



ENGLISH TEXTS



**TITLE OF THE ISSUE****The São Paulo School in Brazil. Structural understanding and architectural conception****DEBATE****Dialectical concrete***Hugo Segawa*

São Paulo in the 1960s and 1970s was the city at the forefront of architectural experiment after a wealthy cultural atmosphere in Brazil late 1950s and the inauguration of Brasília. Architects in São Paulo reinterpreted the principles from Rio de Janeiro's masters and developed a peculiar and influential kind of architecture, usually considered as a trend for its formal features. Besides the preference of exposed concrete being a kind of trademark (worldwide spread at those years), the paulistas established an intense ideological discussion behind the constructive and structural systems, embracing politics, ethics, nationalism, the mission and the education of the architects in the context of a developing country.

The writings and the works of João Batista Vilanova Artigas make him a pivotal personage in that scenario. His rhetoric was bright and authoritative. Disciples and antagonists established a rich and conflicting debate that encouraged architectural attempts of broad expectations. It is used to classify this architecture as a «school». Such approach is inadequate in as much as the differences could be extinguished and the inner contradictions and divergences are dissimulated.

Structural exhibitionism and the overuse of exposed concrete stereotyped a trend and vulgarized what once was an architectural cutting edge. The changing political and cultural panorama in the 1980s, and the passing of Vilanova Artigas symbolize the demise of the ideals raised late 1950s.

A arquitetura moderna e o desenvolvimento da indústria da construção civil em São Paulo*Renato Luiz Sobral Anelli, Felipe de Araujo Contier*

Modern architecture and the development of civil construction industry in São Paulo.

The born of Modern Architecture in Brazil was not an expression of a preexistent industrial condition, but was rather an inducing agent of technological development for the civil construction chain.

From 1927 to 1947 this relation between technological stage and aesthetical innovation in Brazilian architecture was brokered by the construction of judgment values by critics and historians. This article proposes to analyze these three factors in São Paulo, through the works of Gregory Warchavchik (1896-1972), Rino Levi (1901-1965) and Vilanova Artigas (1915-1985).

The analyses intended to demonstrate that the Modern Architecture pushed the development of the construction technics in the civil construction industry since de first modern project designed by Warchavchik in 1927, despite the limits denounced by the architect. Some years later, Levi and Artigas demonstrated that the progressive introduction

of free plan and curtain facades in its buildings demanded new patterns of technological expertise in reinforced concrete structures, then disseminated by many other buildings produced by real estate in São Paulo vertical growth.

Afinidades eletivas: Affonso Eduardo Reidy e o brutalismo paulista*João Masao Kamita*

Elective affinities: Affonso Eduardo Reidy and São Paulo brutalism.

This article seeks to establish points of contact between the architecture of Affonso Eduardo Reidy and the designs of architects São Paulo as Vilanova Artigas and Paulo Mendes da Rocha. Before establishing links between such productions, the text seeks to undo some historiographical categories that rightly opposed the project «Rio» from «São Paulo». Reidy is considered to be the first to experience the brutalist's language works in Brazil in the 1950s and would have had an impact on the environment of São Paulo. So it would be a sort of waypoint and thus overcoming the reading that pitted the two main cities of Brazil. More than formal state or spatial similarities that confirm this affinity, the hypothesis is that the similarities between Reidy and Artigas generation based on the party plan and projective procedures.

Arquitetura paulista ontem e hoje*Guilherme Wisnik*

Paulista architecture yesterday and nowadays.

The São Paulo School or Paulista Brutalism are two terms that are used to describe the work of a group of architects of São Paulo, under the leadership of João Batista Vilanova Artigas and Paulo Mendes da Rocha, and that now describes, in different form, the contemporary work of a younger generation.

The main characteristics are the use of bold structural forms, compact volumes, the direct connections between interior and exterior and the creation of the continuous spatiality. Plazas, gardens and open spaces located within the building emphasize this spatiality and transfer a sense of exterior «landscape» to the interior.

São Paulo is a laboratory for these architects and a primary mission is the search for a new urbanity. The architectural scale is not designed quantitatively with the intention of generating monumentality, but it originates from a rationale that advocates the concentration of core areas so as not to interrupt the continuity of space, and to avoid confining environments. This approach seeks to express not only the elements of construction, but also the apparent measurement of indivisible space.

The architects of the Paulista School focus on the design of public infrastructure, refusing rigid models to determine the portion of the city intended for private occupancy.



A pergunta de Artigas

Álvaro Puntoni

The Artigas' question
The important «paulista» architect and fundamental teacher Vilanova Artigas responds through a lecture in 1967 to the yearning of students eager to master a clear position regarding the military dictatorship that had settled in our country in 1964. The class where the teacher discusses the design ends with a question. This question has yet to be answered by all of us: the students of the students of the teacher.

The Line of the Sky and the Line of the Earth in Paulista Architecture

Maria Argenti

The essay examines the essence of the São Paulo school of architecture, viewed through selected works by Vilanova Artigas and Paulo Mendes da Rocha.
The text looks at what the the Paulista School is, and what it is not. It is a way of thinking and not a catalogue of rules. It is an ethical vision of the relationship between people and buildings, between engineering and architecture, individual creativity and social needs, between memory and future.
Artigas was convinced that architecture and engineering could not be separated by philosophy and politics. Thus the concrete act of designing means contributing, under given conditions, to the collective construction of the world.
The buildings of Artigas and Cascaledi, designed between 1959 and 1961 – the Bittencourt House and the schools of Itanhaém and Guarulhos, the Vestiário do São Paulo Futebol Clube and the Anhembi Tênis Clube, the Garagem de barcos Santapaula – and those of Mendes da Rocha – from the project for the Osaka Pavilion to the Cais das

Artes, to Vitória – are anything but lightweight in their form and raised almost completely above the ground, with the exception of a few bearing points. They are characterised by a preference for the pared down, the essential and the refusal of any self-referential exhibitionism.

The notion of considering the roof as the matrix of a project that evolves from the top down is characteristic of these works, which exalt the intelligent modelling of structural profiles and the reduction to a minimum of the point of encounter between building and ground.
The text emphasises the balancing act, never formalist, between structure and form, between technical ability and creative ingenuity, between heavy and light and between earth and sky typical of all Paulista projects.

Carlos Millan e a cultura arquitetônica paulista

Mônica Junqueira de Camargo

Carlos Millan and São Paulo architectural culture.
The architecture of Carlos Barjas Millan (1927-1964) has been an important reference for successive generations of architects. His buildings and the documentary collection, in custody of the FAUUSP, constitutes, even today, a fertile field of study for those who are interested in peer into the design process. The simplicity and austerity that characterize its most paradigmatic works, such as the Jockey Club headquarters, the Department of Literature, FFLCH USP and the residences: Roberto Millan, Nadir de Oliveira and Antonio Elboux distinguish his architecture among its period production and is very timely in view of the diversity of contemporary architecture. His career, that includes experience in furniture production, participation in professional politics and teaching, evidences the public spirit in which Millan developed his work and is a necessary counterpoint to the dominant individualism of today .

RESEARCH

Reidy's Marooned Arc in Yta Pyta Punta

Alberto Ferlenga

The history of architectural modernism in São Paulo originated outside the city. One of its earliest sites can be found in Asunción, Paraguay.
When, in 1960, Siegfried Giedion penned the introduction to Klaus Franck's book on Affonso Eduardo Reidy (1909-1964), his attitude focused on discovering new paths.
The city's extraordinary geographic position, wrapped in the spires of the river, brought about a mutation in Reidy's work. His language produced something unexpected and, to some degree, was taken to the extreme.
What the German historian most appreciated about Reidy's work was the Pedregulho (1947) in Rio de Janeiro, which he visited personally and, in general, those works that clearly denounced the influence of Le Corbusier.
The project in Asunción marked the first appearance in Brazilian architecture of the dilated spatiality of the covered plaza that, in only a few years time, would be confronted by Bo Bardi in the MASP (1957) and by Villanova Artigas in the FAUUSP building (1961), both in São Paulo.
In Assunción, visited by Le Corbusier in 1929, we find the

large scale appearance of the brutal exposure and formal autonomy of the concrete structure.

In the Colegio Experimental Paraguay-Brasil (CEPB), a fragment of an incomplete complex, Reidy, operating like a parsimonious artisan, returns to ideas and forms tested previously in Brazil: the raised free plan, a tendency toward *stylistic recycling*, the coupling of concrete vaults anchored to the ground and sloping roofs.

The CEPB symbolises a modernism that is the fruit of fertile contaminations between global ideas, a unique talent and an extraordinary site.

Metropolis and World-Building. Three examples in São Paulo Architecture

Aldo Aymonino

The projects examined in this essay show in diagrammatic manner the complex relationship between the various series of forms and methods of use of the architecture, and its social role in the heterogeneous community of metropolitan São Paulo.

All three have become, over time, beloved icons of a megalopolis of more than twenty million inhabitants, and in

which humanity that attends them, in different ways and numbers, can recognize fully itself in their language and in their spaces .

The three projects are very different from each other in size, use and destinations. Also their story and construction issues remarks the difference of scope and fruition: a new building (the Faculdade de Arquitetura e Urbanismo), a complete renovation of an industrial complex with a consistent volumetric addition and change of use (SESC Pompéia), and zero volume architecture, a huge canopy that connect cultural buildings trough a landscape (the Marquise of Ibirapuera Park).

Even the designers come from very different biographical experiences: none of the three was born in São Paulo, and «Lina» as she is affectionately called in Brazil, is born even in another continent (Rome 1914) and will be moving to São Paulo just after WWII.

But while Bo Bardi and Vilanova Artigas – which is closer to be Paulista because he was born in Curitiba in 1915 – elected São Paulo their city of choice, Niemeyer remains the quintessence of the carioca spirit through his long life.

O lugar do pensamento. The Poetic Concreteness of Artigas' FAU

Francesca Sarno

The Faculdade de Arquitetura e Urbanismo at the Universidade de São Paulo (J. B. Vilanova Artigas and C. Castaldi, 1961-1968) is a project-symbol, it is a point where architecture expresses values and lessons. This building expresses the distinguishing characteristics of the Paulista School: the result is a sublime synthesis between architecture, engineering and ideology.

From its foundation the School presented itself as the champion of an ethical study of the human experience: the project represents the first gesture of confronting concrete reality, with the aim of creating social interaction and collective well-being.

Various aspects of the Paulista architectural language can be related to the literary and artistic manifestations of the Concretist Movement, widespread in São Paulo in the early 1950s. It is possible to notice a contiguity between the profound choices, the nobility of intentions and the adjectives used to describe concrete art and architecture. The definitions of the concepts of space and form are central to both, though in ethical rather than aesthetic terms. They are the expression of an idea, realistically associated with the context in which it is situated and to which it is directed.

The Paulista projects, with their unprecedented and often unexpected constructive and ideological choices, possess a formal clarity and concreteness. The architecture of the School is expressed in the essentiality of its forms, imposing for the strength of the ideas its transmits. Collective concerns take priority over the aesthetic, and architectural austerity translates into a social project.

Hazardous beauty. Paulo Mendes da Rocha's reconfiguration of the Praça do Patriarca in São Paulo

Daniele Pisani

Between 1992 and 2002, Paulo Mendes da Rocha works and partly carries out the project of reconfiguration of the

Praça do Patriarca in São Paulo. It is one of his main urban plans. For the first time in his career, he has the chance to operate on one of the nerve centres of the city.

The reconfiguration of the Praça do Patriarca is therefore a task that Mendes da Rocha had been waiting for a long time. And yet, his aim – to build «the city for all» – is compelled to take into account the urban decay and the violence, spread over a large part of the central areas of São Paulo since the seventies; moreover, the fact that the intervention is funded by the local economic *élite* and a series of international banks clashes with most of the political aspirations that are implicit in the project.

The hypothesis formulated in this essay is that the intervention proposed and carried out by Mendes da Rocha in the Praça do Patriarca would be inconceivable in his essence without taking all this into consideration. Mendes da Rocha builds a work which is first of all a landmark and a visual connection among different parts of the city. The work tries nonetheless to be an icon because of the architect's awareness that, under present circumstances, «the city for all» is at the same time necessary and hazardous.

«Art alone offers no consolation, but economy coupled with Poetry, yes»

Antonella Gallo

To the world of architecture the contemporary notion of recycling descends not only from environmental and economic considerations. Instead, it comes in the wake of a series of aesthetic experiences that, from Surrealism to Dada, have accustomed us to perceiving the contrast and dissonance between objects as a part of our visual experience.

The three-dimensional assembly of old and new buildings, or parts of buildings, of old and new spaces in the design of architecture belongs to the culture of transformation and metamorphosis experimented with by all of the other arts throughout the twentieth century. To date, only a handful of masters have applied this technique to the invention of architecture, adopting the recomposition of fragments as a field of investigation that does not translate into the passive acceptance of the heterogeneous, of the *ready made* as a ludic practice.

Composing the heterogeneous fragments generated by collective memory, the abandoned bodies of past civilisations or human desires for the future, it is possible to imagine a realist architecture, neither rational nor irrational, but intent simply on interpreting recycling as poetry and economy. In this sense, Lina Bo Bardi's design of the SESC Pompéia assumes a paradigmatic value. It metabolises the periphery of the South American metropolis, «loading» the new intervention with the energy deposited in the forms of a city in transformation. It sublimes and assigns dignity to suburban space beginning precisely with an element common to the cities of both the first and third world: industrial ruins.

The SESC stands apart from a banal operation of reuse, but also from certain contemporary operations of recycling where, for example, the use of Surrealist or Dada techniques appears to have no other aim than the production of self referential amazement, by the contrasting primary intention that animates it: the desire to make it a space integrated within the urban and social fabric of the megalopolis and at the same time a space for the integration of popular cultures.



The *Citadel da Liberdade* in São Paulo. Lina Bo Bardi SESC Pompéia

Alessandra Criconia

When in 1983 the SESC Pompéia was opened, it caused a scandal. The choice of Lina Bo Bardi to restore the Fábrica da Pompéia, an old, plain industrial factory that had no special architectural qualities, was judged by Brazilian architects incomprehensible and meaningless. Three years later, when the SESC Pompéia was completed with high concrete towers, the opinion did not change: the new parts that emerged from the brick buildings were strange and looked ugly and awkward.

Thirty years on this opinion changed and the design of SESC Pompéia has become universally renowned with the concrete towers becoming symbols of São Paulo skyline. In part, the success of the SESC Pompéia is due to the «formula SESC» – promoting cultural and recreational centers in urban areas – on the other hand, the specific decision of Lina Bo Bardi to restore a factory already in use by the inhabitants, was a key factor for the anthropological quality of the architecture. The strength of the Bo Bardi's project is the personal interpretation of the «Tradition of the New» which, according to the idea of history as a *historical present*, created the conditions for a refurbishment aiming at the *creation of a situation* and not a monument. This cultural approach inspired a process of «thinking outside the box» and defined the distinctiveness of the work of Lina Bo Bardi. The SESC Pompéia became a manifesto of Lina Bo Bardi's architectural work offering a surprisingly contemporary example of ethics and aesthetics.

It is a form of architecture that showcases the ability of reusing an existing building to create an egalitarian and inclusive place where people love to travel.

Um Novo MAM para São Paulo no Parque do Ibirapuera

Angelo Bucci

A New MAM for São Paulo in the Ibirapuera Park. This project was the result of an invitation by the 33° Panorama exhibition in 2013 at the Modern Art Museum in São Paulo (MAM).

A Modern Art Museum has in its permanent collection the gardens by Burle Marx and the buildings by Oscar Niemeyer.

Sixty years after the creation of both MAM and Ibirapuera Park, someone should ask: how to continue this legacy? Or: what would it be the best future configuration for these two crucial actors in the history of São Paulo?

These subjects, among others, are related to the question that was proposed to us: «A new MAM, why and to whom?» This would be a museum whose collection is equally composed by what is outside and inside its walls. Its artefacts are exploded from inside to outside and the external spaces are dragged to its interior. A museum of everything. To whom? This is a museum to exhibit its collection to visitors but also to surprise those strolling through the park or those stuck in traffic. A museum for everyone.

How much? Four identical prisms: 750 m x 10 m x 10 m; 10 spans of 75 m. At its center lies the architectonic ensemble designed by Oscar Niemeyer which generates the geometry of the new museum. The four prisms together

have an extension of 3 km.

The new MAM is both inside and outside the park. In some sections, it is suspended above the avenues, recovering to the park its original dimensions.

The new MAM pays back the generosity of the Ibirapuera marquee.

The new MAM now hovers over the park and its surrounding avenues. It is a museum for workdays and weekends. It is a building whose totality can be easily inferred but only appears in parts. It is a construction that the sight cannot grasp in its entirety.

An architecture to be understood with the eyes closed.

Época da solidariedade humana: the Artigas second Bittencourt house

Matilde Plastina

The second Taques Bittencourt house, designed by João Batista Vilanova Artigas with Carlos Cascaidi in São Paulo, Brazil, in 1959, is a new perspective of thinking and a break point with the usual production of the time. Structures with large spans, rough reinforced concrete, wide covered spaces without intermediate vertical supports, long ramps – designed as an extension of the building toward the outdoor spaces – are the elements that characterize this house making it, perhaps, a necessary step for the most significant Artigas' works.

In this house, as in his other works, the expressive emphasis reached by the Brazilian architect through the sobriety of the materials, the simplicity of the forms and the synthesis of architectural sign are confirmed by the structural organization, often pushed to the limits by innovative sophistication.

On two secondary sides, two large load-bearing walls are shaped on the ground floor to become two main tapered pillars; they support the whole structural complex of the ribbed slabs and ramps. In this way, Bittencourt house is lifted from the ground to leave a covered space with an exotic garden in a patio. This home breaks the rules of domestic intimacy putting itself in continuity with the outdoor spaces and more indirectly with the street; it reveals its uniqueness in the prestigious Sumaré residential area, not only for the image returned, but also for the principles of democracy and social innovation that underlie it.

Structure, form and balance: Magalhães Gouvea house

Giulia Santarelli

This text focus on the house Magalhães Gouvea built, in 1961, by architects Eduardo Corona and Carlos Lemos in São Paulo, during a period of cultural and architectural ferment. Capturing the intimate link between structural choices, distribution and the architectural image, the author underlines the main features of the project: the idea of lightness, a sense of tension, dynamism and unstable equilibrium of the entire composition, a taut horizontality and finally the continuity between interior and exterior space.

The house consists of two parts that fit together without losing their autonomy and recognizability: a large portal that wraps around the upper volume and a parallelepiped that looks flow below, whose coverage becomes roof garden. The portal is characterized by an unusual triangular shape



of the two lateral bearing walls, in reinforced concrete, that shrink down until each one touches the ground at only one point and the large cover plate, jutting out considerably. The fluid and continuous spaces on the ground floor contrasts with the rhythmic sequence of the four bedrooms on the first floor. A precious ceramic mosaic characterizes the covered outdoor space of the house. The protagonists of the recent restructuring, C. Leite and F. Stuchi, respectful of the work of their old masters, have planned a quiet intervention, non-invasive, capable of giving the house actuality and differentiate from the original, establishing a complementary harmony with it.

Masetti house: Mendes da Rocha's «utopia of reality»

Fabio Cutroni

In the poetic vision of Paulo Mendes da Rocha even the design for a simple house becomes the reason for a statement, reveals a political thought founded on the assumption that domestic space is the basis of social life. As a paradox, then, he rejects the very idea of individual, isolated living, always looking for a continuous modulation of collective spaces, sharing areas, with soft edges, cleverly balancing the level of intimacy – never total – in order to pursue a programmatic overlap and hybridization between public and private spheres. The residence for the engineer Mário Masetti, designed in 1967-68 and built in the next two years, is perhaps the most clear example of his criticism of the garden city settlement principle, transferred into São Paulo metropolis since 1912. In the hard years of military coup, of the loss of his father and his expulsion from FAU, he instills in this project the yearning for the «poverty of what is essential», many times invoked, in spite of «all that is superfluous [...] everything that is not necessary». A lesson of architecture which reflects an ideal of domestic life meant to represent a different, fairer social paradigm; the hope for a possible future bitterly shattered by the tragedy of the present, leaving the silent witness of a renewed utopia of reality.

Between Nature and Artifice. Eduardo de Almeida's Point of View

Maura Percoco

When buildings speak they never do so with a raised voice. They use sober and reassuring tones that, in «good architecture», translate into a few signs combined with efficiency and elegance. The Residência Max Define in São Paulo belongs to the genre of «buildings that speak»: invisible to the distracted observer, it asks those who notice it to do so with attention, to listen for that extra time necessary for the message it holds to touch our sensibility. What reflections are thus concealed in the admirable simplicity of forms and means that characterise this project? What method and solutions did Eduardo de Almeida put into play to realise his own ideal of «good architecture»: infusing serenity and creating a «condition of conviviality»?

The essay identifies in the «construction of the prevalence of the void» through the definition of an «interrupted and inclusive spatiality» the design strategy employed by Almeida to «transform a sloping site in the residential district of Cidade Jardim into a space where the infinite

natural and the finite artificial coexist in a vital symbiosis and where, on a theoretical plane, innovation and tradition achieve an unprecedented synthesis».

In the rigour of method, through the control of every detail and a tireless commitment to simplification intent on revealing the «imperceptible», we find Almeida's contribution to the Paulista School and the contemporary value of the «lesson of modesty» that the Residência Max Define has been revealing, for over thirty years, to those willing to listen.

Contemporary Classicism at Street Number Seventy-Six. The House in Vila Romana

Germana Angelini

This home and studio for an artist situated in the *bairro* of Vila Romana is the work of the office MMBB. Its design welcomes and succinctly resolves a series of challenges. A precisely urban challenge derives from the particular position of the lot; situated at the end of a disordered and unresolved block, it required the construction of a «proper end». This was followed by the orography of the site, with a level change of ten meters and, finally, the client's imperative that the home and studio be separated. These premises find their responses in the particular characteristics of the home, which unites a classical severity with the vivacity of modernist space. The level change is resolved by a 4,5 meter deep excavation into which the volume of the partially underground studio is placed, clearly separated from the rest of the home. This sort of basement is surmounted by an open level with barycentric *pilotis* set back from the edge to create a covered space, as continuous as possible and linked with the garden. The structural daring of beams and columns is figuratively balanced by the iconic purity of a square-based prism that floats in the void and defines the domestic realm. The heightened austerity of the design is accompanied by the construction of a fluid space that casually reconnects all areas of the home. The resulting harmony is the outcome of the successful balance between the project's classical and expressive roots.

An Enclosure, Two Piers and Three Courtyards: The Residência Bacopari in Boaçava

Matteo Baglioni

This home is situated on an irregular lot, an exaggeratedly elongated quadrilateral, closed on three sides by neighbouring properties and open solely along the side providing access. Surmounting a high perimeter wall, into which the entrances have been plastically cut, is the only element visible from the street, a compact volume in exposed concrete, that offers a translucent facade of large vertically oriented windows. This definitive closure toward the urban context is juxtaposed, on the other side of the wall, by an open and uninterrupted articulation of space that negates the common duality between interior and exterior, imagining instead a new form of integration between nature and architecture. The enclosure is interpreted as a threshold, an edge that leads into a «small separate world». The house is fused with nature, welcoming it and absorbing it, making it a part of the house itself. The



integration between garden and home generates a new *domestic landscape* that extends uninterrupted across the lot. It can be perceived in its entirety, in all of its composite unity from the moment one enters. The fusion between the diverse spaces is regulated by large glazed surfaces that – as the project description tells us – dissolve «the confines of the home in a series of reflections and transparencies». The protagonist of the project is thus the void, or better yet, the system of voids that, on the one hand, structures the parts of the home and, on the other hand, guarantees the relationship with the natural elements (light, wind and vegetation). The structural solution is the key to *freeing* the space of the ground floor to create a perception of continuity that dematerializes the entire ground floor of the home: the large structural spans, the symmetrical cantilevers of the two end walls-beams and the pattern of openings that resemble perforations in a solid, reduce the physical consistency of these load bearing piers, rendering them more similar to opaque concrete surfaces.

The strategic and central role of the structure, the essentiality of the volumetric and material elements, the conformation of space and the attachment to the ground, all refer to the traditions of the School of São Paulo and its

close ties to the Modern Movement. Exposed concrete, the large structural bay and permeable space are all transversal themes to a generation that, as clearly demonstrated by the Residência Bacopari, endure and evolve in the work of young Paulista architects.

Uma casa para o fim-de-semana na cidade

Luís Antônio Jorge

Weekend house in the city

This essay focuses on the fundamental aspects of a new poetics developed by SPBR architecture's office, directed by Angelo Bucci, instructed by the cultural values of a tradition of modern architecture identified with the city of São Paulo: the extension of urban space – the so called «ground city» – in the private space of the house and the revision of the concept of *promenade architecturale* of Le Corbusier, always considering, as higher value, the language of architecture as a result of a deep research in tune with the engineering design.

