THE COMMUTER’S CATHEDRAL: 
AN EXAMINATION OF THE GEORGE WASHINGTON BRIDGE BUS 
STATION

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Submitted in partial fulfillment of the requirement for the degree 
Master of Science in Historic Preservation

Graduate School of Architecture, Planning and Preservation

Columbia University

May 2012
Abstract
“The Commuter’s Cathedral: An Examination of the George Washington Bridge Bus Station,”
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Commissioned in 1959 by the Port of Authority New York and New Jersey, the George Washington Bridge Bus Station provided a much needed commuter transportation hub for residents living in the suburbs of Northern New Jersey since its opening in 1963. Located in the Washington Heights neighborhood of upper Manhattan, the Bus Station is an architectural and structural gem designed by the celebrated Italian engineer Pier Luigi Nervi (1891-1979). In the nearly fifty years since its completion, the Bus Station has received a combination of praise and derision. Despite its pedigree and important role in the greater tri-state area, a full examination of its history, aesthetic, form and function has never been completed.

This thesis contextualizes the Bus Station as part of a larger project to improve and overhaul the transportation infrastructure across the greater New York metropolitan area. It is an examination that explores the cultural, demographic and transportation shifts and developments on both sides of the Hudson River throughout much of the twentieth century. Along with an analysis of the Bus Station, this thesis explores how the philosophy and approach of Pier Luigi Nervi merged with the needs, politics and wants of the Port Authority of New York and New Jersey.

Furthermore, the George Washington Bridge Bus Station is recognized for its intricately crafted reinforced concrete forms, signature details by the great Italian “master-builder.” Yet, unlike many of his barrel-vaulted domes and expansive exhibition spaces, Nervi utilized a distinct multi-peak roofline for the George Washington Bridge Bus Station. This research examines construction and significance of one of Nervi’s earliest American projects within the continuum of Nervi’s career and the context of an aesthetic expression of engineering. The George Washington Bridge Bus Station is a distinct structure not just within New York, but within the greater scope of all of Nervi’s work.
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Acknowledgements

This thesis would not be possible without the support, encouragement and input of key people; without whom this thesis would not be possible. Firstly, thank you to Historic Preservation Adjunct Associate Professor Theo Prudon, adjunct professor at Columbia University and advisor-extraordinaire, your support, insight and good cheer were encouraging every step of the way. Additional thanks go to my readers Marie Ennis, PE and Historic Preservation Adjunct Associate Professor Carol Clark whose advice and input went above and beyond.

I am grateful for the assistance of the MAXXI Fondazione, particularly Carla Zhara Buda who provided fantastic resources that I had assumed were lost.

Further thanks must go out to Barbara Krieger and the helpful staff at the Rauner Library of Dartmouth College. I would not have understood the construction of the bus station nor Nervi’s role in the matter without the assistance and resources of your library.

A special thanks goes out to Alberto Bologna Architetto, Ph.D. whose own research on Pier Luigi Nervi and his American projects pointed me in the right direction of some fantastic resources. The depth of my research would not have been possible without your insight.

I must also thank the entire GSAPP program and faculty, particularly for the opportunities that was provided through the William Kinne Fund and the Dorothy Miner Fellowship. Such funding allowed me the ability to travel to Italy and Dartmouth College in Hanover New Hampshire to supplement my research and further understand the work of Pier Luigi Nervi. Many thanks as well to the Avery Library and their always patient staff.

Many thanks also go to DOCOMOMO-US and DOCOMOMO-US Tri-State New York for their encouragement and enthusiasm.

Special thanks goes out to my fantastic classmates of Columbia University Historic Preservation class of 2012, particularly my study buddies Kayla Loveman and Alison Chiu, who always made me laugh even in the most frustrating moments.

I am forever grateful to my parents Gregory and Carole Ann Taylor who have always supported me and my dreams of saving buildings.

And most of all Ryan Murphy, my partner and best friend, thank you for your never-ending support and encouragement.
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Introduction

Before the construction of the George Washington Bridge in 1931 travelers boarded ferries and later trains as their sole means of crossing the Hudson River from New Jersey to New York City. The train, and to some degree the ferry, holds in our collective conscious a romantic connotation. Yet the increased availability of the automobile in the early 20th century inspired a new cultural wave that is intimately linked with the advent of suburb and soon residential enclaves grew faster than track could be laid down. With the rise of automobiles, bridges and tunnels were not far behind, thereby causing a shifting perception as buses gained a certain amount of, perhaps not prestige, but a comparable alternative and level of convenience to the rail lines and ferry.

As new developments sprung up as early as the 1920’s, and continues on even today, so too did the roads, the highways, the freeways and the bridges. So that by the 1950’s, in the years following World War II, when America’s growth seemed to know no bounds, New Jersey and portions of New York across the Hudson were beacons of new suburban developments. Soon it was no longer just the long-distance bus that travelled overnight through the expansive stretches of countryside; the commuter bus joined its ranks and soon became a symbol of suburbia.

Located in the Washington Heights neighborhood of upper Manhattan is an architectural and structural gem designed by the celebrated Italian engineer Pier Luigi Nervi: the George Washington Bridge Bus Station. Commissioned in 1959 and opened in 1963, the bus station provided a much needed commuter transportation hub particularly for residents living in the suburbs of New Jersey and parts of New York State but worked across the Hudson River in Manhattan. As one of Nervi’s earliest American projects (a distinction shared with the concurrent Field House project at Dartmouth completed in 1962), the Bus Station was a collaboration with the New York Port Authority’s Chief Engineer John M. Kyle.

Recognized for its intricately crafted reinforced concrete forms, and unique butterfly roof, the structure is located at 4211 Broadway in the Upper Manhattan neighborhood of Washington Heights between 178th and 179th Streets between Fort Washington and Wadsworth Avenues. It straddles both the Trans-Manhattan Expressway and the Cross Bronx Expressway, between two bridges on each side of the island. To the west, the George Washington Bridge feeds directly into the multi-lane expressway that directs general traffic underneath the Bus
Station. To the east, on the Trans-Manhattan Expressway, the Bus Station feeds on to the Triborough Bridge and Tunnel Authority’s Alexander Hamilton Bridge (crossing the Harlem River) that leads to and from the Bronx borough of New York City. From each entrance and exit point, commuter buses are led up a separate ramp to the George Washington Bridge Bus Station Concourse located three stories above street level. Its juxtaposition between two highly populated areas lends itself as a convenient location connecting New Jersey and New York while providing a convenient hub for the tri-state commuter. And although the station caters largely to commuters from northern New Jersey and Rockland County, N.Y., the building was constructed to accommodate additional lines for long-distance travel as well. As an added convenience terminal connects provides subterranean access to the "A" train at the 175th Street subway station.

The Bus Station was part of a larger project originally proposed by the Port of New York Authority in 1957. An ambitious endeavor, the project included the expansion of the George Washington Bridge to accommodate an additional level of roadway to the existing single level. The proposal also included the construction of a new highway system that ran through the upper portion of the Manhattan Island bisecting through a new elevated bus station and connecting to a proposed bridge across the Harlem River to complete a connection with the equally monumental Cross Bronx Expressway.

Recognized at its completion with an award from the Concrete Industry Board, the George Washington Bridge Bus Station is and was celebrated not just for its expressionist forms but its beautifully engineered design. Whether approaching by vehicle or on foot, the exposed concrete forms that make up the multi-peaked roofline of the Bus Station are a compelling vision of a great engineering mind.

Yet in the nearly fifty years since the completion of the George Washington Bus Station, the structure has received both praise and derision, but never the full examination of its history, aesthetic, form and function that it deserves. The following is an exploration of how the philosophy and approach of Pier Luigi Nervi collided, generally positively, with the needs, politics and wants of the Port Authority of New York and New Jersey from 1959 until 1963. The George Washington Bus Station is at times perceived as the key to the massive organism that is the Trans-Manhattan Expressway and other times appears alone and forgotten as it rests atop a neighborhood in the most populated city in the United States.
But whatever one’s opinion may be of the successes and failures of the structure in function and location, very few could deny the fortune of having a true Nervi within New York City’s amazing collection of awe-inspiring buildings. The George Washington Bridge Bus Station is a treasure to behold in aesthetics and history.

The Port Authority of New York and New Jersey archives were stored in the World Trade Center but were lost in the tragic events of September 11, 2001. Due to the loss of these primary resources the following examination of the George Washington Bridge Bus Station are pieced together through a wide range of resources. A great deal of the information regarding the Port Authority, the George Washington Bridge Bus Station, and the relationship between New York and New Jersey were gleaned from a large number of periodical articles of local newspapers, particularly The New York Times. In addition to examining the limited number of English resources written about Pier Luigi Nervi, I was fortunate enough to access Port Authority construction photographs from the Pier Luigi Nervi Archives at the Maxxi Museum in Rome. Of further assistance were correspondence and memorandums between Nervi and Dartmouth College in the early 1960’s when the engineer designed the Leverone Field House.

Image i.i: The George Washington Bridge Bus Station (undated)
Chapter 1: Pier Luigi Nervi

“The relationship between aesthetics and technology in building has acquired a new richness and variety with the introduction of reinforced concrete, the most fertile, ductile, and complete construction process that mankind has yet found”¹ Pier Luigi Nervi

In 1959, the Port of New York Authority approached Pier Luigi Nervi, an Italian engineer internationally regarded for his innovative and remarkable use of reinforced concrete, to construct the crown jewel of a bi-state highway project: the George Washington Bridge Bus Station. At the age of 68, having just completed a series of innovative structures for the 1960 World Olympics in Rome, Nervi accepted the American commission. Recognized for his thoughtful and organic expressions achieved with reinforced concrete, Nervi’s work throughout his career received accolades of approval from architects and engineers. Yet praise resulted not just from his designs, but also Nervi’s reputation as a “master builder;” as designer, engineer and contractor for a large portion of his projects he strongly favored a philosophy and practice that married form, function and design.² (Image 1.1)

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² “Form, function and aesthetic” was an often repeated philosophy by Nervi and can be found repeated in many of his writings, interviews and reviews.
Although his expressive use of reinforced concrete was innovative, Nervi’s approach and perspective was part of a continuum of great engineers who sought not just the structural but the economic and aesthetic expressions of this modern material. In the 19th Century as the professionalization of engineers and architects coincided with an expanded understanding and proliferation of structural metals such as iron soon followed by steel, architects were hired for buildings, engineers generally emerged for their ability to create civic structures and infrastructures. Generally selected for utilitarian projects and infrastructure, engineers provided municipalities with bridges, ports, and warehouses: projects that were often linked with public coffers or restrictive budgets that forced the engineer to be innovative in his use of materials.3

**Engineering and Reinforced Concrete**

The earliest concrete developed by the Romans proved that a man-made product derived from natural materials could create structures of astounding beauty and wonder. Vitruvius, often considered the father of concrete, provides us with a description of the material that is similar to today’s material comprised mainly of crushed limestone, water, aggregate and sometimes ash. Even from those early days, concrete proved to be an innovative, multi-faceted and multi-use building material. The Pantheon, a Roman treasure, represents one of these earliest and astounding manifestations of concrete’s limitless uses. This concrete dome is remarkable not just as the world’s largest unreinforced concrete structure, but also for the delicate and thoughtful design of the dome itself (Image 1.2).

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However, unlike the great concrete structures of the Romans, concrete of the 19th and 20th Centuries was closely tied with the developments of structural metals, first iron and then steel. The 19th Century witnessed a proliferation of impressive spans of steel to construct great utilitarian infrastructure. From Thomas Telford’s suspension bridges in the early 19th Century to the International Exhibition, Paris of 1889 that exhibited the three-hinged arch of the steel Galerie des Machines and the Eiffel Tower.\(^4\) Across the Atlantic, the professionalization of engineering and America’s innovative spirit led to the proliferation of the Chicago steel frame at the end of the 19th Century.\(^5\)

With the growing use and availability of iron followed by steel, reinforced concrete as a building material emerged and Nervi, stepping onto field of engineering in 1913, was successor and contemporary to great engineers who used reinforced concrete. In its simplest form, reinforced concrete is concrete “reinforced” with a stiff and stabilizing frame such as steel rods. One of the earliest incarnations of the material may be credited to French farmers Joseph L.

Lambot and Joseph Monier, who separately but contemporaneously strengthened concrete with iron, followed by the French engineer Francois Hennebique who developed a reinforced concrete structural system in Belgium. But perhaps most influential to the discipline of reinforced concrete was Robert Maillart, a Swiss civil engineer (1872-1940) who is often considered founder of reinforced concrete. In addition to his innovative use of the material, Maillart developed an aesthetic approach to engineering with mushroom columned ceilings and beautifully arch forms that undoubtedly influenced some of the later work of Nervi. Another influential contemporary, Felix Candela (1910-1997) devised reinforced concrete thin-shelled structures equally captivated the common observer, and organic forms were analogous to some of Nervi’s quintessential dome structures.

An Engineer with the Vision of an Architect

Born on June 21, 1891 in the Alpine town of Sondrio, Italy, Pier Luigi Nervi was the third child, and only son, of a postmaster and his wife. After a childhood fascinated with the inner workings of machines, Nervi pursued studies in civil engineering and in 1913 graduated from the Civil Engineering School at the University Bologna. Trained in a period that embraced the experimentation and understandings of steel, tension, stress and reinforced concrete, Nervi entered into a world that approached new technologies with open arms.

With an early love of reinforced concrete already established while pursuing his studies, Nervi joined after graduation the technical office of a large contracting firm that specialized in the material, the Societa per Construzioni Cementizie, based in Bologna. However not long after, Italy, like much of Western Europe, found itself embroiled in the First World War, and Nervi served from 1915-1918 as a Lieutenant with the Italian Engineering Corps, digging trenches and building platoon bridges.

In addition to a tumultuous war, Nervi’s professional life began during a period of great political and social upheaval in Italy. A few years after the war Fascism overwhelmed Italy and for nearly a generation, until after World War II a great deal of the architecture and engineering

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in Italy was greatly influenced by the political culture. When Nervi graduated in 1913 the popular architectural style of the day embraced classical and historical forms—although not entirely encapsulated by one style; the architecture through the teens and the twenties was an eclectic manifestation of style derived from the Renaissance to the Romanesque. Even when modern materials were used, such as reinforced concrete, the materials were often obscured with stone cladding or manifested as cast stone in classical, medieval and renaissance forms.

At the end of the First World War, Nervi returned to the Societa per Construzioni Cementizie, but by 1920 with several years of experience, he left to form his own contracting firm as both co-owner and director of Nervi and Alfonso Nebbiosi in Rome. Yet, it was not until 1928, that Nervi designed, as he put it, “his first major work:” the Municipal Stadium of Florence. He once described, that up until that point he focused on the technical aspect of structures, whereas the Stadium provided both an aesthetic and technical challenge.

The sports stadium in Florence was a competitive bid project that provided an opportunity for Nervi to devise a design and functional solution all at a competitive cost. While the athletic field was to be open to the elements, the design for spectator seating required not just ample accommodations for a large crowd, but was also located within a structure that shielded the viewer from inclement weather. The project scope entailed seating for 35,000 spectators split between an uncovered grandstand on one side of the field and a covered grandstand directly across from the first. This was the beginning of the massive spans that would eventually lead to the magnificent reinforced concrete structures of Nervi’s airplane hangars. And indeed, Nervi credited his process of devising a solution that included a cantilevered overhang made of

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11 Unfortunately, very little is written about Nebossi other than his name, further research is needed to determine his relationship with Nervi.


13 As an engineer and contractor in Italy, Nervi often acquired his projects through competitive bids; a method he favored (and favored by the Italians in general) because the fruitful by-product of economy was often an expressive structural form that translated into a greater aesthetic quality than the play-it-safe structures that arose from less economically restrictive budgets.
reinforced concrete as a pivotal point in his development of approaching structural form as an aesthetic expression.\textsuperscript{14}

The covered portion of seating proved to be the biggest challenge of the project, requiring a completely unobstructed view for the spectators while also providing an 82 foot overhang that spanned the width of the seating at approximately 330 feet long.\textsuperscript{15} (Images 1.3 & 1.4) And although not credited by Nervi, the great cantilevered grandstand is similar in concept and form to Otto Ernst Schweizer’s stadium designs in Germany, and was part of a larger trend at the time to use reinforced concrete in more daring capacities.\textsuperscript{16}

![Image 1.3](Image 1.3)  
![Image 1.4](Image 1.4)  

The Florence Stadium, undated historic photo (1.3) and plans of the structure by Pier Luigi Nervi (1.4).

**Nervi and Bartoli**

In 1932, Nervi established a new partnership with his cousin engineer Giovanni Bartoli, to form Nervi and Bartoli, a Rome-based engineering and contracting firm that went on to design and construct Nervi’s greatest structures.\textsuperscript{17} The 1930’s and 1940’s, proved to be one of the most tumultuous economic and political periods in Italy’s modern history, and for Nervi it proved to be a creative turning point. During this period, in Nervi’s opinion, his greatest pieces were the military hangars of expansive forms of concrete. Nervi spoke fondly of this inventive time when


\textsuperscript{17} Although Giovanni Bartoli passed away in 1957, Nervi kept the name. The business remained a family affair, Nervi was also joined by three of his sons four sons, two of whom Vittorio and Antonio were architects, and the other, Mario, a civil engineer, all in his office. Nervi’s other son Carlo, was a physician.
he began to develop his signature style of triangular and rectangular forms that created large expanses of strength, tension and grace.

Within the first decade of his work with Nervi and Bartoli, Nervi designed what he often described as his “best-loved” structures, eight reinforced concrete airplane hangars commissioned by the Italian Air Force. The first hangars were a pair of identical structures designed and built in 1936 in Orvieto Italy that required a column-free interior of 131 feet by 328 feet, “with one side composed of two openings” measuring “164 feet wide and 26 feet high for large movable doors.” The large vaulted spans were reminiscent of the great steel Galerie de Machines featured in Paris in 1889. Faced with a competitive bid process and the restrictive design parameters, Nervi embraced the full scope of the challenge, stating “as a contracting firm we would also be the ones to build it.” Although these and subsequent hangars were lost when demolished by retreating Germans in 1944, Nervi credited these projects as a foundation for his approach to ethics and building throughout his career.

The 1936 hangars were the first to exhibit Nervi’s signature geometric form which he devised to meet the economic restrictions required for the bidding process. (Image 1.5) It was here that Nervi utilized a lamella arch that diffused tension over the expansive area of a barrel vault that culminated in buttress-like columns on the outside edge of the structure. Nervi’s lamella vaulting method that criss-crossed structural members to create various three or four sided shapes that varied from a triangular, rectangular and diamond forms. Generally however the shapes were quadrangular in shape, or four sides connected by four points. Such an approach to designing expansive dome like ceilings wasYears later, in the early 1960’s, Nervi commented that “this scheme… was beginning to interest me more and more even from an architectural point of view as the design progressed…” and indeed many of his later structures included variations of this scheme. 

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In a similar manner, in 1939 Nervi designed six additional hangars for the Italian Air Force in Orvieto known as the Orbetello hangars, however due to a scarcity of materials design modifications were a necessary to limit the use of steel and dead load to reduce the overall reinforcement and support required. Furthermore, like their predecessors, these hangars required expansive and unobstructed space, this time measuring 328 by 132 feet. To address the list of restrictive parameters, Nervi devised a prefabricated reinforced concrete system with as little steel, stress or weight as possible through the use of quadrangle pre-cast forms reinforced with steel rods that were then welded together, creating a relatively light interlinking chain; a process that elicited skepticism from his colleagues.22 (See image 1.6) Due to the economic constraints of these hangars, Nervi was compelled to use a pre-cast method of construction; one of his first such projects to utilize the system.

Image 1.5: Examples of the barrel vault using the lamella method.

Image 1.6: 1936 photograph of one of Nervi’s airplane hangars built in Orvieto, Italy for the Italian Air Force.

Nervi considered this design approach “less complicated” than his 1936 hangars, and a better solution to the structural form that also resulted in a pleasing aesthetic. Nervi later credited this project as a confirmation of the theory that quality engineering results in creative and satisfying design: “I saw again how a purely technical process also brought aesthetic results and suggested promising architectural direction.” Unfortunately, these buildings too were lost to demolition in 1944.

![Image 1.7: 1939 photograph of an Orbetello hangar.](image)

**The Post-War Years**

Unlike many of his contemporaries, Nervi escaped the criticism and backlash that his colleagues received in the 1940’s and 1950’s following the end of World War II and the Fascist regime. After the tumultuous years of Mussolini’s rule, many developers, building owners, and even architects distanced themselves from the work of some of the regime’s most prolific architects. Correspondingly, the aesthetic and manifestation of architecture removed itself on a philosophical level as well in the wake of the war; as architects and engineers pursued a new path of design that moved away from the modern monumental designs of the 1920’s and 1930’s that often manifested itself as a modern or simplified approach to classical architecture. Nervi however bypassed some of the stigma of his colleagues in part because his work through this

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period, save for the military hangars and the stadium in Florence, were private projects for utilitarian structures such as warehouses or wharves.26

Furthermore, Nervi’s style and aesthetic only received appreciation later in his career, unlike his colleagues whose work may have been recognized before the Second World War. Therefore when the war ended, Nervi’s work came to the forefront following some particularly innovative structures in the late 1940’s and through the 1950’s. And ultimately, Nervi may have escaped criticism or prejudice largely because his work was that of an engineer and not an architect subject to the aesthetic tutelage of Fascism that embraced a neo-classical monumentalism of Italian’s government buildings.

It is no secret that Nervi favored concrete above all other materials. As he once asserted: “Concrete is the finest construction material that man has found to this day. It has a very elevated moral character.”27 In the decade following the end of World War II, Nervi refined his comprehension of his favored material, honing in on its range of potential and capabilities. Nervi appreciated that architecturally, the material was plastic and therefore could be molded in to seemingly endless possibilities of form, but structurally, when reinforced it could support and provide the backbone of a building—it could be both aesthetic and structural at once.

A turning point in Nervi’s understanding of the material occurred during the German occupation of Italy in 1944 when Nervi closed his offices to avoid contact with Nazis and instead experimented with developing a light-weight and malleable structural material that he ultimately christened “ferro-cemento.”28 Ferro-cemento, or as it is commonly known in the United States, ferrocement, is a form of reinforced concrete that typically comprises of cement mortar that is enmeshed into a skeleton framing of layered wire mesh, sometimes further supplemented by thin metal rods, to create a moldable, durable, and lightweight structural form.29 Although perhaps

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28 Nervi did not easily discuss this dark period in Italy’s history, but it is known that he lost most of his equipment and business during the War and therefore was required to re-establish his business following the occupation.
29 Most post-war literature credits Italian architect and engineer, Pier Luigi Nervi as the inventor of ferrocement in 1943; however the material and construction method was first discovered nearly a hundred years earlier by Joseph Louis Lambot. A lawyer and horticulturist from the southern region of France, M. Lambot is recognized by many ferrocement enthusiasts as the unsung hero and inventor of ferrocement. In 1848-49, M. Lambot fashioned a small row boat by constructing layers of common agricultural fencing, a woven chain link mesh, into the shape of a boat and then hand-plastered the sea-faring structure with a cement and sand mortar. Several descriptions of his method of construction explain that the cement mortar was pressed along the inside of the formwork, through the mesh, and then smoothed with a trowel or by hand on the outside of the formwork. Once cured the boat was considered a success, (and still survives today in a small museum in southern France); yet news of the concrete boat appears to be
best known in the United States for the application of the material in water-craft construction; this versatile material has long been recognized by a small sector of builders and engineers as a robust, malleable and lightweight material that can be successfully utilized for more traditional forms of construction.

This revolutionary material is commonly thought to be invented in the 1940’s by Pier Luigi Nervi; however the simplistic composite of materials and method was first invented nearly a hundred years prior by a French horticulturist. Similar in structure and method to the nearly identical incarnations developed in the 19th Century, Nervi’s ferro-cemento was nonetheless hailed as a revolutionary material by many of his contemporaries. The material can also be understood as what may be thought of as a reinforced concrete thin-shell.

As an engineer, Nervi understood that the structural and physical capabilities of concrete was determined by the ratio of reinforcement to cement and so began to experiment with layers of steel mesh surrounded by a cement mortar and after some efforts explained that “[in order] to increase the thickness and strength of the slabs without using more than 10 or 12 layers of mesh I tried inserting one or more layers of steel bars…between the middle layers of mesh, thus attaining [increased] thickness.” With this method, Nervi successfully created a material that could be molded to create a thin-shell form and therefore could allow for the construction of continuous concrete of complex or innovative shapes.

The first known structure built with the material and method was a small personal warehouse (currently used as a garage) by Nervi and Bartoli in 1947. Following the success of the simple structure, Nervi continued to apply the theories of ferro-cemento to more ambitious projects such

limited until M. Lambot exhibited a ferrocement boat at the Paris Exposition Universalle in 1855, and soon after sought a patent for his invention in 1856. Furthermore the word ferro-cement, and variations, such as ferro-concrete, were often used from its earliest point of use.


31 Pier Luigi Nervi, Structures. Translated by Giuseppina and Mario Salvadori. (New York: F.W. Dodge Corporation, 1956), 50-51. The mesh utilized by Nervi was described as “a standard type on which plaster is sprayed on the construction of ceilings.”

as large spanned cantilevers, thin shells and undulating surfaces. His first celebrated representation of ferro-cemento can be seen most notably at the Turin Exhibition Hall “Salone B” (1949) where Nervi successfully applied the ferro-cemento process and material to precast elements that were no more than 1 ½ inches thick and connected to reinforced concrete arches to create a delicately undulating roof. (See Images 1.8 & 1.9) Using ferro-cemento Nervi designed a corrugated, reinforced concrete thin shell barrel vault roof that drew accolades throughout Italy for its innovation and beauty.

Image 1.8: Turin Hall, Exterior, Turin, Italy

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Turin had long been a center of architectural advancement, and it is no wonder with Nervi’s engineering and aesthetic sensibilities that he would have been drawn to the industrial approach to architecture. Turin’s economy was linked to Fiat, and could therefore be seen as a sort of Italian Detroit, fueled by innovation, industry and wealth. It was also home to one of Italy’s most impressive and large reinforced concrete structures, Fiat’s Lingotto plant designed by Giacomo Matte-Trucco in Turin (1914-1923). Ultimately, it was this successful application of a new material in a visually pleasing manner in Turin Italy in 1949 that pushed Nervi to the center-stage of the international world of architecture. And by 1952 Nervi was working on his most prestigious project to-date, the main UNESCO building and auditorium in Paris, France. In collaboration with Marcel Breuer and Bernard Louis Zehrfuss, Nervi designed architectural and structural elements utilizing reinforced concrete.

The mid-century brought about not just innovative approaches to concrete—in use and aesthetic, but also how it was displayed. From Breuer to Rudolph to Nervi there was a greater movement to present concrete honestly, not just as an imitation of natural stones (as with cast-stone) or as a material behind stone-clad or brick columns, but as untreated concrete. For this reason Nervi played with different expressions of the material. From his white washed smooth, almost plastic representation through *ferro-cemento* to the craftsman-like presentation of wood form poured in place columns visible at UNESCO.

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However it was the hosting of the Olympics when an international audience was introduced to Nervi’s two most distinctive styles and approaches to reinforced concrete. In the late 1950’s, in preparation for the upcoming 1960 Olympics to be hosted in Rome, Nervi was invited to design three stadiums for the games. The Olympian open field Stadium Flaminio designed by Nervi was reminiscent of the Florence Municipal Stadium. This cantilevered, covered grandstand design of the stadium was a perfected version of the Florence Stadium, built to accommodate 50,000 spectators.36 (See Image 1.10)

![Image 1.10: Stadium Flaminio, Rome, Italy](image)

For his other two buildings, the Small Sports Palace (Palazzetto dello Sport) and the Large Sports Palace (Palazzo dello Sport) Nervi implemented a combined modification of the prefabricated precast forms used in the airplane hangars and his ferro-cemento technique used at the Turin Exhibition Hall. The large Sports Palace, like his 1939 hangars, was comprised largely of a pre-cast reinforced concrete roof system, engineered into an expansive dome. Once again by diverting the stress of the roof to the perimeter of the building Nervi, with collaborating architect Marcello Piacentini, successfully constructed unobstructed seating for an audience of up to 16,000 people. (See Images 1.11, 1.12 & 1.13)

**Image 1.11**: Palazzo dello Sport Interior, Rome, Italy

**Image 1.12**: Palazzo dello Sport precast Roof Elements similar to those of the Turin Exhibition Hall. Rome, Italy
Unlike its larger counterpart, what was compelling about the Small Sports Palace in Rome was that its roof is entirely separate from the base of the building to create an expansive unobstructed dome. Considered to be one of his best works by contemporaries such as Ada Louise Huxtable and by modern architectural historians, the delicate but intricate nature of the building is a compelling feat of both architecture and engineering. Distinctively, the dome did not rest on the exterior walls of the building; instead all of the tension of the roof was carried to the Y-shaped buttresses that ring the exterior of the building. Furthermore the roof of the smaller stadium was a delicate lamella pattern that drew accolades from architect and layman alike. The flexibility of ferro-cemento and precast elements had allowed Nervi to create lightweight, curved forms that would have been near impossible with traditional poured concrete which settles with gravity. The Palazzetto dello Sport, along with the series of hangars in the 1930’s, were considered Nervi’s favorite pieces for their complex but visually pleasing devised structural systems. (See Images 1.14, 1.15 & 1.16).

Image 1.14: Historic Image of the Palazzetto dello Sport (Undated image)

Image 1.15: The Palazzetto dello Sport as it stands today.
Although the Rome Olympics buildings garnered significant praise internationally, domestically Nervi received a chill reception from contemporaries and critics. However it was not Nervi’s designs that caused ambivalence, it was the venue. Many linked stadiums with the political ideologies of Fascism and Nazism whose organizers had often utilized large sporting events and their venues as spaces to rally support for political causes and were often the sites of elaborate political pageants. Therefore although many dismissed Nervi’s earlier stadium and the military airplane hangars completed under the fascist regime, when Nervi constructed three stadiums consecutively some contemporary writers questioned his motives and political standing. Fortunately however, others did not assign such grudges to Nervi and he continued to work both inside and outside of Italy for another twenty years.

39 Vittorio Gregotti, *New Directions in Italian Architecture*, (George Braziller, New York, 1968), 73
The Built Form: In Theory and Practice

Robert A.M. Stern once wrote that Pier Luigi Nervi’s “designs in reinforced concrete approached the sublime poetics of the great engineering of the early Roman Empire.”40 Although Nervi aspired to the structural wonder of the Gothic cathedral to that of the Roman Empire, it was without a doubt Nervi’s intention to create structures that evoked beauty in truth. It is no secret that Nervi’s material of choice was reinforced concrete, and it was this dedication to the material that allowed him to develop a philosophy of building that influenced his approach to each project with dedication and thoughtfulness.

As a professor at the University of Rome from 1946-1961, and as an engineer, Nervi strongly supported a dual approach to buildings, particularly through a university curriculum that did not separate engineering and architecture as separate disciplines. Nervi believed that great architecture could not exist without engineering and held particularly strong opinions on the necessary curriculum of future designers: that architects and engineers should be essentially one and the same or at least have enough cross-over to understand the esthetic and structural hurdles.41 Nervi’s adamant feelings regarding education may have in part been a result of an educational reform that emerged in the 1920’s that advocated for the separation of architecture and engineering as disciplines. The Italian Rationalists, supported by the Fascist party, successfully disjoined the curriculums at most university’s throughout Italy, beginning with the University of Rome in 1919.42

Within in his practice and his teaching Nervi developed a philosophical approach to both the design and the curriculum of the built form that revolved around three interrelated pillars: economy, function and aesthetic, a philosophy that he repeated in his writings, lectures and interviews. Nervi often remarked that no form of building captured these pillars of building ethics better than the Gothic cathedrals, “In no other architectural period…has the tie between aesthetics and technology been so evident, the building science so refined, the architectural expression so powerful, as during the Gothic period.”43 The beauty of the gothic cathedral perfectly married engineering and architecture that caused the viewer to both examine

engineering at its best while marveling at the awe-inspiring beauty of what appears to be weightless stone vaults. Nervi often praised those who built such structures for their use of stone in such a way to create weightless vaults offset by a series of buttresses to distribute the weight and height of these incredible structures. Many of Nervi’s buildings in fact allude to the Gothic aesthetic and approach as he frequently utilized buttresses in many of his structures and was fond of the intricate interior supports visible in many of his roofs. Yet many argue that it was the beautiful and intricate domes throughout Rome, such as the concrete Pantheon, that most influenced Nervi’s work and it is hard to deny the affect such structures must have had on Nervi’s aesthetic. Like the Pantheon, Nervi’s barrel vaults and domes, that although simple in form, have a similar reverential beauty displayed with well-executed interior patterns

Many perceived Nervi as an architect, yet trained as an engineer and contractor he never considered himself an architect but approached all of his engineering solutions with the aesthetic component of building in mind. Furthermore, most of his projects were taken on as engineer and contractor collaborating with an architect. Ultimately he believed that if an architect, contractor or engineer approached a design with the determination of creating an economical and functional building the aesthetic component of the buildings would emerge naturally. He therefore came to the conclusion “…that a technically perfect work can be aesthetically inexpressive but there does not exist, either in the past or in the present, a work of architecture which is accepted and recognized as excellent from the aesthetic point of view which is not also excellent from a technical point of view. Good technology seems to be a necessary though not sufficient condition for good architecture.”

Unlike some of his contemporaries who favored or accepted planned obsolescence as a modern approach to architecture, Nervi approached building as an engineer in a quest for sound and quality construction. This philosophy encompassed Nervi’s method of design and construction that favored quality materials, solid engineering and honest expressions of structure. Nervi was known to work with several universities and testing firms to test and build scale models of his ideas and in fact many of his admirers considered Nervi to be somewhat of a mathematician whose great calculations resulted in astounding structural form.

Correspondingly he believed in a “style of truth” which directly expressed engineering and use of materials, and through such a truthful expression of construction, beauty from the honest form of building emerge. Such a philosophy was often associated with the Italian Rationalists in the 1920’s and 1930’s, particularly Gruppo 7, and Nervi had in fact worked members of the group in the 1920’s and was considered by some to be a rationalist himself. The Rationalists, in addition to advocating for honesty in structure, favored reinforced concrete and shunned needless ornamentation.

Others associated Nervi with the organica (as it was known in Italy) or organic movement for this elegantly bio-aesthetic pattern roofs and mushroom columns. The movement had become particularly popular in Italy as a rejection of the monumental style of fascism. However, Nervi often derided the label in the early 1960’s, perceiving the movement in direct conflict with his own philosophy. Buildings such as curvilinear forms of the TWA or Guggenheim Nervi felt had too much bravado and ego to be considered truthful and therefore beautiful. Once remarking that they “suffered from fake structuralism…a structuralism which instead of being born of the natural materialization of structural and construction requirements, originates in a presumed formal structuralism which may not correspond at all to the statical [sic] reality of the problem. In other words, I am referring to the danger of structures being generated by the exterior appearance rather than by the inner essence of the statical problem.” Many who interviewed or wrote of Nervi’s designs often remarked that although Nervi’s work was likened to that of Frank Lloyd Wright, Nervi politely but sternly dismissed the comparison.

It was also through this honesty in form that each observer, whether he was an architect or layman, could easily read a building or understand the play with tension and structure. In all of Nervi’s greatest structures, he aimed to provide unobstructed views of a building’s key components, so that the common viewer may to understand how each of the columns, beams and buttresses work in cohesion to support a structure. As Ada Louise Huxtable wrote at the time of

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his death in 1979, “[t]he components of his structural systems have a superb integration of rhythm, pattern and line that works both mathematically and as pure geometric abstraction.”

In reinforced concrete Nervi strived to fulfill all of his tenets of philosophy. He appreciated that architecturally, the concrete was plastic and therefore could be molded in to a seemingly endless number of possibilities of form but structurally, when reinforced it could support and provide the backbone of a building—it could be both aesthetic and structural at once. In his work Nervi utilized both precast and cast in place forms of reinforced concrete for different means and ends. He recognized that precast had economic and technological advantages, but furthermore it had a specific richness of form that allowed him to create the beautifully patterned lamella domes that garnered international attention. Additionally, Nervi often utilized and played with the aesthetic texture that resulted from well-planned formwork, a signature detail that is often visible on some of Nervi’s finest columns, support beams and buttresses. (See Image 1.17)

**Image 1.17**: Formwork detail at the Palazzetto dello Sport.

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American Invitations

By 1960, at nearly 70 years old, Nervi was at the height of his career. Working from an office connected to his apartment in Rome with a staff of 15-20 engineers, contractors and architects, Nervi dedicated himself to no more than five or six projects a year. Ever the renaissance man, Nervi, while also teaching at the University of Rome, not only designed and engineered his projects but could be found on site overseeing construction until completion. Justly then, he described himself not as an architect but “an engineer in the contracting business and as a teacher of engineering.” Nervi was said to approach each of his projects with a mix of structural know-how and intuition and knowledge of the interaction between materials, form and function.

Following the increased global attention generated by his highly praised Olympian structures, Nervi was approached by two separate American entities to design and engineer signature pieces across the Atlantic. Undeterred by the language barrier, New Hampshire’s Dartmouth College, contacted Nervi in 1960 in hopes of gaining his services for the construction of an athletic Field House on the university’s campus. Mr. Olmstead, a representative of the college, instructed Nervi to design a large vaulted, unobstructed structure measuring 357 by 259 feet. A large rectangular structure was reminiscent of Nervi’s 1939 airplane hangars in function, form and aesthetic.

Although, unremarkable from the exterior, some likened it to a shed, the repetitive lamella barrel vault of the roof of the interior was pure Nervi. The, lattice-like pattern of the roof was achieved with a pre-cast procedure that Nervi had perfected with his Olympian domes, while the spacious interior was supported by his signature, poured-in-place buttresses, unadorned save for the faint texture of wood formwork on the natural concrete surfaces. Opened in 1962, Dartmouth’s Leverone Field House was the first Nervi structure in America. (See Images 1.18 & 1.19)

Image 1.18: Dartmouth Field House Exterior.

Image 1.19: Dartmouth Field House Interior.
Yet it was a year earlier, when Nervi accepted his first American invitation. In 1959, John Kyle, chief engineer of the Port of New York Authority and avid admirer of Nervi’s work, requested Nervi to contribute to an expansive transportation project that would include a landmark transportation hub within Manhattan. Nervi accepted and the George Washington Bridge Bus Station, named after the bridge it connected to, was an impressive structure that still graces the upper streets of Manhattan through an ambitious web of bridge and highway connections. The crown jewel of a bi-state, multi-borough, multi-agency project was thoughtfully designed by the Italian engineer was part of an ambitious project to improve and construct transportation thoroughfares that extended from the banks of Hudson River in New Jersey to the outer-reaches of the Bronx and Staten Island. The bus station was the key to a project that had been more than thirty years in the making.
Chapter 2: Suburbia and the City (1921-1956)

The Port of New York Authority: The Beginning of an Era

Today most travelers entering and exiting New York City, whether it be by train, plane or automobile, interact with some component of the Port Authority of New York and New Jersey. Formed on April 30, 1921 by the legislatures of New York and New Jersey, the Port of New York Authority was established as an official quasi-governmental bi-state partnership. After years of disputes regarding property rights and freight commerce between rail lines in New Jersey and shipping ports in New York along the Hudson. While shipping and freight dominated the ports of New York, New Jersey benefitted from extensive railway lines, however disputes arose over what New Jersey perceived as domination of goods and shipping by its neighboring state. By the second decade of the twentieth century, rate disputes between shipping and rail rates caused tension between the two states so that ultimately the Port Authority emerged as a means of creating a cohesive body of transportation management along the shared border. The new agency was originally concerned with the shared power of commerce along the Hudson River, but soon encompassed most points of commercial and transportation interaction between the two states. The formation of the Authority was the first of its kind in the United States, and was considered a seemingly necessary marriage given the symbiotic nature of the rail and transportation systems between New Jersey and New York within the metropolitan area of New York City.

Empowered by each of the state’s legislatures, the Authority was created as a non-profit that acted with co-operation on behalf of the two states with the power to handle joint ventures between the states, such as transportation and commerce, within a twenty-five mile radius from the Statue of Liberty. According to the articles of incorporation, a twelve member board

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1. The quasi-governmental entity was known as the Port of New York Authority until 1972 when it adopted the more equalizing moniker the Port Authority of New York and New Jersey. For consistency with the period of events, I will use the original name, or simply the Authority for matters that occurred before 1972, and the new title or PANYNJ for any event following that year. The Committee on A Regional Plan of New York and Environs was formed one year later in 1922 and today is known as the Regional Plan Association. This tri-state transportation planning association “prepares long-range plans and policies to guide the growth and development of the New York- New Jersey-Connecticut metropolitan region.” From their point of incorporation they made several recommendations to both the PANYNJ and the Triborough Bridge Authority. Source and more information on the RPA at http://www.rpa.org/mission.html


oversees the actions of the Authority, consisting of six members appointed by each state with the power “To purchase, construct, lease and/or operate any terminal or transportation facility within said district; and to make charges for the use thereof; and for such purposes, to borrow money and secure the same by bonds or mortgages upon any property held to or to be held by it.”

Although given great luxury to construct, purchase, and sell such actions and operations by the Authority also required each city, borough and state’s consent where the proposed action takes place. Furthermore, checks and balances on the Authority’s power were ensured with the power of veto allotted by the governors of New York and New Jersey.

Through the 1920’s the Authority slowly established its footing and gained necessary funding through various government grants, loans and bonds. After securing funds and establishing day to day operations, the Authority successfully secured approval for the construction of the Holland Tunnel, completed in 1927, soon followed by the Goethals Bridge and Outerbridge Crossings, both approved in 1924 and completed in 1928. Through these endeavors, and further benefitting from a tax-exempt status, the Port of New York Authority’s collection of tolls and other income allowed it to achieve the status as an independent and self-sustaining agency in the 1930’s.

Within ten years of its formation, the Port of New York Authority, constructed what would be one of its most celebrated achievements, and at the heart of this examination: the George Washington Bridge. Completed in 1931, this incredible steel structure spans from the upper Manhattan neighborhood of Washington Heights across the Hudson River to Fort Lee in New Jersey. At its opening the bridge, designed by Othmar Ammann, was celebrated not just as the longest span in the world, but for its construction on schedule and under budget at a cost of $60,000,000, a feat credited in part by an organization that was “considered free from political impediments.” Although much could be and has been written about this engineering marvel, it is
not so much the engineering intricacies of the bridge, but the consequences of its construction that play an important role in the history and formation of New York and New Jersey in the twentieth century in general and the bus station in particular. (Image 2.1)

![Image 2.1: Illustration showing the approaches to the George Washington Bridge from Manhattan at the time of the Bridge’s opening in 1931.](image.png)

Ammann had originally intended for stone cladding around the towers, similar to the Brooklyn Bridge however with the Depression the Port Authority could not pay for such unnecessary additions and so the steel towers were left bare—far more structurally encumbered and larger than necessary because they no longer would need to hold the weight of the originally proposed concrete faced with stone. Source: David P. Billington, *The Tower and the Bridge*. (New York: Basic Books, 1983), 131-134.
The Rise of the Suburb: 1900-1950

At the beginning of the twentieth century, the bucolic pastures of upper Manhattan were slowly replaced by houses and apartment buildings. Named Washington Heights in memory of the colonial stronghold Fort Washington located in the vicinity, the neighborhood occupied the entire width of the island from 155th street north to Dyckman Street. Until the early twentieth century when roads and subway lines allowed access to the neighborhood, the northern reaches of Manhattan were largely isolated from the rest of the island due to an unwieldy geography of steep slopes and cliffs; a matter only exasperated when the Manhattan grid, laid in 1811, only extended as far north as 155th Street. In 1905 only 5% of the total Manhattan population lived in Washington Heights; however the population increased when in 1908 the IRT subway line extended north from its 1904 termination of 145th Street and Broadway to incorporate new stops up to the far reaches of the island at 242nd Street and Broadway. Development predictably boomed in the area, with the bulk of construction consisting of apartment buildings, tenements and some single family homes from about 1908 to 1925.

By the middle of the 1920’s, city officials and Manhattan residents increasingly requested additional subway lines along the western portion of Manhattan and extending through Washington Heights. Plans for such a subway line along 8th Avenue (today’s A line) were first approved by the city and transportation commission in early 1924, yet it was not until a year after the opening of the George Washington Bridge that the subway line was complete and open for ridership. In 1930 104 proposed stations were announced by the city owned and operated IND, 39 of which were located in Manhattan extending from Chambers Street to 207th Street along 8th Avenue. At that point construction of the George Washington Bridge was underway and the new subway stops coincided with convenient access to the bridge at Fort Washington Avenue and 175th Street and Broadway and 168th Street. On September 10, 1932, the IND subway line opened to allowing the public access to eleven miles of the city-owned and operated underground subway.

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Across the Hudson River, northern New Jersey remained largely rural throughout the same period. In the 1920’s, however, with the rise of the automobile and the garden city movement, civic leaders and local real estate boards in Bergen County saw the advantage of a bridge across the Hudson River from the county to the Washington Heights neighborhood. Several of these organizations banded together to voice adamant support of such a span. By 1925, such a bridge, known in those early days as the Hudson Bridge, was approved by both states and the newly minted Port of New York Authority and completed in 1931 as the George Washington Bridge.

The Real Estate Board of the Palisades (New Jersey), amongst other local organizations, was a major supporter and instigator for a bridge to span from the Palisades to Manhattan. They had in fact predicted “that hundreds of acres of undeveloped property on the hilltop will develop into communities of home owners and apartment dwellers because of the convenience the bridge will offer to the commuting public” in communities such as Fort Lee, Palisades Park, Teaneck, Edgewater, Englewood, Leonia and Englewood Cliffs.

At around the time of the opening of the bridge, just as automobile production was ramping up and becoming ingrained in American consciousness and culture, so too was the rise of the bus as a means of both short and long-distance transportation. The first transcontinental bus arrived in New York City as early as 1928, and by 1929, bus transportation from New Jersey into New York saw significant numbers of growth as an alternative means of transportation from that of the train or ferry. Prior to the George Washington Bridge completion, and the resulting growth of Bergen County, New Jersey boasted an excess of 400 daily interstate bus routes originating in the Garden State, and three times that of buses passing through or terminating in the state. (Image 2.2)

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15 “Bridge Commuters Pay 5-Cent Fare.” The New York Times, October 25, 1931
At the opening of the George Washington Bridge in 1931, the Hackensack Motor Coach Company was the first New Jersey based bus company to establish interstate service across the span, and offered a discounted fare to support the commute. Like many of the Authority’s endeavors, the bridge was partly financed by tolls, fifty cents for personal automobiles and 10 cents for pedestrians. To encourage both real estate interests and bus travel, the Real Estate Board of the Palisades proposed, a five cent fare for bus riders—a steep discount to that of the pedestrian—so as to “assur[e] cheap, convenient rapid transit from East Bergen to Broadway” where the 181st Street subway stop was located.\footnote{“Bridge Commuters Pay 5-Cent Fare.” \textit{The New York Times}, October 25, 1931, RE1.; “Bridge Line Opens Sunday.” \textit{The New York Times}, October 21, 1931, 32.}

Due to the growth of the mass-transit, regulation was considered necessary to insure safety of large motor vehicles and regulate competitive rates, particularly ones that crossed state lines. In 1934 there was growing pressure that “all transportation should be regulated by the [federal] Interstate [Commerce] Commission,” according to the Federal Coordinator of Transportation, Joseph B. Eastman.\footnote{“ICC Control Urged on all Transport.” \textit{The New York Times}, September 22, 1934, 21.} Throughout the 1930’s such tasks were largely handled by the Interstate Commerce Commission, who although had originally been organized in 1887 to handle the transportation of goods along rail lines were as of 1935 also charged with the safety of
passengers of buses crossing state lines, eventually culminating in the Motor Carrier Act of 1935.\textsuperscript{20}

The Port of New York Authority also noticed the increase ridership on buses and as early as 1933, noted that “[b]us traffic between Fort Lee and Manhattan increased by 25,746 passengers, or 36 percent, in the first four months of the year in comparison with the total in the corresponding period in 1932. A total of 96,665 passengers were carried.”\textsuperscript{21} Such a high number of bus ridership highlighted the lack of facilities to accommodate the average commuter who disembarked at the Manhattan end of the George Washington Bridge often with inadequate shelters or bus stops. As one commuter noted in a 1932 editorial: “With all the splendid work which has been done in connection with this development [the opening of the 8th Avenue and 175th Street subway at the base of the George Washington Bridge] it was a little surprising to find that no shelter has as yet been provided for those awaiting buses. Surely, with the improved facilities this fine highway to New Jersey gives us, and the increased travel which is certain to result…”\textsuperscript{22}

After increasing frustration regarding the lack of facilities, the Port of New York Authority responded to local demands and successfully completed in 1933 curbside waiting areas on each side of the bridge to accommodate the commuters travelling to and from Bergen County and Manhattan. The Manhattan shelter, which catered to several private short-haul commuter bus lines, was located at a sidewalk plaza between Fort Washington and Pinehurst Avenues near West 179th Street. The plaza which measured 37 by 17 feet was often referred to as the “Manhattan Plaza” over the following years.\textsuperscript{23} Furthermore, this location at Fort Washington and 179th provided easy access for commuters to connect with the IND subway line at 175th Street and Fort Washington. (Image 2.3)

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\textsuperscript{22} New Jersey Resident, “Shelter at Bus Stations,” The New York Times, December 3, 1932, p16
\textsuperscript{23} Ibid.
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In fact, despite the Depression, ten years after the completion of the George Washington Bridge Bergen County achieved the increased population and growing popularity that the civic leaders had hoped for. In a ten-year anniversary celebration of the bridge’s opening, civic leaders of Bergen county commended the good fortune the span had brought to the community including the doubling of the population in twenty years and had added “more than a billion dollars to Bergen County values.”

However with success came setbacks, by the end of the 1930’s there was growing recognition of increased traffic congestion and the corresponding crowding of commuters and buses filling up Manhattan’s streets. In 1939 New York City’s Mayor Fiorello H. La Guardia announced, on the recommendations of a special city Commission on Interstate Buses, that as of January 1, 1941 interstate and intercity buses would be limited on the streets of Manhattan. LaGuardia insisted that to mitigate the impact of the new requirements on the bus companies in question bus terminals would be built at the end of both the Holland Tunnel and the George Washington Bridge. Although both requests were repeatedly hindered by political pressures, blocking by bus companies, lack of funding, and the war effort a few years later, the problem continued unabated.

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By 1945, officials estimated that “ninety per cent of the interstate bus traffic” occurred between New York and New Jersey, and efforts were renewed to block interstate buses from clogging the streets of Manhattan.\textsuperscript{26} Contributing to the problem were not just the number of buses but the number of stations, shelters and curbside waiting areas for intercity and interstate buses located largely in midtown near the Holland and Lincoln tunnels and in Upper Manhattan near the George Washington Bridge and the adjacent subway entrances. The largest of these stations, in addition to the shelters constructed by the Authority in 1933, and the privately owned Inter-City Transportation Company at 168\textsuperscript{th} Street and St. Nichols, were the midtown hubs such as “the Greyhound terminal on West Thirty-fourth Street, three terminals on West Forty-first Street, the Midtown and Dixie Terminals on West Forty-third Street and a large terminal on West Fiftieth Street.”\textsuperscript{27}

By 1950 traffic commissioners, commuters, and city officials finally saw some of their efforts come to fruition. In the years following the war the Port Authority agreed to the construction of a central bus terminal for inter-city and inter-state buses arriving in midtown Manhattan. Christened the Port Authority Bus Terminal, or PABT, this mass transit hub that stands today in its larger form at 42\textsuperscript{nd} Street was equipped with off-the-street bus parking enclosed waiting areas, and easy access to subway lines for the commuter or tourist.\textsuperscript{28} (Image 2.4)

\textsuperscript{26} "New Curb on Interstate Buses Ban More Than One to One-Way Block." \textit{The New York Times}, February 19, 1945, 19.
\textsuperscript{27} Ibid.
\textsuperscript{28} The Port Authority Bus Terminal has always existed at this site. It was later expanded in 1950 with additional floors and again in the 1980’s but occupied the same location.
Encouraged by the fruition of an effort more than a decade in the making, then Traffic Commissioner Lloyd B. Reid announced that the laws from a decade earlier prohibiting intercity buses on city streets would be stringently enforced. In an attempt to address the growing congestion of 736 intercity buses driving along the main streets of Manhattan, Reid announced that as of January 2, 1951, no intercity buses were permitted to stop between 168th and 23rd Streets. Those emerging from the Bridge were permitted to stop only at the IND subway stop at the end of the bridge at Fort Washington and at Broadway and 168th Streets at the IRT subway entrance.29

A Growing Problem of Congestion: 1950-1956

In the years since the construction of the George Washington Bridge, particularly after the Second World War, large tracts of Bergen County pastures and farmland were purchased for housing and retail development.30 From 1940-1950 the housing development in the area had increased by 31 percent and the population by 37 percent. Anecdotally one local Bergen County builder and real estate broker, George H. Beckman, who had profited greatly by the growth of the area, linked the development of the area with a corresponding popularity of mass transit, stating that “an increasing share [of Bergen County Residents] go by bus over the bridge.”31

The growth experienced by such developers as Mr. Beckman, were a result of several colliding and contributing factors established since the 1920’s. Coupled with the rise of industry in metropolitan centers such as New York where large corporate headquarters popped up throughout midtown and the corresponding rise of the middle class led to the burgeoning of Northern New Jersey and other communities across the Hudson that housed the benefactors of the post-war years.

But with the boom in automobiles, productions, development and suburban growth, came with it the effects on the infrastructure of the metropolitan area. By the early 1950’s Washington Heights residents, who by and large were not the primary benefactors of the George Washington Bridge, perceived the increasing number of interstate commuters as a nuisance at best and hazardous at worst. In addition to heavy traffic from the bridge, the method of boarding and disembarking interstate buses was through a series of haphazard bus stops and waiting areas near the foot of the bridge, where “hundreds of commuters have to scurry across lanes of moving traffic.”

In 1952 in response to both the increasing number of buses and the complaints by residents and city officials, the Authority, proposed several infrastructure improvements to the Manhattan end of the George Washington Bridge. At the cost of $628,000, the improvements included the widening of West 178th Street between Fort Washington Ave and Broadway in order to ease traffic congestion, along with the demolition of half of a city block for the construction of a street level bus shelter, located at what would later become the more expansive George Washington Bridge Bus Station.

Pending approval from Governor Dewey and other city officials, the Authority had by 1952 already removed nearly two dozen families in anticipation of constructing the new platforms. Presented to the city by Port of New York Authority chairman, Howard S. Cullman, the proposed bus shelters required the removal of three apartment buildings at 701-109 West 178th Street and the Young Men and Women’s Hebrew Association at 406 Fort Washington Avenue at the corner of W. 178th Street; all buildings the Port Authority had owned since 1929, along with adjacent lots on the block facing West 179th Street.

32 “Street Plan to Aid Traffic at Bridge.” The New York Times, April 8, 1952, 31. Although the bus plaza at 179th Street and Fort Washington proved helpful, the private bus lines were plentiful and disorganized. Several periodical accounts from the period suggest that bus companies established their own unofficial stops at the base of the bridge in addition to utilizing the Port Authority shelters.
The demolished buildings were to be replaced by a “twenty-two platform bus station, an open island layout with a sheltered portico for commuters waiting for New Jersey-bound buses,” along with an entrance to the underground 175th Street and Broadway Subway station. Two-thirds of the platforms were allotted for incoming buses largely arriving from New Jersey that accounted for approximately 8,000 persons daily. The remaining berths were to be reserved for west-bound buses since many of the passengers heading over the Bridge commuted from depots located near the 168th Street and Broadway subway station or at the newly constructed Port Authority Bus Terminal in midtown.34 (See Image 2.5)
In 1953, more than a year after the initial proposals to construct a bus shelter, and despite the successful demolition of the four buildings along the West 178th Street, plans for the Port Authority bus platforms were stalled. Several interested parties argued in front of the City Planning Commission that the bus plan inadequately addressed the concerns of the Washington Heights residents, particularly the traffic and safety hazards caused by the never-ending stream of buses exiting the Bridge. Local residents such as Councilman, Samuel Davis opposed the
smaller shelter that kept the interstate buses on the streets that were “a menace to life and limb.” However Davis and other residents strongly favored a new bus terminal that removed the buses from the streets of Washington Heights, proposing the construction of a bus station at the bridge, although the exact location or means of such a development were not detailed.35

Such concerns were publically voiced in June of 1953 when a privately owned bus company, the Inter-City Transportation Company, Inc. applied for the enlargement of their existing station at West 168th Street and St. Nichols Avenue (See Image 2).36 Inter-city’s lease was up in 1969, and given the expected growth of the area they argued it was necessary to accommodate both the passengers and the neighborhood by removing people off the street as they waited for buses. In opposition to the proposal, city representatives publicly approached the Port of New York Authority to construct a bus terminal at the end of the George Washington Bridge between 178th and 179th Streets. Robert F. Wagner Jr., Manhattan Borough President, was a major proponent of an off-the-street bus terminal and presented his support “to put an end to complaints that the buses are a continuous hazard to residents of the” Washington Heights area.37

![Image 2.6: St. Nicholas Avenue - 166th Street (West) c. 1937.](image)

Whereas the expansion of an existing station would “perpetuate the objectionable bus routes” along the Washington Heights streets causing congestion, traffic and safety issues as it

36 Ibid.
37 Ibid.
travelled in the roughly 10 block journey, Wagner and others advocated an alternative station at the foot of the bridge. Wagner citing the residents’ concerns and complaints about safety, asked the Commission to refrain from an approval of the proposed expansion in order to work with the Authority to conduct a study for a larger terminal. Expected to be completed within a year, the report would examine an alternative proposal to construct a terminal located at the end of the George Washington Bridge. Although the Port Authority agreed to such a study, they in turn asked for approval for their own proposed bus shelter submitted the previous year. Although demolition of the four buildings was complete but the Authority had yet to gain approval for the twenty-two berths along West 178th Street.

By the following fall, the expansion of the Inter-City Station gained approval, yet the Authority’s own project had remained dormant with the Board of Estimates since its submittal in 1952. Civic leaders, residents and realty interests remained strongly opposed to the proposed Port Authority bus shelter much to the chagrin of the Port of New York Authority Executive Director Austin J. Tobin who felt pressured to “construct a grandiose bus terminal.” Although Tobin adamantly declared such a proposal as “unwarranted and economically unfeasible,” he did however give in to local pressures and agreed to conduct a study for the construction of a $3,000,000 one-story bus terminal that removed bus traffic off the streets of Washington Heights. He recognized that such a terminal had the potential to increase the property values in the area, much the same way the $24,000,000 Port Authority Bus Terminal in midtown had done only three years earlier.

Equally dissatisfied with the busing problem, the unwillingness by the Authority to seriously consider a bus terminal and disheartened by the approval of the Inter-City Transportation expansion, Manhattan Borough President Robert F. Wagner Jr., repeatedly supported the construction of “a terminal with sufficient capacity to accommodate all buses used in the area.” Wagner publicly derided that the Authority’s proposed plans at West 178th and 179th Streets, stressing that the project would fail to solve the pedestrian and traffic congestion problems “but merely shift it to another location.” He further described the inadequacies of the the Port of New York Authority’s proposal stating that “to use the southerly half of the block

38 Ibid.
40 Ibid.
42 Ibid.
between West 178th and 179th Streets from Broadway to Fort Washington Avenue for a depot was inadequate. While it would eliminate foot travel on the bridge plaza, where the buses now stop, it would increase the dangers on Broadway."

Meanwhile growth continued in Northern New Jersey, and so too did the traffic, as new ramps and highway extensions were planned heading west and north from the George Washington Bridge. In 1954 highway expansion continued as the first two miles of a forty-three mile highway from the bridge to Englewood Cliffs, New Jersey was completed; the improvements were slated to head north and extend to the New York state line within two years. Such extensions were planned to help mitigate the 76 million vehicles that crossed the Hudson in 1954, more than double the amount of traffic in the same area before World War II, and the number was expected to rise to 80 million by 1960, and 180,000,000 by 1975.

In 1955, when the impact of suburban growth and development were perhaps more pronounced than ever across the George Washington Bridge, New York agencies completed a year-long study examining the necessary improvements, connections, ramps and bridges needed to accommodate the influx of daily commuters, weekenders and tri-state travelers through the greater metropolitan area. In January of that year the Port of New York Authority joined with the Triborough Bridge and Tunnel Authority to present their findings in an ambitious $600,000,000 project to improve the arterial connections throughout the metropolitan area (See Image 3). In the wake of recent announcements by the Eisenhower administration that a national Highway Act would provide funding for highway improvements across the country, the two Authorities’ announced that it would be feasible to secure $200,000,000 through Federal-state financing. Although no such monies were guaranteed, the two agencies assured the New York City and State legislatures that such funding “would ease the burden on this state in implementing toll facilities.”

In addition to an extensive Cross-Bronx expressway proposed by the Triborough Bridge and Tunnel Authority, the study also included approach systems on both sides of the span to

43 Ibid.
48 Ibid.
better facilitate traffic flow along highway extensions in New Jersey such as a “$60,000,000 Bergen County Expressway from the Fort Lee Plaza of the George Washington Bridge to Paterson,” $24,000,000 of the cost would be provided by the Port of New York Authority.\(^{49}\) Set to be completed by 1960, the Port Authority portion of the project included the double-decking of the George Washington Bridge; a feasible endeavor since the bridge had been built with the capability of such an expansion. This portion of the project was to be financed entirely by the Port of New York Authority and would also include a proposed $5,000,000 bus terminal on the Manhattan side of the bridge.

In an attempt to address the concerns of safety and congestion voiced by residents and city officials the Port Authority proposed that the terminal include: “…bus loading and unloading platforms … at the grade of Fort Washington Avenue; a concourse-lobby level below the bus platforms … at the grade of Broadway. An extension of the bus platform level in the half block east of Broadway reached by connections overpassing Broadway would provide an elevated bus turn-around, holding and parking platforms as well as terminal space for long-haul buses.”\(^{50}\) Such a terminal, an early precursor to today’s existing station, was slated to accommodate a peak load of 221 buses per hour.\(^{51}\) In further support of the community, the Port Authority also strongly recommended transferring the additional uptown bus station located at 167\(^{th}\) Street, to the new facility.

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\(^{49}\) Ibid.  
\(^{50}\) Ibid.  
Although there was some skepticism regarding funding through state and national programs, initial reviews of the joint venture were generally positive from city officials, residents throughout the boroughs, and state legislatures on both sides of the Hudson. Within a month the New York and New Jersey states Republican party officially endorsed the $600,000,000 project, including Governor Harriman of New York, Mayor Wagner and New Jersey Governor Robert B. Meyner.\(^{52}\)

Unfortunately in the spring of 1955, the City and the Port of New York Authority appeared to be in a hopeless impasse as neither budged to accommodate the traffic controls and infrastructure improvements necessary to handle the growing suburbs and corresponding

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The dispute as described by Howard S. Cullman, chairman of the Port of New York Authority, in a letter addressed to Mayor Wagner, involved a block by the City to allow the Port Authority to purchase land at the foot of the bridge necessary for the proposed second level addition and to create the necessary overpasses and underpasses for the proposed expansion. The deadlock appeared largely centered around the lack of input given to the City by the Port Authority for the approval of construction plans and city street connections. Essentially the Port Authority could not proceed without City approval and the City refused to grant approval without further say in the progress and construction of the proposed project. Fortunately, after a public exchange of grievances, the Port Authority and the City of New York settled their differences within days and the project was allowed to proceed with Wagner’s approval by early April of 1955. Full approval was then provided within weeks by the now defunct New York City Board of Estimate and the state legislature in Albany.

Progress however on the other side of the Hudson River was less forthcoming. It was not until spring of the following year, after several months of debate that both houses of the New Jersey legislature approved of the second deck of the George Washington Bridge along with the construction of the Bergen-Passaic Expressway. Opposition for the project was spearheaded by New Jersey State Senator Walter H. Jones of Bergen County who argued that the proposed lower deck of the bridge and corresponding highway expansions would lead to intolerable congestion and traffic that would cause overcrowding in the area. Such opposition had successfully killed a similar bill for the double-decking of the bridge presented to the state legislature in 1955. Fortunately by November of 1956 both houses approved the legislature necessary to proceed with both the highway improvements and the expansion of the bridge. Within a year the Port Authority would begin drafting plans that would eventually lead to the construction of one New York’s most distinct structures, the George Washington Bridge Bus Station.

Chapter 3: The George Washington Bridge Bus Station

In 1957, just over twenty-five years after the opening of one of the longest spans in the world, the Port Authority confronted overwhelming pressure to address the rise in motorized travel between New Jersey and New York City at the George Washington Bridge. A combination of cultural, economic and demographic forces resulted in the increased popularity of suburbia. From the rise of America’s automobile culture, to the planned obsolescence of the annual car model, to the funding of the 1956 Highway Act, and the cultural and legislative push for suburban homeownership, Americans were on the move.

Communities along the Hudson River in New Jersey acted as one of the key areas of growth in the metropolitan area so that by 1954, in the midst of the post-war boom, 76 million vehicles travelled over the Hudson River, approximately twice the number before the war. Given the large number of commuters who travelled via bus and automobile from the neighborhoods along the Hudson, motor and pedestrian congestion at the Manhattan base of the bridge was an increasing problem; signaling that infrastructure improvements were long overdue.

In 1957, with approval from the relevant New York City commissions, the necessary bureaucracies from both states, the commissioners of the Port of New York Authority and in conjunction with the Triborough Bridge and Tunnel Authority, the initial renderings and scope for the highway and infrastructure improvements first proposed in 1955 between New Jersey and New York were approved. As presented by Port of New York Authority Executive Director, Austin J. Tobin, the George Washington Bridge Bus Station proved a key component of the plan—functioning as a convenient hub for those approaching from the residential enclaves from across the Hudson. Such a station would allow commuters the ability to transfer from the short-haul commuter bus to the subway within the convenience of a single building rather than scrambling from the hodge-podge of curbside platforms then located at the base of the bridge.¹

The proposal presented by the Port Authority envisioned a two-story, $12,000,000 bus depot with direct connections to a proposed cross-town expressway that would span from the George Washington Bridge to Harlem River Drive. Early plans presented in February of 1957 outlined a transportation hub built to accommodate 255 buses an hour (an optimistic capacity given the then average of 75 buses per hour over the bridge at the time.) The site of the station

¹ The George Washington Bridge Bus Station connects with the existing 175th Street Stop of the IND line, or what we today know as the “A” line.
extended over a two-block area from Wadsworth to Fort Washington between 178th and 179th Streets in order to accommodate 36 suburban commuter bus platforms, seven additional street-level long-haul berths, storage, along with bus parking and a bus turn around connected by a pair of bridges across Broadway. The bus station would also boast a direct connection to the underground 175th Street Independent Subway Station for the convenience of commuters. In return for such an ambitious and expensive project, the Port of New York Authority quietly asked that the city of New York to prohibit the establishment or expansion of private bus stations. The Board of Estimate did pass such a measure, stating that “such restrictions were in the public’s interest,” and that a similar measure was passed at around the time that the Port Authority Bus Station was built in 1950.

The approved proposals also included new bridge connections and off-ramps that connected to the West End Highway and a new Manhattan expressway that would bypass all city streets. This Trans-Manhattan Expressway, as it was known, would cross the island from the George Washington Bridge to the simultaneously proposed Triborough Bridge and Tunnel Authority improvements that included a bridge across the Harlem River and the Cross-Bronx Expressway. The new Trans-Manhattan Expressway would additionally replace the Port Authority tunnels accessible from the George Washington Bridge that crossed Manhattan to Harlem Drive as a means to bypass Washington Heights.

The Manhattan-Expressway, as a twelve-lane crosstown artery would extend from the Bridge to opposite side of the island through blocks of land that roughly situated between 177th and 180th Streets in upper Manhattan. As per the city requests, conditions of approval, and engineering requirements the Trans-Manhattan Expressway was designed as both a depressed and overpass highway, the elevation and design of which varied at different points as it crossed

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2 This location and footprint of the bus station did not change from this 1957 proposal although other adjustments were made in the following years of planning and construction. The information regarding the proposals and construction of the bridge are largely derived from a series of periodical articles from 1956-1963. A full list of the articles referenced can be found in the bibliography. Joseph Ingraham: Joseph C. Ingraham, "New Bridge Links Planned Uptown." The New York Times, February 18, 1957, 1.; Charles G. Bennett, "City Votes Change in Hudson Bridge." The New York Times, June 14, 1957, 1.

3 Joseph C. Ingraham, "New Bridge Links Planned Uptown." The New York Times, February 18, 1957, 1. It is also important to note that the PABT at not even a decade old also underwent an extensive expansion during this time in order to accommodate additional parking along with new and/or expanding bus companies. The PABT in addition to a facelift that modified its original streamline façade into a modern steel truss design, direct roadway connections were also constructed in order to allow ease of traffic and bus connections.

4 The tunnels were constructed at the insistence of the City but were considered inadequate to handle the level of traffic that crossed the island. Source: Joseph C. Ingraham, "New Bridge Links Planned Uptown," The New York Times, February 18, 1957, 1.
the island, and thus at no point intersected with the city street-grad. The arterial improvements would extend from the proposed new lower deck and existing upper deck of the George Washington Bridge through a series of ramps and connections to the West End Highway and Trans-Manhattan Expressway with the hope of allowing up to fifty percent of commuters to bypass city streets.5 One such connection would fork from the expressway to connect with the new bus depot, accessible only via the Expressway, similar in theory and design to the 42nd Street Port Authority Bus Terminal.6 (See Image 3.1)

TRAFFIC PROJECT: A rendering of Port Authority's plan for adding a new deck under present deck of George Washington Bridge and building related roads and structures. View is toward Manhattan end, with the Bronx at top. At 1, 2 and 3 are projected exits and approaches to link the bridge with Henry Hudson Parkway and a new trans-Manhattan Expressway (4) between the bridge and a new span (6) across the Harlem River at 178th Street. New span would connect with Major Deegan Interchange of Cross-Bronx Expressway (7). At 5 would be a bus terminal.

Image 3.1: 1957 Rendering of proposed George Washington Bridge improvements. Item (5) is an early rendering of the proposed bus station, prior to commissioning Pier Luigi Nervi.
The plans proposed by the Port Authority did not confine itself to the island of Manhattan or just the state of New York but extended out. In burgeoning Bergen County, across the Hudson, ambitious proposals by the Port Authority augmented the George Washington Bridge improvements to include new ramps, freeway connections and new freeways. The total cost of the proposed projects on the New Jersey end of the bridge were estimated to cost $48,500,000; $24,000,000 of which was allotted to the new Bergen-Passaic Expressway, and a substantial portion of the funds would contribute to the bi-state’s double-decking of the bridge.¹ (See Image 3.2) The entire George Washington Bridge project, which includes a double deckering of the bridge, freeway connections on each side of the bridge, the construction of the Trans-Manhattan Expressway and of course the bus station was estimated to cost no less than $182,000,000, of which $167,000,000 was promised by the Port Authority partly through bonds and partly through coffers filled by tolls, and the remaining $15,000,000 through unsecured Federal Aid.²

Image 3.2: A map showing “the road network that will accompany the new lower deck approaches on the New Jersey side of the George Washington Bridge.”: "New Roads and Shopping Center for Fort Lee Are Part of Bridge Project." The New York Times, July 14, 1957, 56.

Such a massive undertaking however presented not just a financial cost to the Port Authority but also a social impact on the residents of Washington Heights. In exchange for a substantial reduction in commuter traffic, both motorized and pedestrian, the neighborhood

² Ibid.
would undergo extensive changes and loss of built fabric. From an area spanning the width of the island, from roughly between 177th and 180th Streets, the Port Authority acquired more than 80 buildings, at an estimated cost of $7,000,000, all slated for demolition. All but two of these structures were apartment buildings, thereby resulting in the loss of homes for 10,000 people, or approximately 1,850 families, in addition to the demolition of the neighborhood post office and the Congregation Mount Sinai Anshe Emith of Washington Heights located at Wadsworth Ave and W. 178th St. (Image 3.3)

*Image 3.3: Land cleared for the construction of the George Washington Bridge Bus Station (1959)*
In order to both ease the tensions surrounding the relocation of families (in the heyday of Robert Moses) and encourage speedy relinquishment of their homes, the Port Authority offered a $600 stipend for any voluntary relocation. The Port Authority refused to evict a single resident and by 1958, only 180 residents remained in their homes, a number that dwindled down to a handful in the spring of 1959; many of the displaced finding homes with the aid of the Port Authority aid through a relocation program.3

However, of course, even with the concessions by the Port Authority some residents and representatives expressed anger and frustration with the loss of residences. One such opponent, State Representative, and Washington Heights resident, Herbert Zelenko publicly spoke out against the relocation of 10,000 persons. In the early months of 1957 Mr. Zelenko accused the Port Authority of refusing to build housing for the dislocated people.4 The Port Authority attempted to ease such community tensions with the construction of new low-income housing for displaced residents of Washington Heights in 1958. At completion the apartment proposed to accommodate 165 families at a new structure on the corner of Amsterdam Avenue and West 115th Street.5 A certain number of the units were to be specifically built with elderly residents in mind, and all units were subsidized for affordable rents.6 Additionally, the Port Authority pledged $30,000 to the local Washington Heights YMCA “to keep young people out of the abandoned buildings and off the scarred streets of the Washington Heights Area.”7 Located at 121 Wadsworth Avenue, the Washington Heights Youth Center as it was called, aimed to provide a recreation area for at least two years starting with the first rounds of relocation in the summer of 1957.

To offset the loss of tax properties, and to a lesser extent the loss of housing, the Board of Estimates asked that the Port of New York Authority study the feasibility of developing air rights above the new expressway. Mr. Lowe, chairman of the Port Authority, agreed to the request and included an additional $400,000 to the cost of the project to structurally accommodate a handful

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3 Joseph C. Ingraham, "Relocation Is Almost Completed Near George Washington Bridge," *The New York Times*, April 23, 1959, 33.; "Port Body Opposed to Uptown Project," *The New York Times*, February 22, 1957, 23. Little detail is given as to where the residents relocated to, although it was reported that the Port Authority provided real estate agents to assist the individuals and families.
6 Ibid.
of apartment buildings atop of the new roadway.\textsuperscript{8} However the city of New York did not seek out improvement of the lots simply for the tax revenue, although that was important, but also as a model of air rights development. Early consultations by the city with real estate brokers recommended multi-story apartment houses with garages as the most appropriate for the site and neighborhood’s needs.\textsuperscript{9}

By the summer of 1960, the lofty plans of air rights development secured a financial backer. Developer Kratter Corporation purchased the air rights from the City of New York in order to construct a $12 million residential complex comprising of four buildings with a total of 750 units.\textsuperscript{10} The structures would occupy a total area of approximately two acres over the Trans-Manhattan Expressway but each of the structures would be accessible at street level, under the overpass. (Image 3.4)

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\textsuperscript{10} "Kratter Plans to Build $12 Million Apartment Project in Manhattan," \textit{The Wall Street Journal}, August 18, 1960, 14.
The men behind the Curtain

The making of the bus station included a handful of men prior to Nervi’s involvement, all of whom were associated with the Port of New York Authority such as Port Authority Chairman Donald V. Lowe and Port Authority Chief Engineer John M. Kyle. However the most prominent of these men, Austin J. Tobin (1903-1978) had been described after his passing as the “lawyer who built the Port Authority of New York and New Jersey into the most powerful agency of its kind in the world.”11 A Brooklyn-native and a lawyer by training, Tobin joined the Port Authority around 1925 as a law clerk, later promoted to the position of the Port Authority’s real estate lawyer, and then assistant general counsel until eventually replacing the first Executive Director John E. Ramsey in 1942.12 Tobin maintained his seat of power through an annual reappointment by the board until his retirement in 1968.

Under Tobin’s direction, the Port of New York Authority was repeatedly criticized as a greedy and overly powerful an agency. His obituary claimed that he was not afraid to admit that “he did not care what he maintained so long as it made money.”13 He justified this statement with the understanding that if the Port Authority did not make money “it would die” because its income was based on self-supporting projects.14 And make money it did, in 1960 the Port Authority was worth a billion dollars and considered one of the city’s top businesses.

Furthermore at retirement Tobin was considered the highest paid public official in the country, save for the president of the United States.

It was likely this negative impression of Mr. Tobin that led to an increased visibility of Donald V. Lowe, the Chairman of the Authority and later Lowe’s successor S. Sloan Colt as the face and voice of the Port Authority throughout the George Washington Bridge projects. Mr. Lowe served as the commission Chairman, elected by the Port Authority’s commissioners, from 1955 until 1959 and handled the initial press releases regarding the demolition of homes and the negotiations with the city and the development of air rights.15 Lowe was a native of New Jersey, a hobbyist airplane pilot and a chemical engineer by trade.16 And although he only served as Chairman for four years, he remained a member of the board until his retirement in 1969 and

12 Ibid
13 Ibid
14 Ibid
received the Port Authority’s highest honor in 1964, the Distinguished Service Medal.\footnote{17} From 1966 to 1968 Lowe served as chairman of the Engineering Council at Columbia University, he died in 1969.\footnote{18}

Mr. S. Sloan Colt served on the Port Authority Commission beginning in 1946 and later relieved Mr. Lowe’s position as Chairman in 1959.\footnote{19} Colt then served as chairman through the remainder of the George Washington Bridge projects, including the bus station, and beyond until his retirement from the position and the commission in 1968.\footnote{20} Prior to his appointment with the Port Authority, Mr. Colt was appointed president of the Bankers Trust Company from 1931 to 1956, and therefore served for some years simultaneously with the two large entities.\footnote{21} The New York City native and Yale University alumni, passed away in 1975 with a legacy of an active and contributing force in several large and influential companies in New York City.\footnote{22}

But perhaps most importantly for the construction of the bus station were the Port Authority engineers and planners who oversaw the George Washington Bridge Bus Station project. Chief Engineer John M. Kyle, a highly regarded engineer, had worked with the Port Authority since 1946 and in 1957 received The Port of New York Authority’s Distinguished Service Medal, the highest recognition of merit within the agency.\footnote{23} Kyle oversaw a staff of more than 1,000 engineers at the Port Authority at the time of his death in 1970 at the age of 65.\footnote{24} In addition to his role as chief engineer of the George Washington Bridge Bus Station, Kyle also oversaw the construction of most of the Port Authority’s projects during his career including the Lincoln Tunnel, the Port Authority Bus Terminal and the second deck of the George Washington Bridge.\footnote{25}

Under Kyle’s management throughout the construction of the George Washington Bridge Bus Station was Resident Engineer Paul Nicholson, the supervising engineer on the project. Nicholson, a civil engineer by training, began his career with the Port Authority in 1948 and

\begin{footnotes}
\footnote{17} "Lowe Honored by Port Authority." \textit{The New York Times}, November 13, 1964, 69.
\footnote{18} "Donald Lowe, Former Chairman of Port Authority, Is Dead at 78." \textit{The New York Times}, December 11, 1969.
\footnote{21} Ibid.
\footnote{22} Ibid.
\footnote{23} "Port Authority Honors Engineer for Tube Role." \textit{The New York Times}, May 26, 1957, 52.
\footnote{24} "John Kyle, Aide in Port Authority." \textit{The New York Times}, October 1, 1970, 44.
\footnote{25} Ibid.
\end{footnotes}
retired in 1984 as the Assistant Chief Engineer of Construction. Another key player during the George Washington Bridge projects was Port Development director Roger H. Gilman. Gilman trained as an Engineer at Harvard with additional education in transportation began his career at the Port Authority in 1937 as a Statistician-Economist. From 1953 until 1974, and thus during the years of the George Washington Bridge projects, Gilman served as the Port Authority’s Director of Planning and Development; he retired in 1977 as Acting Executive Director of the PANYNJ and passed away in 1992.

Pier Luigi Nervi: A Collaboration

Much like the quick brushed strokes of Van Gogh or the play with light of Rembrandt, Pier Luigi Nervi’s buildings have a stylistic similarity to them. His triangular forms to create strength, tension and an organic aesthetic are signature details on each of his buildings, aspects that, although largely made of concrete, appear weightless over the occupant’s head. And although the intricate patterns present in nearly each of Nervi’s structures has a thoughtful and geometric play of shapes most visible at the roof that may remind most architecture enthusiasts of that great concrete monument, the Pantheon, it was for Nervi the great Gothic cathedrals to which he often alluded.

With these great medieval structures as a model, Nervi saw as a correct approach to building a perfect marriage of engineering and architecture, which naturally lent itself to beauty. This was largely why very little is hidden in his work. Often considered “honest” Nervi’s structures exhibit natural, unpainted concrete, unhidden structural beams and columns, and bare formwork. From the rawness of the material to unobstructed structural supports, Nervi almost demands that one understand not just architecture but engineering as well.

In 1959, John Kyle personally invited Nervi to design the center piece of the George Washington Bridge project. Mr. Kyle had first come across the work of Nervi on a trip to Italy in

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1958 when Kyle and a colleague inspected concrete structures on behalf of the Port Authority.¹ 

So impressed with the work of the Italian engineer, Kyle personally invited Nervi to design the center piece of the George Washington Bridge/Trans-Manhattan Expressway project.

The George Washington Bridge Bus Station was designed with three floors of amenities and points of transfer and travel, but it is at the uppermost floor that a commuter understands and embraces Nervi’s vision. Here, sheltering rows of buses and their occupants, are high triangular peaks of exposed concrete widely spaced openings that allow the traveler to admire the structural engineering feats of the George Washington Bridge or look out into the bustling streets of the Manhattan neighborhood. Above the commuter’s head, the vaults are designed to allow for cross ventilation and daylight. The massive crests of concrete are supported by concrete pillars; these large columns allow for clear spans so to avoid intermediate columns which would be an obstruction to traffic flow. (Image 3.5)

The intricate roof is comprised of 26 poured-in-place concrete triangular sections, sixteen of which are horizontal and fourteen of which alternately slope upward from the center of the building to create a dynamic wing-like roof. The alternated peaks were ventilated with large triangular openings and are supported by distinct poured in place columns that have the undulating geometric forms for Nervi’s work is known. And whether inside or out of the George Washington Bridge Bus Station, Nervi’s distinct peaks and columns appear limitless; while the complex, yet austere, butterfly roof embodies a wingspan of fourteen monumental peaks, seven each of the north and south sides. This unique design and shape of the roof were most likely influenced by the trusses and towers of the George Washington Bridge, the engineering marvel across the Hudson.

While most of the attention received by Nervi’s work has gone to the size and shape of the shells and domes overhead, the columns, where the visual and structural focus of the shelter meets the ground, are equally significant and emblematic of Nervi’s work. It is in his columns which fold, undulate and taper that a less celebrated but no less important visual and functional signature emerges. And in no other place than the bus station is the static play of the column and the roof more apparent. Unlike some his dome structures, the visibly textured pattern, the natural concrete form, and the undulating shape of the columns, whether locked in pairs or solitary, draw your eye up and over every surface of that platform ceiling. (Image 3.6)

Recognized at its completion with an award from the Concrete Industry Board, the George Washington Bridge Bus Station is and was celebrated not just for its expressionist forms but its beautifully engineered design. Whether approaching by vehicle or on foot, the exposed concrete forms that make up the multi-peaked roofline of the Bus Station is a compelling vision of a great engineering mind. (Image 3.7)

![Image 3.6: George Washington Bridge Bus Station (c.1963)](image)

Although very little evidence of their encounters remain after the loss of the Port Authority archival materials, some clues of Nervi’s design process and his work with the Port Authority can be gleaned from contemporary articles, Nervi’s own brief account of the project, and, surprisingly, revealing documentation found in Dartmouth’s Field House archives, a contemporaneous project to the Port Authority’s own.\(^2\) When initial plans were revealed in 1957 the Port Authority proposed a two-story, open platform structure that fed directly onto the proposed Trans-Manhattan expressway from both directions. The intent and design of the building therefore assured that inter-state and inter-city bus transportation by-passed Manhattan’s streets through the raised (from the east) or the depressed (from the west) highways that fed into the bus station. By 1959, when much of the project area was cleared of buildings, the Port

\(^2\) The Dartmouth archives provide correspondence between the college and the Port Authority prior to Nervi’s commission for the Field House. These archives are a great tool since all of the Port Authority archives were located in the basement of the World Trade Center and were therefore lost on September 11, 2001.
Authority had yielded to the city’s insistence of a covered bus platform. Unfortunately evidence does not reveal when or by whom the building gained a story, but it is easy to assume that it may have allowed for the space necessary to construct the necessary ramps from the expressway to and from the station. The desire for additional retail space may have also been a factor; like its midtown counterpart, the Port Authority Bus Terminal, the Washington Heights Bus Station was designed with retail in mind.

By 1960 press releases unveiled a bus station very similar to what stands today (minor modifications have been made since completion). Photos and descriptions of the building reveal a three-story, $13,000,000 ($1 million more than earlier estimates) building that spanned over a two block area via a bridge over Broadway (Image 3.7). Similar to its earlier incarnation the scope included a large enough structure to accommodate 2,000 buses and 50,000 passengers daily at 36 loading platforms located at the top level for suburban travel and at street level for long-distance transportation. The station also provided direct subterranean access to the 175th Street subway station.  

According to a later account provided by Nervi, when Mr. Kyle approached him, the Port Authority had devised a rough project program that included a covered platform area but with open “roof planes alternately raised to help expel exhaust fumes of the buses.” Furthermore the bus loading area atop of the station occupied an entire block. Although an impressive size, the upper floor did not leave a wide margin to accommodate the complex roof structure, columns, methods of egress, 36 bus berths and roadways with entry and exits for the buses ease of transport.

Design challenges due to the complex nature of the project confronted Nervi from the onset. In addition to accommodating such a large number of bus platforms in a limited amount of space, the plans also called for complex architectural and structural solutions at nearly every level. Not only would such a building need to provide ample structural support for 2,000 buses and 50,000 passengers daily, it would also straddle a twelve-lane expressway then under construction, thereby requiring additional structural measures to accommodate the vibrations of the expressway and subway trains that ran under and through the building (Images 3.8 & 3.9). Furthermore, in Nervi’s own words:

“The structural problem was also complicated by large openings on the sides for the entrance and exit of the buses for the crossing of streets. As a result, the sides were composed of a trussed structure. This also solved the problem of supporting the ends of the roof which cantilevered over the floors below. The static system of these trussed sides turned out to be very complex.”

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5 Ibid.
Image 3.8: 1963 Photograph showing the perspective of the George Washington Bridge Bus Station from the Trans-Manhattan Expressway

Image 3.9: The George Washington Bridge Bus Station and the truss system (1963)
In 1960, after some deliberation, Dartmouth approached Nervi to design their athletic field house, approving of his design, reputation and affable nature. Well aware that other universities benefitted from enviable designs from prestigious architects such as “Saranin [sic] who designed the auditorium at MIT and the hockey rink at Yale, LeCorbusier who is designing an art center for Harvard and the Finnish architect Alto [sic] who designed the Serpentine Dormitories at MIT,” the Dartmouth alumni rallied for a structure of equal esteem on campus. \(^1\) However, others voiced reservations over the cost and necessity of such a talent for a simple ancillary building that could easily be built with wood. In order to properly assess the feasibility of working with Nervi, representatives from Dartmouth’s alumni and administrative offices conducted a series of consultations with those Nervi worked with in America.

It is these series of conversations archived in memos, meeting minutes, telephone conversations and telegrams that offer insight as to how Nervi worked with the Port Authority. Given the loss of the Port Authority archives, there is a lack of information regarding the construction of the bus station, particularly Nervi’s role in the matter. \(^2\) Through chance tidbits of information from these sources, valuable clues indicate how an agency in New York on the cusp of the 1960’s worked with a man across the Atlantic who spoke no English.

One of the earliest memos from this series of conversations occurs between a Dartmouth representative and two New York engineers from Weidlinger Associates, Paul Weidlinger and Mario Salvadori, both of whom had worked with Nervi. Salvadori, a registered engineer in Italy who taught engineering at Columbia, had also worked with Nervi in Italy and translated Nervi’s book *Structures*, published in America in 1956. Additionally Nervi was a consulting engineer for Weidlinger Associates for the Priory of Saint Mary and Saint Louis in Creve Coeur, Missouri, a reinforced concrete thin-shell structure completed in 1962.

When Dartmouth approached the two gentlemen, a key question voiced by the College was whether Nervi preferred to have aesthetic control of the design. Salvadori and Weidlinger both insisted that Nervi “would want to assume all responsibility—and they questioned whether he would even require working drawings be prepared in America.” \(^3\) All available copies of the

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1 Dartmouth Memorandum addressed to Mr. Meck dated October 14, 1960, “Subject: Field House Construction—Nervi Design” Dartmouth College Archives, Facilities Planning Box 5703
2 Because the construction was conducted on state property with state engineers the City of New York does not have records of the construction.
3 Dartmouth Meeting notes in Paul Weidlinger’s office with an unnamed representative from Dartmouth College dated October 28, 1960, Dartmouth College Archives, Facilities Planning Box 5703
George Washington Bridge Bus Station plans confirm these statements; as each are stamped and signed by the Maestro himself. Although an interview by Dartmouth with Mr. Kyle revealed that the Port Authority may have redrawn all of Nervi’s plans in order to convert them from the metric system.⁴

Mr. Kyle also remarked in his meeting with Dartmouth in the fall of 1960, that the Port Authority’s own engineers provided working drawings for Nervi at the start of the project, and modified “the design to fit the conditions.”⁵ Kyle further the stressed the importance of allowing an American engineer to confirm that Nervi’s calculations met American guidelines. Salvadori however thought such safeguards unnecessary, stating that the Italian standards were nearly identical with those in America.⁶ Kyle, perhaps overly cautious given the massive scope of the Port Authority project, recommended checking all of Nervi’s calculations and stress loads, but insisted as well that Nervi was a highly capable engineer.⁷

In the late fall of 1960, due in part to the sentiments of Nervi’s colleagues and supporters; Dartmouth secured the commission of Nervi with specific requirements on both sides, which may provide a sense of how Nervi worked with the Port Authority.⁸ Unlike Mr. Kyle’s claims, Nervi drew in the metric scale however he willingly converted all dimensions to the English system.⁹ It was further decided that all plans and correspondence were to be sent through air mail, although there are records of telegrams and scheduled telephone calls as well.¹⁰ Kyle suggested that communication and timelines might be difficult given the time and distance difference (implying perhaps that the Port Authority had experienced such issues) but a notation in the memorandum states that as of November 1960 Dartmouth had so far experienced no such problems.¹¹ A final requirement by Dartmouth insisted that Nervi’s final design would include

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⁴ Dartmouth Meeting notes with Austin Tobin and Jack Kyle in Tobin’s office at the Port Authority, Document Title: “Nervi Construction: New York Port Authority” Meeting conducted with an unnamed representative from Dartmouth College dated October 28, 1960, Dartmouth College Archives, Facilities Planning Box 5703
⁵ Tobin, Kyle and Dartmouth Meeting, October 28, 1960, Dartmouth College Archives
⁶ Correspondence From Mario Salvadori to Mr. Olmstead, December 9, 1960, Dartmouth College Archives, Facilities Planning Box 5703
⁷ Dartmouth Memorandum, To: Files, Subject: “Nervi Designed Field House –Considerations” November 4, 1960, Dartmouth College Archives, Facilities Planning Box 5703. However, Dartmouth is a far smaller entity than the massive Port Authority, and so the Port Authority may have been a little more restrictive than the college.
⁹ Ibid.
¹⁰ Ibid.
¹¹ Dartmouth Memorandum, To: Files, Subject: “Nervi Designed Field House –Considerations” November 4, 1960, Dartmouth College Archives, Facilities Planning Box 5703.
“detailed structural plans…Detailed plans and elevations from which American architects can develop working drawings.”  

The Dartmouth documents further suggest that the Port Authority engineering department oversaw the bulk of the George Washington Bridge Bus Station project, a conjecture further supported with documentation that suggests Nervi visited the site on only two known occasions. Given the distance, the lack of technological ability and the language barrier, Nervi’s role in the construction of the building was likely limited.

Due to the loss of the Port Authority archival materials, construction too remains a bit of a mystery; little is known to the exact role Nervi may have played once the steel was placed and the concrete poured. Articles from the period however suggest one early visit by Nervi in 1961 with a later visit in 1962, during the construction of the roof. It was the latter visit that was documented by the admiring architectural critic, Ada Louise Huxtable. Other surviving documentation can only be gleaned from a series of Port Authority construction photographs throughout the course of the erection available from the MAXXI Pier Luigi Nervi Archives (Fondazione MAXXI—Museo Nazionale Delle Arti Del XXI Secolo) in Rome, Italy and brief newspaper accounts of the progress.

Of the construction itself, at the end of 1960, construction bids were awarded as a joint venture to two long-standing New York based firms. Together W. J. Barney Corporation and William L. Crow Construction Company, both based in separate offices at 101 Park Avenue, would erect the complex reinforced concrete structure.

Information provided by construction photo and corresponding descriptions reveal cleared land ready for the foundation in March of 1961 (Image 3.3). But it would not be until the winter of 1961 that the first Bethlehem steel member was raised and within months the concrete placed for the “Nervi Sidewalk Truss,” the crossed forms along the length of the north and south sides of the building. Additional photos and descriptions disclose that the reinforced concrete

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12 Dartmouth Memo dated November 14-16 1960, Dartmouth College Archives, Facilities Planning Box 5703. The American architects secured in the final Nervi contract were Campbell & Aldrich.
portions designed by Nervi were mainly cast-in place formwork, (a detail that is apparent to anyone who visits the station and sees first-hand the faint imprint and texture of wooden planks on the columns and ceilings. Nervi enjoyed the impression of planks in the formwork; in part because they show that “The transition between each section [of a reinforced concrete structure] is obtained by joining with straight lines the corresponding points of the two extreme sections.”15 In 1962, when Nervi observed the progress of the roof construction he expressed his approval of the formwork and level of craftsmanship of the concrete. Unfortunately this was the last documented visit by Nervi to the bus station so it is unclear whether he ever viewed the finished product. (Images 3.10, 3.11 & 3.12)

Image 3.10: Port Authority Construction Photograph, Dated November 1, 1961, Photograph Caption: “George Washington Bridge Bus Station Pouring of the First Concrete.”

Image 3.11: Port Authority Construction Photograph, Dated December 1, 1961; Photograph Caption: “George Washington Bridge Bus Station, Construction Progress. Contract GWB 200.013. View looking east at Nervi roof endpost construction at column lines “A”. The inside form has been erected and reinforcing steel has been placed. The next operation will be placing of the outer form which will be surrounded by a steel bracing cage bolted to the inner steel frame shown in the center.”
The Unveiling

When the bus station opened on January 17, 1963, nearly five years to the day when it was first proposed, the transportation hub was considered a great success. Complete, the structure stood at three stories tall, with subterranean access to the IND subway line (the A line) and topped with a distinctive, sculptural roof design by one of the world's most admired engineers. At the dedication ceremony Governor Nelson A. Rockefeller commended the aesthetic accomplishment achieved with the construction of the bus station, stating that it "transforms the poetry of an architectural genius, Dr. Pier Luigi Nervi, into reality."

As a distinctive component of a larger project, the George Washington Bridge Bus Station provided a striking tour-de-force of infrastructure ingenuity. Furthermore, with the

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double decking of the bridge, construction of the Harlem River Bridge (or Alexander Hamilton Bridge), the Trans-Manhattan Expressway and the completion of Nervi’s Bus Station, the boroughs and the city were more accessible than ever for the commuter and traveler whether by bus or automobile.

Contemporary architectural reviews of the structure were generally favorable although the interior received less than worthy praise. As one Progressive Architecture writer expressed, “the station on the lower floors reflects all the mediocre design precepts shown by its downtown sister, the Port Authority Bus Terminal.”1 Additional accounts of the interior design described a “blue-and-white color scheme carried out in the glass mosaic tile covering the walls,” Venetian terrazzo floors and fluorescent lights overhead.2 (Images 3.13, 3.14, & 3.15)

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The George Washington Bus Station is not just a dynamic and distinct structure within New York City, but also within the scope of all of Nervi’s work. The multi-peaked, concrete roofline and defined perimeter within a dense city block departs from Nervi’s typical form and setting of free-standing structures exhibiting expansive spaces and delicate formwork. The bus station however, due to the use and requirements of the structure, created an entirely new set of challenges for the contractor and engineer. While the bus station occupies a piece of land similar in size and shape to that of the Leverone Field House at Dartmouth, the design program and building footprint resulted in a complex and striking structure.

Whereas the exteriors of Nervi’s earlier buildings tended to err on the side of simple perhaps even unremarkable (such as the Dartmouth’s Leverone Field House or the Pallazo dello Sport), the Bus Station, whether approaching by motor vehicle across the George Washington Bridge and on foot at Broadway, is arresting from whatever vantage point. Similarly, Nervi’s more typical structures are in part so inspiring because of a simple expression of form and pattern on the interior, yet the Bus Station, while using many of the same themes and forms, is in some ways a less delicate expression of concrete and the play with tension than his signature dome and vault structures.

Image 3.15: Interior of Broadway Street Entrance (2011)
Faced with a unique design challenge and objective the George Washington Bridge Bus Station departs from Nervi’s signature approach to buildings which generally involves a play with a domed roof above large expanses of open space—the bus station on the other hand, due to the use and restrictive footprint of the structure, created an entirely new set of challenges for the engineer-contractor. While still incorporating the playful use of lamella forms, the domed intricate patterns of his stadiums are replaced by massive, yet sculptural, columns that support strong and dynamic peaks that are visible from both within and outside of the bus station. Furthermore, for the bus station Nervi uses large expansive openings without glass to express movement, ventilation, voids, sculpture—a decisive break from the midtown modern structures in Manhattan or the remodeled Port Authority Bus Terminal.

The roof is repeatedly Nervi’s point of expression; often the exterior is functional, while the interior design is minimal, but in his structure that Nervi plays, with tension, form, compression, structure and art. Nervi always asks the viewer to look up; just as with the great Gothic cathedrals, Nervi invites to crane our necks and contemplate the heavens. His structures are further notable for an almost organic tension—his columns seems to resemble the trunks of trees and his play with patterns with that of a microscopic views of complex biological forms. These allusions to nature provide simultaneous feelings of calm, familiarity and awe and evoke other contemporary expressive engineers such as the reinforced concrete thin-shell engineers Felix Candela and Heinz Isler whose forms play with organic shapes and cantilevers. But unlike Nervi’s lamella barrel-vault roofs, the Bus Station, seems to be a departure—but not as a slight to New York, but in an homage to engineering of the George Washington Bridge—whose trusses and towers are complimented in the columns and peaks of the arresting Bus Station.

In realization of the connection of the George Washington Bridge to the corresponding Bus Station, Reynard Banham once pronounced Nervi’s building, and the connecting infrastructure a megastructure, and went on to describe the structure in glowing terms. Although once a term used freely and frequently amongst architecture critics in the 1960’s, today the concept of a building that encompasses spans large areas with multiple uses is considered somewhat alien. And yet, how else does one describe a building that appears boundless? That has no hard beginning or end? The structure seamlessly connects not just with the adjacent parking lot, but with the freeway, the underpass, the overpass, two magnificent bridges and four

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towering residential buildings. If perceived as one part of a whole, as it was constructed to be, than the bus station spans for miles, across not just the island of Manhattan but the Bronx to the East and across state lines to the West. It is this this expansiveness of the bus station as a small part of a whole that further underscores the importance and distinctiveness of the structure.
Image 3.17: 1963 Historic Photograph at Fort Washington Avenue Entrance

Image 3.18: Fort Washington Entrance Today (2011)
Chapter 4
The Way To New Jersey (1963-Present)
Preservation Challenges and Recommendations

A Multi-Functional Building

Like the mid-town terminal, the George Washington Bridge Bus Station was intended as a multi-use structure and like the Port Authority Bus Terminal the Washington Heights transportation hub included street level (along Broadway) and second level retail in order to appeal to commuter and local resident alike. By the summer of 1964, a year and a half after it opened, the bus station provided more than just access to the bus or subway, it also included retail for commuter and neighborhood resident alike, such as Rexall Drugs at street level adjacent the Broadway entrance. Within the first year of opening, the hub included such conveniences as the typical newsstands along with a bakery, a candy store, two restaurants and a cocktail lounge specifically catered to waiting passengers.¹ The station additionally benefitted from a newly opened Washington Heights Federal Savings and Loan Association’s two-story storefront, installed within the bus station in hopes of attracting commuters as a convenient local branch, and so as to attract “suburbanites” by offering a morning drop-off and afternoon pick-up service for deposits.²

Trans-Hudson commuter ridership accounted for the bulk of the transportation services offered at the George Washington Bus Station, largely serving Bergen County, NJ and Rockland County, NY. By 1964 four such bus companies were stationed at the transit hub, Public Service, Rockland Coach Co., Hill Bus Co., and Westwood Transportation.³ While the mid-town terminal provided the bulk of long-distance departures, the upper Manhattan station provided limited access to extended travel to most of the East Coast and as far south as Miami Florida, with future plans to increase service to the West Coast. The eight long-distance carriers included the Asbury Park New York Transit, Hudson Transit Lines, Lincoln Transit Co. Inc., Mohawk Coach Lines, N.Y. Bus Tours, Public Service Coordinated Transport, Safeway Trails Inc. and Trailways of New England.⁴ Yet, despite the apparent interest and investment of private bus lines with the

station, the Port Authority considered the depot underutilized, and hoped that with time the
demand for the station’s services would grow.5

By 1967 the bus station had grown to accommodate an additional New England bus line, a
direct link to the airport and most importantly the Inter-City Transportation Co. line.6 Inter-
City, previously located just blocks away at 167th Street and St. Nichols Avenue, was the Port
Authority’s largest competitor in the area. Following the City’s strict prohibition against the
expansion or erection of competitive bus stations in Upper Manhattan, Inter-City succumbed to
municipal and pressure and moved their operations to the George Washington Bridge Bus
Station, closing the last remaining private bus terminal in Manhattan.7 Inter-City provided
service to the cross-Hudson commuter crowd, an estimated 7,000 daily commuters, who were
expected to transfer to the George Washington Bridge Bus Station with Inter-City’s move.
Officials of the Port Authority hoped the additional bus company would raise the ridership from
36,000 to 50,000 passengers a day. Residents of Washington Heights also welcomed the move,
as the transfer led to the long overdue reprieve from the corresponding 300 daily bus trips on the
streets of Washington Heights from the Bridge to the 167th Street station.8

Near the close of the 1960's, the Port Authority conducted a transportation study of the
George Washington Bridge Bus Station. Released in 1970, the Port Authority stated the mission
of the bus station: to “provide a centralized mass transportation facility in upper Manhattan for
Trans-Hudson bus passengers.” To study the success of this purpose, the Port Authority surveyed
short-haul passengers; particularly given the recent addition of the Inter-City bus lines serviced
to the station, which accounted for twenty-percent of all bus operations at the station.9 The study
revealed what many feared: a dire underutilization of the Bus Station with no more than a
weekday average of 21,700 passengers; nowhere near its intended capacity of 50,000 travelers
per day, nor even the estimated number of 36,000 travelers prior to Inter-City’s transfer.
However, the survey confirmed that the intended patron resided across the Hudson, in fact
residents within Bergen County accounted for 92% of all travelers while another 6% from

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6 "2 New Bus Lines Begin Service At GW Bridge." New York Amsterdam News, October 30, 1965, 26.; "Last Bus
9 Port of New York Authority. George Washington Bridge Bus Station : passenger origin and destination
Rockland County, NY. Furthermore, the vast majority of the weekday travelers (over 80%) travelled to Manhattan for work related purposes, most of whom utilized the subway train to reach their places of employment in midtown.

**Life after Nervi**

From an aesthetic perspective, the poor utilization of the station left it largely untouched, with only minor modifications since its opening in 1963. Given its age of nearly fifty years old, it is remarkable to note the strong integrity of the building. By far the most significant of the changes occurred in the first year of its operation. As per the recommendations of the Chief Resident Engineer John M. Kyle, Nervi designed the roof vaults with large triangular open windows to allow for ventilation of the bus fumes; a persistent problem at the established Port Authority Bus Terminal. The original openings were not “coldproofed” so as to for allow maximum ventilation; however when the bus station opened in the middle of the winter in 1963 there were immediate complaints about the biting wind off the Hudson. To amend the design flaw the Port Authority sought to provide warmth in the winter, cool in the summer and ventilation year round with the installation of louvres and glass at the cost of $200,000 in the vault openings, in addition to constructing heated shelters at the uppermost level.”

![Image 4.1: Installation of louvres in the openings of the George Washington Bridge Bus Station, c.1964](image)

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Other changes and adjustments to the bus station were largely cosmetic, and for many years were in response to the underutilization of the station, not its overuse. What may not be a surprise to anyone, but in the 1970’s bus, subway and rail stations were increasingly synonymous with the homeless population. The persistent problem of loitering at the George Washington Bridge Bus Station was credited to several factors including the unshakable underutilization of the station. Ten years after its dedication, the Bus Station plagued with that never-ending status: “half-empty most of the time,” by 1973 had dropped nearly half to 18,000 travelers per day.¹³ Unlike the midtown station which handled mostly long-haul bus routes, the George Washington Bridge Bus Station catered to the short-distance commuter with 1,500 buses per day. One noted reason for the decline in the 1970’s was the loss of a major carrier, Trailways, a long-haul bus company.¹⁴ Ultimately however, as one Port Authority official remarked in 1973, the George Washington Bridge Bus Station was “not self-supporting, but it was always understood that it would not pay its way.”¹⁵ Even so, efforts were made enliven the place, and combat perceptions that it was nothing more than the Port Authority Bus Terminal’s overflow depot, with various efforts such as the opening of an Off Track Betting spot, and allowing charter buses for day trips and summer camps to utilize the station.

By the end of the 1980’s after growing complaints and problems at all of the main transit hubs, the city of New York and the Port Authority enforced rules against loitering, drinking and sleeping in the station. The George Washington Bus Station was no different and in the 1980’s required that the station was “closed to all except those holding bus tickets.”¹⁶ As the executive of one local homeless advocacy group, George T. McDonald noted that there had been “a definite shift in attitude towards homeless from being in public places.”¹⁷

Furthermore, in the 1980’s with the rise of office and commercial real estate in Manhattan, several companies moved their offices across the Hudson into New Jersey. However, the George Bus Station fared no worse than before thanks to the trend of the “reverse

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commuter”: residents who live in New York City but work in New Jersey. The number of travelers through the upper Manhattan station remained relatively unchanged due to an increased number of new or recently transplanted commercial offices in New Jersey, or “the rise of the exodus of businesses from New York to New Jersey.” Between 1984 and 1989, New Jersey saw an increase of 350 new or transplanted companies and plants. The shift in locale was largely credited with the more affordable real estate on the other side of the Hudson River; these businesses were concentrated in Northern New Jersey, and thereby easily accessible from the George Washington Bridge Bus Station. In the fall of 1989 the Port Authority conducted a one day survey of commuters at both the PABT at 42nd Street and the George Washington Bridge Bus Station and found that a total of 18,000 people (at both stations combined) traveled between New Jersey and New York during a three hour period at the height of rush hour.

A quote states that in 1990 a Port Authority credited the lack of ridership and retail in the bus station was its location: it was “just in the wrong place.” It was no secret to the Port Authority or commuters alike, that in general travelers preferred the midtown station for its one-stop convenience; many favored a single bus into the PABT rather than transferring to the subway at the George Washington Bus Station to reach midtown. Furthermore, as one reporter described the Upper Manhattan station, “[t]he place had all the charm of a penitentiary. It was grim and badly lighted. There were only six seats. The bathrooms were shabby and unattended. Commuters were constantly accosted by beggars cadging cigarettes and money.”

The 1990’s also saw a bit of a revival of aesthetic appreciation for the building as Robert A. M. Stern listed it as one of thirty-five modern buildings worthy of landmarking within the five boroughs as published in the New York Times. However, the notable distinction did not increase the building’s popularity or use. As a result of the increased presence of homelessness and criminal behavior at the location during the 1970’s and 1980’s, the bus station’s use declined. In an attempt to revitalize the underutilized structure various efforts have been proposed through the decades with intentions to expand the facilities to accommodate new retailers or update the station.

21 Jeffrey Page, "GWB Bus Station Starting to Win Back Commuters." The Record [Bergen County, N.J.], April 24, 2000: 3. Descriptions from the period suggest that a large number of the seats provided for waiting commuters were removed at some point to discourage loitering.
In 1999 the Port Authority sought to diversify its holdings and take the George Washington Bridge Bus Station off its hands. During this period the Port Authority also sought to expand development rights over the Port Authority Bus Terminal and had already leased two terminals to private companies at the John F. Kennedy International Airport. In search of a lease to maintain the George Washington Bridge Bus Station, the Port Authority selected the developer, McCann Real Equities, who proposed the erection of a multiplex atop of the bus station, following an engineering feasibility study. If feasible, the developers proposed a twelve-screen theater and in exchange the Port Authority would gain a 40 year lease with the new tenants.  

In preparation of the impending transfer of the property to the new developer, in 2000 the Port Authority conducted its first major refurbishment of the Bus Station since 1963. Improvements included new ceiling panels and overhead lights (see images), and new chairs to replace the original multi-color plastic ones. The station was also updated with new video monitors in the waiting areas that showed the bus platforms for waiting passengers. Further renovations were made as well to the corridor leading to the subway. The cosmetic renovations coincided with the full occupancy of the retail space, an achievement that had not occurred in several years. The refurbishment of the bus station cost $7,000,000 funded by the Port Authority. The new lights and ceiling were added to the waiting areas and main concourse. Improvements also included new phone kiosks and the addition of freestanding retail kiosks. New seating has also been added on the second floor, the first in eight years. The new retail occupants included a bank and a grocery store, both opened within the first couple of months in 2000. With the $7 million improvements, the station was applauded for its “serene” atmosphere and an influx of shops that included “a newsstand, bookshop, pizza place, dentist’s office, shoe repair shop, barbershop and beauty parlor, an optometrist’s office,” and a convenience store with a deli counter and seating. Further renovations were planned for each of the entrances at Broadway and Fort Washington Avenue, including concealing the original entrance mosaics on Broadwa

25 Jeffrey Page, "GWB Bus Station Starting to Win Back Commuters." The Record [Bergen County, N.J.], April 24, 2000, 3.
the interior walls. However, the improvements were also credited with attracting a larger homeless population who, according to the retailers and bus station employees, occupied the seats more than the commuters.

4.2: The largely extant original interior at the second floor as seen today (expect for the lighting). Notice that the booths allude to the geometric forms of the roof (2011)

Yet despite these improvements, at the turn of the century, while the Port Authority Bus Terminal saw a daily influx of 200,000 travelers each day, only approximately 13,000 passengers passed through the George Washington Bus Station each day. The particularly low number of passengers through the Upper Manhattan neighborhood was largely credited to the expansion of the mid-town station in the 1980’s. The Port Authority Bus Terminal expansion led to the transfer of several long-distance bus lines to the midtown station, which therefore led to a significant loss of travelers through the George Washington Bridge Bus Station.

26What appear to be the original aqua-marine colored mosaics still adorn the Broadway entrance. See image.
27 "Views; Refitting the Port Authority's Other Bus Station." The New York Times, January 9, 2000.
In 2002, the multiplex development was put on hold after the September 11th tragedy. Yet the bus station continued to grow and welcomed the inclusion of a new long-distance bus company, Greyhound. By 2003, the Port Authority had surpassed its $7 million budget as estimates were closer to $20-25 million which included increased security and janitorial services. Beyond the lighting and seating, the Port Authority replaced windows and doors to the 1963 station.

Plans for development appeared to have fallen by the wayside until 2008 when a less ambitious, but still impactful proposal emerged. A private developer proposed retail revitalization and a renovation of the bus station, but not too long after the plans were abandoned in the wake of the financial crisis. However, over the summer of 2011 the New York Port Authority unveiled plans for a $183.2 million renovation project of the monumental George Washington Bridge Bus Station. This summer’s press release has reinvigorated a similar but shelved renovation proposal from 2008, yet this time the Port Authority has joined forces with private developers, while working with the previously commissioned New York based architects, STV. Scheduled for completion in 2013, the project proposes expanded new retail space, quadrupling the space from the existing 30,000 square feet to 120,000 square feet.29 New occupants are slated to fill in the now vacant commercial spots that once housed amongst many, a barber, credit union and newsstands. The PANYNJ is marketing the remodel as “A New Shopping Destination,” as new commercial entities are promised including ambitious tenants like a name-brand discount clothing store and an affordable fitness club chain.30 Such marketing implies that soon the bus station may be more shopping mall than bus station in the near future.

However, the proposed changes are not limited to commercial improvements but also include a refurbished waiting area and twenty-one new bus gates to replace the existing seventeen. Released renderings also display a “modernized” facelift of the nearly fifty year old building that include what appear to be a replacement of the original blue panels with large windows along the Broadway façade. Unfortunately, no clear floor plans or a detailed scope of work has yet been released from the Port Authority, and so it is uncertain as of yet how much of an impact the proposed project will have on this transit icon. Although a good scrubbing and a

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29 No clear plans of how this expansion have been released so it as of date unclear how and where the additional retail space will be located.
fresh coat of paint may in fact reinvigorate this modern icon, let’s hope the final product of the Port Authority’s undertaking does not detract from the dynamic structural form and intention of Nervi’s work.


Image 4.4: Broadway Exterior Entrance Mosaic detail (2011)
Preservation Challenges and Recommendations

Key to the George Washington Bridge Bus Station’s fate is its use; currently the transportation hub still confronts grave underutilization. More than four million passengers utilized the station in 2010 or an average of nearly 11,000 passengers each day passed through the terminal, numbers far below capacity. However, the largest hurdle to the protection of the George Washington Bus Station is not the love/hate relationship people may have with the mid-century building, it is the ownership. Given the quasi-government, bi-state status of the Port Authority of New York and New Jersey, the property is not under city jurisdiction but under that of the PANYNJ within New York State. Therefore, although the Landmarks Preservation Commission (LPC) may declare the George Washington Bridge Bus Station a local landmark, the designation is in title only. The bi-state ownership of the structure allows the Port Authority to act independently of New York City and therefore any recommendations the LPC are provide are advisory only.

Similarly, in the summer of 1994, the Landmarks Preservation Board declared the Port Authority owned Trans World Airlines terminal at the John F. Kennedy International Airport a landmark. The 1960’s iconic curvilinear form designed by Eero Saarinen & Associates, was completed in 1962, and although aesthetically variant from Nervi’s uptown hub, the buildings were contemporaries. Functionally obsolete for its original purposes, the terminal was threatened with demolition or total abandonment in recent years. Fortunately however, with strong local support from advocacy groups such as the New York Landmarks Conservancy (NYLC) and DOCOMOMO, support for the building has grown and is today considered a symbol of international travel coupled with an imaginative modern approach to architecture. Furthermore in recent years the Port Authority’s appreciation for the building has grown as well while forming a partnership with the NYLC. As of 2011, the Port Authority has secured a tenant for


the building that intends to both revitalize and preserve the building in compliance with local and state preservation standards.  

The TWA building can therefore be a model of responsible stewardship; however National register eligibility is a crucial step in order to ensure long-term preservation of the building. Due to the ownership issue, the only official means of protection are through federal and state preservation programs. Legislation such as Section 4(f) of the Department of Transportation Act and the National Historic Preservation Act’s Section 106 enforceable through the New York State Historic Preservation Office (SHPO). Once such landmarking is achieved there is hope that the Port Authority will recognize and maintain the Nervi masterpiece within New York City.

There is little doubt in the great importance of the George Washington Bus Station as a transportation icon, an engineering wonder or New York’s lone Nervi structure, yet the George Washington Bus Station has not yet been declared eligible for the listing in the National Register of Historic Places. The eligibility is the first and necessary step to allow the state to intercede if alterations are proposed to the distinctive structure. Unfortunately, such involvement is advisory only; however the Port Authority would be obligated under the National Historic Preservation Act guidelines to thoroughly explore all options, recommendations and comments presented by the New York’s SHPO.

Furthermore given the interconnected nature of the building with the Trans-Manhattan Expressway, one may argue that any change to the structure may trigger an assessment by the Department of Transportation under Section 4(f). And unlike the NHPA guidelines, the Section 4(f) process and decisions are binding; therefore any use of federal monies for the improvement of the Bus Station may first require federal approval, through the DOT. However, given the Port Authority’s recent partnerships with private developers, the agency may not trigger Section 4(f) if their funding is provided through private sources.

Lastly, the Port Authority of New York and New Jersey will need to recognize the structural and architectural icon within their property holdings. The building is an arresting engineering feat from the mid-century and is unique not just within New York City, but also in the prolific lexicon of Pier Luigi Nervi. On par with the George Washington Bridge, an engineering wonder,

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and the local landmark the TWA, Pier Luigi Nervi’s George Washington Bridge Bus Station is a unique treasure not just within the Port Authority’s possession, but for the city and region as well. The building is an award winning structure and admired by such well-respected architecture critics as Ada Louise Huxtable and R.M. Stern and Reynar Benham. As one of the few Nervi buildings in the United States, the structure represents a moment of great experimental architecture by a governmental agency. The Port Authority must treasure the building for the icon and significance it attained from the moment of inception.

Furthermore, designed by the “master builder” and constructed by a team of talented engineers and contractors the George Washington Bridge Bus Station was built efficiently and was well-crafted. After 50 years it remains structurally sounds and visually resplendent. With the proper care and stewardship the mid-century modern icon will thrive for another fifty.

The Bus Station’s critics may argue that the building is insensitive; aiming to connect more with the engineering wonder hovering over the ocean than with the built form it is located within. However, its size, materials, form and use of concrete is unlike anything else in New York City, and so although it may have its detractors, even they acknowledge the distinctive aesthetic of the building. Furthermore, the building is more than just a mid-century icon; it is a functioning transportation hub and local retail spot.

But perhaps best of all, on a sunny, clear day, the blue sky is visible through those various peaks and openings in the bus station. It is adventurous and grand, just as a starting a journey should be.
Image 4.5: The George Washington Bridge Bus Station at West 179th Street and Fort Washington Avenue (2011)

Image 4.6: Roof Detail (interior) (2011)
Image 4.7: George Washington Bridge Apartments, Western Façade from West 179th Street (2011)
Image 4.8: Eastern Façade of the Upper Deck of the George Washington Bridge Bus Station (2011)

Image 4.9: Interior Roof Detail (2011)
Bibliography


