新。它不仅为现代新型工作方式提供了灵活性，也认可较随意空间的重要意义，如引进空中花园。每九层就有一个全覆盖型平面花园空间。这些花园与一楼的入口和接待处相似，连接着城市网，部分开放区域可为公众提供休息空间。这样的花园不仅可以鼓励内部员工形成高质量的内部文化，而且还有助于垂直城市空间进一步优化和致密化。为满足办公村的想法，整个建筑以花园为中心，形成一个拥有丰富公共生活的大社区。由气候促成的公共互动是墨西哥文化内在价值的一个重要方面，这在表面上是看不出来的。

空间吊顶颜色鲜艳，街道上也清晰可见，这是建筑的城市语境和文化关联（图8、9）。

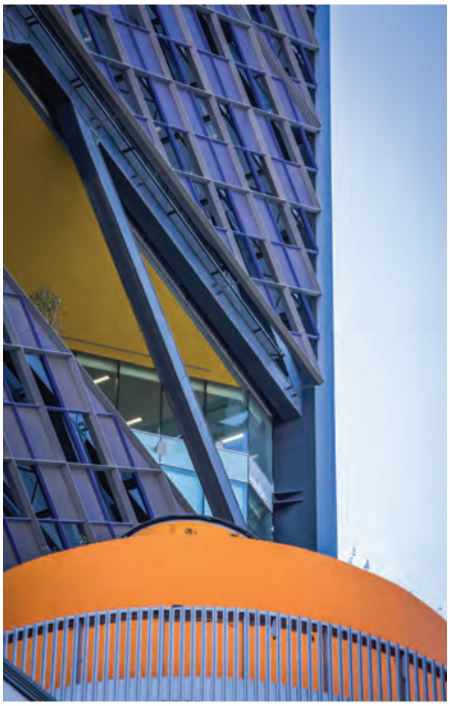

Figure 8. The color of the garden space soffits and annexed buildings adds another layer of urban contextualization and cultural relevance. (Source: Rogers Stirk Harbour+Partners)
图8. 五颜六色的吊顶为空间和附楼增添了另一种城市语境和文化关联。（来源：Rogers Stirk Harbour+Partners）

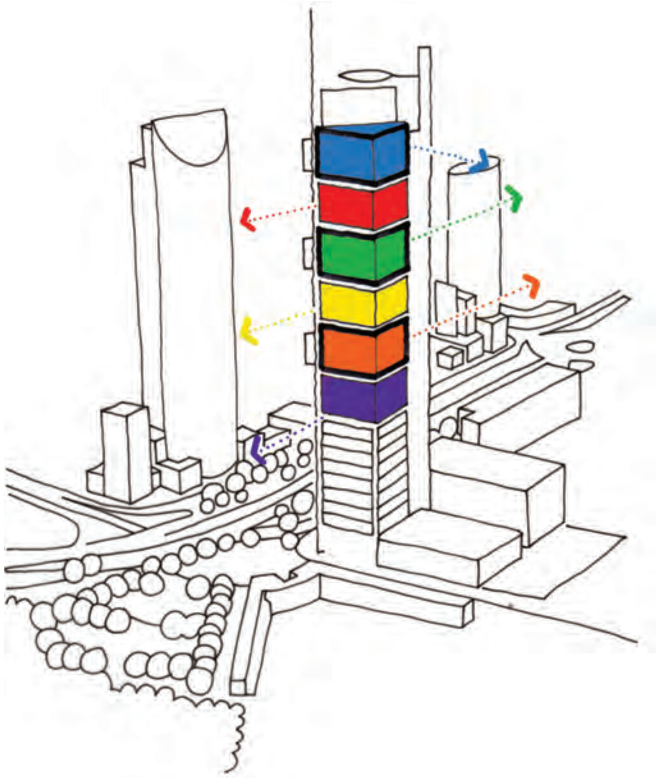

Figure 9. Stacked "villages" as social subdivisions of the larger office community are tied together with dedicated garden spaces. (Source: Rogers Stirk Harbour+Partners)
图9. 大办公社区由堆叠的"办公村"形成，与精美的花园相连。（来源：Rogers Stirk Harbour+Partners）

Figure 10. Overall shot of Torre BBVA Bancomer during construction. Its successful architecture proudly displays cultural standards as well as civic virtues of Mexico City. (Source: Rogers Stirk Harbour+Partners)
图10. 施工期间BBVA大楼的整体图。这个值得夸耀的建筑取得的成功不仅体现出墨西哥城的文化标准，还展示出当地的公民美德。（来源：Rogers Stirk Harbour+Partners）

seismic engineering, prescribed methods of fabrication, and assembly), the team has proven to be well versed in adapting constraints and using them to create outstanding and innovative solutions, adding to existing rich working cultures through the implementation of the latest digital tools.

Torre BBVA Bancomer is seen as a tested prototype representing a new generation of urban substance in Mexico City. It is proposing strategies for future models of urban densification in the South Americas while maintaining contextual relevance through effective and attractive urban fabric. Through its successful architecture it proudly displays cultural standards as well as civic virtue of Mexico City (Figure 10).

结语

该项目充分体现出文化环境和建造技术对城市同等重要。RSHP事务所的高层建筑项目遍及五大洲，实践证明，在建筑技术、首选施工方法和运输等当地可能出现问题的方面，必须要谨慎应对。在处理一系列具体技术问题（包括对地震工程的要求、规定的制造和装配方法）时，团队已经能够应付，他们还在有限的条件下创造出优秀的且新颖的解决方案，通过运用最新的数字工具，丰富工作文化。

本文所研究的建筑作为测试的蓝本标志着墨西哥城步入意义重大的新阶段。该建筑作为未来模型也为南美洲城市致密化的发展提供了案例，与城市可行、有效的构造保持着语境关联。这个值得夸耀的建筑所取得的成功不仅体现出墨西哥城的文化标准，还展示出当地的公民美德（图10）。