

The Problem of Air New Zealand House in 1960s Auckland

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Abstract

In the 1960s, Auckland's Downtown site at the prominent No. 1 Queen Street gateway faced comprehensive redevelopment, with a series of proposals combining the clearance of numerous old buildings and their replacement with a convention centre, department stores, high-rise office buildings and a public space that ultimately became known as Queen Elizabeth II Square. The Square was proposed in the first scheme developed by Professor Robert Terence Kennedy of the University of Auckland. A later scheme, by Connor & Associates, introduced a 22 storey office building on its north side.

This paper explores the controversy surrounding this office building: Air New Zealand House. Groups of young architects and planners, particularly members of the Auckland Architectural Association (AAA), objected to the building, because of the negative effects they believed it would have, including increased wind speeds at street level at its base and excessive shading on the Square to its south.

Utilising archival documents and newspaper reports, this paper examines the campaign against this urban renewal proposal and the technologies that the opponents used to build their case, and to demonstrate and present their concerns, particularly wind tunnel testing. The main research question becomes, how effective were the technologies of the day in predicting the negative impact that Air New Zealand House would have on its immediate surrounds?

In the end, the Auckland City Council gave permission for the construction of Air New Zealand House. As built, it confirmed all the predictions about increased wind speeds and shading; QEII Square's value as a public space

was compromised from the outset. The paper shows that economics and politics were privileged over amenity value. And the decision was short-sighted, as evidenced by another major redevelopment of the site, underway at the present time.

Introduction

In the 1960s, the use of wind tunnel testing for building research was relatively new. Early testing had used aeronautical wind tunnel technology to investigate aspects of wind-building interaction, but discrepancies in the results had not proven credible. In the early 1960s, however, researchers began to overcome inconsistencies and develop the technology to make it more reliable.¹

These advances coincided with the comprehensive redevelopment of cities post-war and the proliferation of high-rise office buildings utilising steel and concrete-framed construction. Wind tunnel testing was further developed to investigate the relationship between buildings and wind. The First International Conference on Wind Effects on Building and Structure was held at Farnborough, in the United Kingdom, in 1963. This event heightened awareness of the technology and its possibilities. The central prerogatives were: 1) to measure the force of the wind on façades, which now often comprised light-weight cladding systems such as glass curtain walling; and 2) to understand the extent and effects of increased wind speeds at street level, around the bases of high-rise buildings.² In this way, there is a direct relationship between the modernist architecture of the period and the improvement of the wind tunnel testing technology to analyse the design of new buildings and their locations in urban contexts.

This paper explores what is thought to be the first New Zealand example of wind tunnel testing for a proposed building: No. 1 Queen Street, gateway to Auckland's main commercial thoroughfare and abutting the waterfront, which in this era, was designated mainly for port activities. The now iconic 'red fence' sealed off public access to piers and the sea. Known in the design phase as Office Block No. 1, it was renamed Air New Zealand House (1968-72) and is now HSBC House. The paper is part of more extensive research on the 1960s Downtown Scheme, with future work drawing on interviews with architects, planners and legal counsel, to elucidate the processes involved in the decisions towards an arguably compromised outcome for Auckland's public realm.

By the 1960s, the lower or northern end of Queen Street had become rat-infested and dilapidated as the city's economic locus moved from the port, uphill to the south. Much of it was reclaimed land and primarily owned by the Auckland Harbour Board (AHB). The Board began to make plans for the renewal of a substantial tract of land bounded by Quay Street and Customs Street. This paper does not aim to present a history of the Downtown area, already covered by Robert Hanson, John Sutherland and Dennis Smith.³ Instead, it focuses on the design and realisation of Office Block No.1/Air New Zealand House, its effects on its immediate neighbour, Queen Elizabeth II Square (QEII Square) (see Fig. 1 and Fig. 2) and the campaign mounted against it.

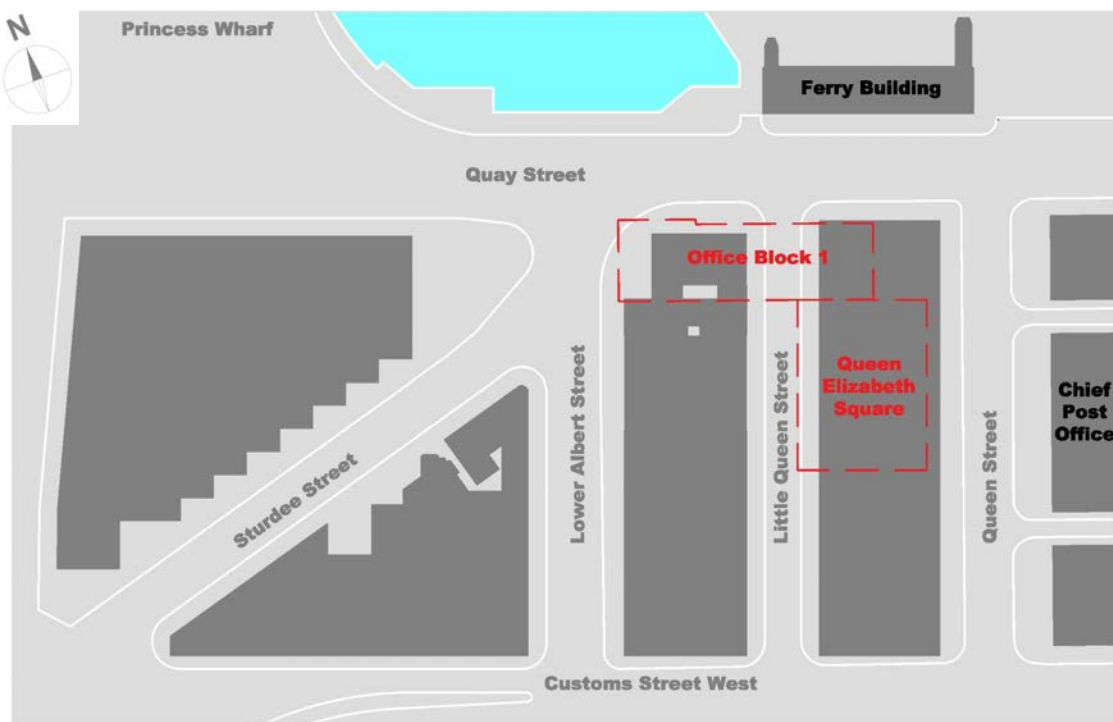


Figure 1. Downtown Auckland in 1968, with the locations of Office Block 1 and QEII Square identified in dotted lines. Image by Luciana Mota. Adapted from Hanson, "Urban Renewal and the Downtown Area," 1968.

A group of young architects and legal counsel, many of whom went on to have significant careers, led the resistance. Ivan Juriss, Marshall Cook and David Mitchell eventually won the New Zealand Institute of Architects' (NZIA) highest honour, the Gold Medal, with Julian Miles and Paul Cavanagh becoming Queens Counsel. The campaign employed the current building technologies, including solar charts and wind tunnel testing, to investigate shadowing and wind speeds around the base of the proposal.⁴ Despite the evidence presented, the Auckland City Council and Town and Country Planning Appeal Board (now the Environment Court) dismissed the objections in 1968. The 21-storey office building, with ground floor retail space and basement car parking, was completed in

1972 (developed by the AMP Society, designed by Peddle, Thorp & Walker, and built by Mainline-Dillingham-Fletcher Ltd), with Queen Elizabeth Square II opening in 1980.⁵ The campaign's predictions were vindicated, with politics and economics privileged over amenity values. The paper begins with a brief contextual overview of the Downtown Scheme before examining, in greater depth, the Office Block No. 1 proposal and the main strands of the debate and evidence presented leading up to its approval.



Figure 2. Downtown Auckland in 2017, before recent demolitions. Image by Luciana Mota. Adapted from Auckland Council's GIS.

The Downtown Scheme

Professor Robert Kennedy, an English architect-planner, appointed in 1957 to establish the University of Auckland's Department of Town Planning, was commissioned by the AHB to prepare the first plans to redevelop the Downtown area. His outline plan, released in January 1964, covered a 13-hectare site – five owned by the AHB.⁶ Among other ideas, he envisaged closing the northern block of lower Queen Street, along with Little Queen Street and Sturdee Street to the west, to accommodate 20 new multi-storeyed commercial and residential buildings. Central to this was the creation of a substantial pedestrian plaza abutting the sumptuous Edwardian Baroque Chief Post Office (built 1909-12, with a street frontage of 55 metres). To be known as Queen Square, it would “provide ample room for the civic amenities and embellishments of sculpture, fountains, trees and plants.”⁷ Kennedy also proposed a 22-storey office block on the northwest side of the Square (see Fig. 3).

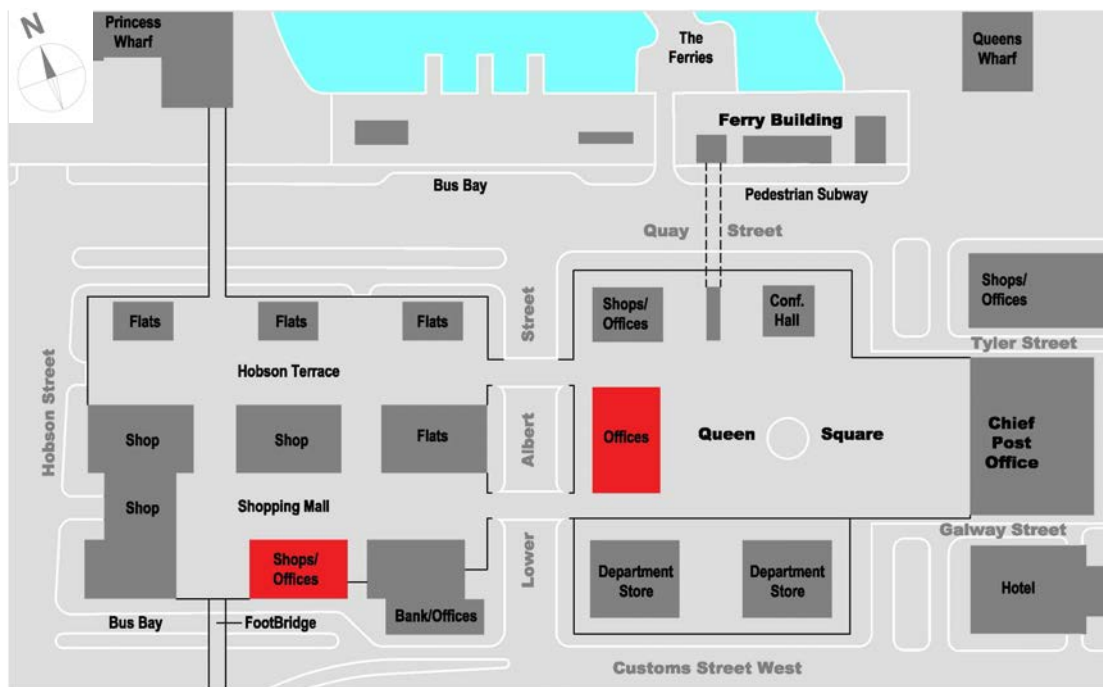


Figure 3. Part of Kennedy’s Downtown proposal. Image by Luciana Mota. Adapted from Smith, “A Short History of the Sixties Downtown,” 2013.

For Stage 1 of the redevelopment, the AHB then commissioned George J. Connor & Associates to prepare a study for a smaller 2.83-hectare site bounded by Queen, Customs, and Quay Streets, with an emphasis on commercial feasibility. The Connor proposal abandoned residential development in favour of shops, offices and car parking. The podium also went, and Lower Queen Street was retained, with a much-diminished square to the west. The 22-storey tower (now referred to as Office Block No. 1) moved from the north-west to the northern boundary of the square (see Fig. 4).

Armed with both possible master plans, the AHB invited developers to tender for Stage 1, while emphasising that a firm decision had not yet been made. Although both schemes were included in the tender documentation, the Board’s preference, in its statement of outcomes, was aligned with the Connor plan.⁸

The tender closed in January 1966. Three months later, the AHB announced the winner – the Australian and New Zealand consortium of Mainline-Dillingham-Fletcher (MDF). The bid included a series of conditions. Among these, the consortium required that a life insurance company (in fact, the AMP Society) would own the principal office block sites.⁹ The enactment of the Auckland Harbour Board Loan and Empowering Act 1967 enabled the Board to create a freehold title for No. 1 Queen Street, meeting MDF’s terms.¹⁰

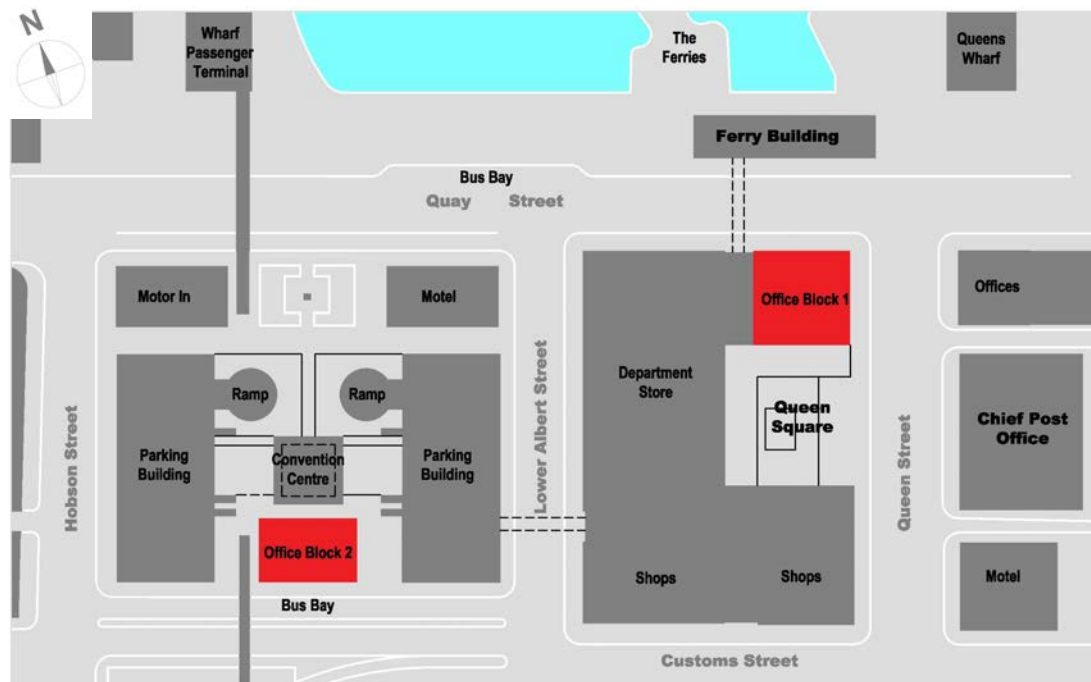


Figure 4. Connor & Associates' Downtown proposal. Image by Luciana Mota. Source: Sutherland, "Downtown Auckland," 1976.

Approval for Office Block 1

The process to secure Auckland City Council approval for proceeding with MDF's scheme started in June 1966, when the consortium submitted a report and a set of drawings of the Downtown Scheme to the Council for analysis. The Director of Works and City Engineer, A. J. Dickson, noted that three buildings – Office Blocks 1 and 2 and a Motel – all infringed the height limit of 110 feet (33.53 metres) and "the bulk control of 65 degrees from the centre line of the adjacent street."¹¹ Thus, the buildings did not comply with the height limits and angular plane provisions specified in the Council's District Scheme (subsequently District Plan). Dickson also expressed concern about the shading that Office Block 1 would cast over the square. He noted that the public space would be entirely in shadow from approximately 11:00 a.m. to 1:30 p.m. at the time of equinoxes in September and March each year, and from around 10:00 a.m. to 2:00 p.m. at the time of the winter solstice in June.¹² Recommending approval of the proposal in principle, he advised, among other things, that "further consideration should be given to the relationship between Office Block No. 1 and the proposed Square."¹³ Following Dickson's advice, the Town Clerk approved the project in principle in August 1966.¹⁴

MDF's solicitors sought formal confirmation of the approval in April 1968.¹⁵ At this time, Dickson explained to the Town Clerk that Council had not yet given consent for the construction of Office Blocks 1 and 2 and that it would need to consider both under Ordinance 901, because of their height and bulk.¹⁶ Upon learning this, the consortium

sought a dispensation for Office Block 1 to exceed the height and bulk regulations and a further exemption to build colonnades instead of verandahs on the street frontage.¹⁷ B. Duder, from the Town Planning Division, suggested the reorientation of the Block from east-west to north-south alignment to the Deputy Mayor A. O. Glasse as a viable option.¹⁸ It was to no avail, and in June 1968 the Council's Town Planning Committee granted the dispensations.¹⁹ By this time, MDF had secured Air New Zealand as the future occupant of Office Block 1.

The Office Block 1 Campaign

As soon as the dispensations became publicly known, the Auckland Architectural Association (AAA), a lobby group formed in 1965, complained that the Auckland City Council had not publicly notified the proposal.²⁰ The New Zealand Institute of Architects (NZIA) soon raised its concern too. All parties recognised that formal objections would delay the project and that even the threat of such a delay could influence the financial backers to withdraw from the project.

Despite this possibility, the AAA, NZIA, University of Auckland's School of Architecture and Department of Town Planning staff, and other young Auckland architects started a campaign against the construction of Office Block 1. In July 1968, the AHB attended meetings with the AAA and University staff to try to "correct misconception" about the scheme. Meanwhile, the project architects increased the proposed height of the colonnade to 10 feet (3.05 metres), but refused to move the tower to a different part of the site.²¹

Besides the AAA and the NZIA, which were represented by the same solicitor (Nicholson, Gribbin & Co), two more groups soon raised objections. One comprised architects Nigel Cook, Marshall Cook and David Mitchell, and the other, architects Ivan Juriss and Keith E. Hay, architectural student Allan Quinn and solicitor Frank Haigh. Their objections were against the height and bulk of Office Blocks 1 and 2, and the lack of verandahs on Office Block 1 and the Parking Building. The Auckland City Council would only consider the objection against the height and bulk of Office Blocks 1 and 2 – not the lack of a verandah on Office Block 1 or the Parking Building.²²

From the outset, the NZIA had been tentative in expressing its objection. Following discussions with the AHB, it withdrew, leaving the other groups to proceed without it.²³

The Hearings and the Experiment

Council heard the objections at a special meeting in August 1968. Julian Miles, representing the team of Cook, Cook and Mitchell, clarified that their only complaint was the positioning of the Office Block 1. They based this on the “technical nature relating to sun and shade diagrams and the effect of winds upon buildings of this height.”²⁴ They claimed that Queen Square would be “virtually shaded in its entirety from approximately 11:00 a.m. to 2:00 p.m.,” exactly “the time when the users of this square are going to want to use it.”²⁵ Miles presented evidence of wind tests carried out in England on a model of a building of a design similar to Office Block 1. Research showed that “when winds hitting a building at approximately this height hit the building, are drawn down to the square itself in a type of vortex action and, by the time it reaches the ground level it is going at something like twice its original speed.”²⁶

At the August meeting, the Juriss group presented an alternative design, relocating Office Block 1 from the site’s northern boundary to a more central location, on the west side of the Square (see Fig. 5). They aimed to find a solution that would save the public square from the shade of the building. They also worked to increase opposition to the proposed design by publishing their arguments and an alternative plan in the *AA Bulletin*.²⁷

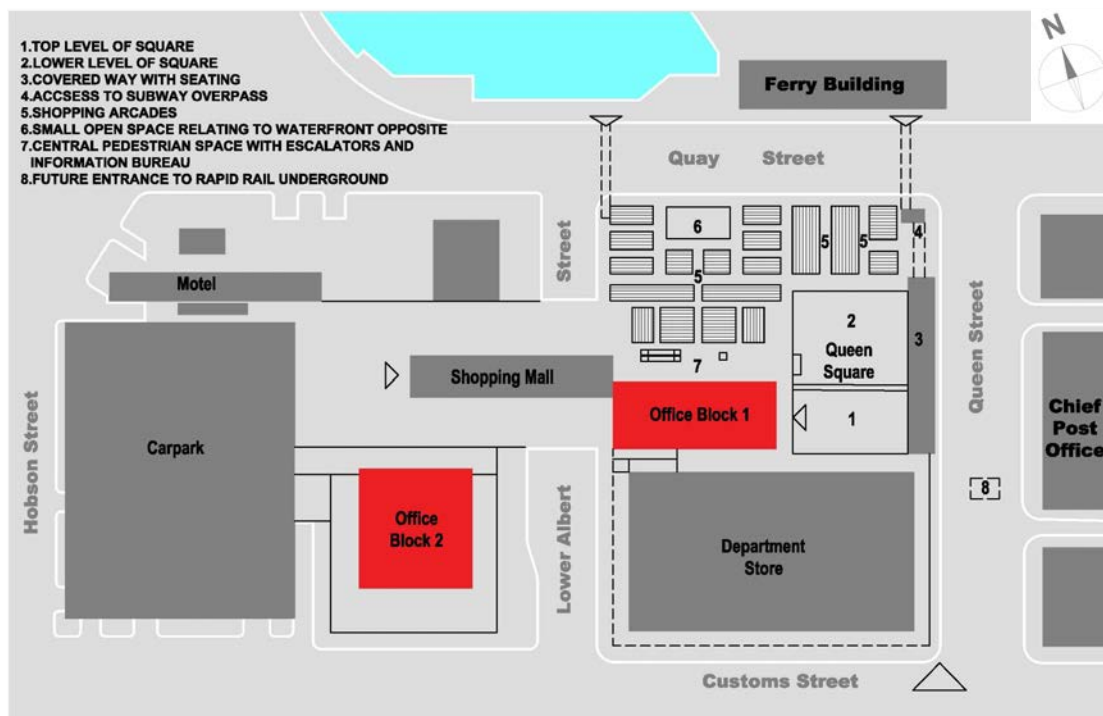


Figure 5. Alternative scheme proposed by the Juriss group.
Image by Luciana Mota. Adapted from *AA Bulletin*, no. 22, n.p.

Other objectors included Mr Curtis, from the AAA, and Professor Kennedy. Curtis noted that the location of Office Block 1 had been raised in the discussions held in 1966, yet the AHB's architects had not modified their design. Kennedy, invited by the AHB to comment on the MDF proposal, was particularly conscious that his plan had been superseded.²⁸

David Beattie QC (later Sir David Beattie and Governor General) represented the AHB. Referring to an article by D. E. Sexton – an engineer at the United Kingdom's Building Research Station (BRS) – he argued that “no series of tests on typical cases can provide sufficient information to predict what conditions will occur around all arrangements of building and many ad hoc tests of new developments have been made.”²⁹ He concluded somewhat bizarrely, given Auckland's windy subtropical climate, “that vortex formations by a large building is not necessarily an unwelcome problem. In hot, humid regions, wind speeds are often low, and by correct choices of building shapes a vortex can be generated which will provide welcome breezes.”³⁰ There is no record of the Sexton publication to which Beattie was referring, although the comment may have been taken out of context from a report mentioning Sexton, believed to have been given to the Council by David Mitchell. Beattie may also have been alluding to Sexton's early work in the field, where Sexton noted that it was not “possible in wind tunnel equipment to reproduce correctly all the features present at full scale, for example, the turbulence or gustiness of the wind.”³¹

Although Beattie's attestation demonstrates the extent to which the technology was still thought to be in its infancy in the 1960s, studies on the wind effects of tall buildings were being carried out around the world. The BRS, in particular, responding to concerns about pedestrian discomfort and damage to doors and windows in shopping precincts and around multi-storey buildings, was demonstrating that it was possible to create an acceptable test correcting the irregularities of earlier technologies.³² In a 1964 publication (reprinted in 1965), Sexton described a BRS wind tunnel costing around £2,500, “constructed in part of an existing building, 75ft x 40ft on plan”, and similar to one constructed at the Texas Engineering Station.³³ In an article published in 1968, however, Sexton outlines a simplified model: one “suitable for teaching purposes and ad hoc testing in relation to airflow around buildings”, costing around a £1,000, not requiring special contractors and fitting into a space not exceeding 20ft long by 15ft wide by 10ft high (6.0m by 4.5m by 3.0m).³⁴ (see Fig. 6)

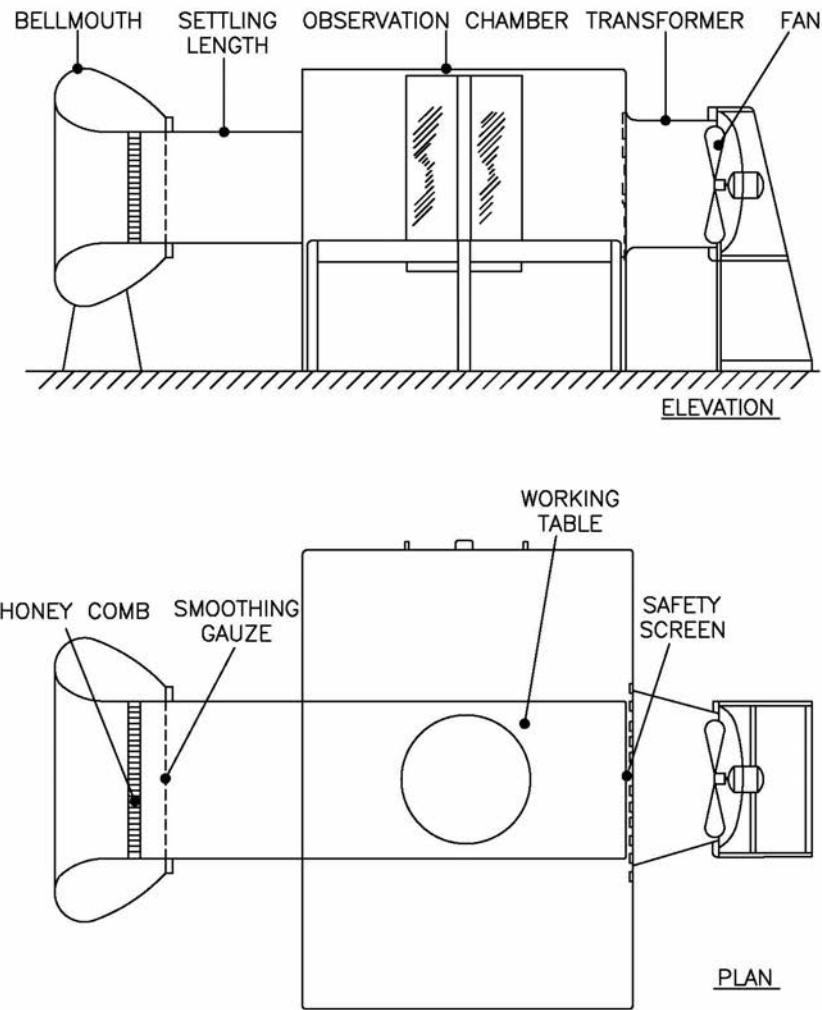


Figure 6. Simple wind tunnel design by Sexton. Image by authors.
 Source: Sexton, "A Simple Wind-Tunnel for Studying Air-Flow Round Buildings," 1968.

At the hearing, Beattie also asserted that his clients could not re-position Office Block 1 because Air New Zealand (now the tenant) wished for "maximum visibility," and that the Juriss alternative was "an unfavourable location from the point of view of public access." He suggested that Queen Square "should rather be called a 'place'," and as a square, people should consider Office Block 1's first-floor terrace: a "7,000 sq. ft. [650.3 square metres] Garden deck into the sun, with a view, for the use of Aucklanders."³⁵

The Auckland City Council found in favour of the developers. While recognising the shade and wind effects that the tall building would have on the Square, councillors concluded the impact did not justify "a reduction in the permitted height of the building that could jeopardise the construction of this building, and might perhaps result in the abandonment of the whole Downtown Scheme." Furthermore, they claimed that they did

not have the jurisdiction to require the applicants to relocate the building elsewhere on the site.³⁶

Cook, Cook and Mitchell continued their campaign against Office Block 1, drawing up a petition asking the Auckland City Council to deny the project planning permission, collecting signatures on the streets of Auckland.³⁷ They also made what is thought to have been New Zealand's first wind tunnel for testing the wind effects of a proposed building. The Tunnel, constructed in the former Browns Mill building (Durham Lane, Auckland), was based on Sexton's drawings, which Nigel Cook took from one of the British journal articles then recently published.³⁸

The article describes the design and performance of a simple, low-speed wind tunnel that Sexton had constructed inside an old building. Cook, Cook and Mitchell's wind tunnel included a scale model of the Downtown Scheme with fans and smoke to demonstrate the effects of wind. Their efforts generated media attention, with Television New Zealand screening the experiment on its *Town and Around* programme,³⁹ the nightly magazine-format current affairs show that followed the evening news in the mid-to-late 1960s.

The Juriss and Cook, Cook and Mitchell groups decided to appeal the Council's decision. They sought to get the dispensations allowing the building to breach the Council's height limit and angular plane provisions revoked – although the re-siting of the building remained their preferred option. The case was heard by the Town and Country Planning Appeal Board in October 1968. The Board, convinced by the AHB and MDF claim that “the proposed office building was appropriately sited and well designed and was unlikely to cause any but minimal difficulties as regards shade or wind,” upheld the Council's decision to grant the dispensations.⁴⁰

The Aftermath

When Air New Zealand House opened, it was immediately apparent that all the predictions regarding wind effects and shading were realised, exactly as per the objectors' research and analyses. In particular, the wind tunnel tests performed by Cook, Cook and Mitchell were verified *in loco*, after construction.

The corner of Air New Zealand House at the intersection of Queen and Quay Streets was soon recognised as problematic. Indeed, in a 1974 newspaper article highlighting the “swirls around the tall buildings of the downtown redevelopment scheme”, senior Auckland City Council planner, J. R. Betts, described it as a “particularly bad spot”.⁴¹ That

year, the Council commissioned staff at the University of Auckland's School of Engineering to conduct a wind tunnel test for the building, in an effort to work out how to relieve the effects of the wind on pedestrians.⁴² Now accepting the wind effects, MDF (by this time Fletcher-Mainline Downtown Ltd) expressed interest in the results, to inform the design of the canopy "as a continuation of the office block colonnade to the Queen and Customs Streets corner".⁴³ One of those involved in the testing, D.H. Freeston, a senior lecturer in Engineering, concluded that the results showed that "the presence of the canopy resulted in no significant improvement under north-east wind conditions," and only "slight improvement directly under the canopy with south-west winds."⁴⁴ The Downtown saga appears to have prompted the University to take an interest in wind tunnel testing, with a tunnel built at the School of Engineering City Campus in the late 1960s and research becoming well established in the following decade.⁴⁵

The criticisms continued. In 1976, architect and future academic John Sutherland published an appraisal of the completed parts of the Downtown Scheme. Although QEII Square was unfinished, he could already describe the effects as predicted in 1968:

The square is no place for the less than hardy when shaded and no place at all when moderate breezes blow. A TV2 programme last year was able to find someone actually blown off their feet, Wellington style.⁴⁶

A 1977 book, *Walking Around Town*, identified the Square as one of four New Zealand examples of public spaces that suffered from wind and shading issues. The author, J. Mackay, noted that the winds were stronger higher up the exterior walls of the building and the "downflow twists into a horseshoe vortex, which wraps around the building, causing high velocities at street level near the front face and corners of the building."⁴⁷ Of the Square, he wrote:

Within the Square the air is gusty, and a clockwise rising vortex sucks up litter and deposits it on the three-storey roof of the shopping complex. Meanwhile, at the front face of the building, the aggravated wind conditions make the crossing of Quay Street to the ferry terminal very unpleasant.⁴⁸

In rethinking the future of the Downtown site in 2014, the Auckland Council (which subsumed the Auckland City Council in 2010) commissioned an evaluation of the public spaces in the area. This evaluation re-confirmed all earlier assessments, concluding that the Square was an uncomfortable space: in the shade "at the crucial lunchtime and evening times most of the year," with "localized wind turbulence caused by wind shear of adjacent buildings."⁴⁹ When the Council sold much of the city block in 2015, there was

little expectation that the public space would survive redevelopment. Thus it came to pass in 2016, despite a vigorous legal challenge from the Auckland Architectural Association over the Council's right to sell the land and sacrifice public space in a city already short of urban squares in its heartland.

Conclusion

This paper has examined the controversy that surrounded the realisation of Auckland's Air New Zealand House in the 1960s, including the use of the new and emerging technology of wind tunnel testing for buildings in urban environments, as part of a campaign to prevent the building from being built as per the original design. The paper shows how the young New Zealand architects researched international developments in the technology available at that time and applied their research to the specifics of the design for Air New Zealand House and its context.

The design of Air New Zealand House coincided with the dissemination of the new research on wind tunnel testing, at conferences and in books and journals. The publications were available in New Zealand, enabling Nigel Cook, Marshall Cook and David Mitchell to build their wind-tunnel, utilising a scale model of the scheme. They produced an accurate forecast of the increased wind speeds and shading that the new building would have on its surrounds, to the detriment of pedestrians.

Their conclusions had little impact at the time. The Auckland City Council gave permission for Air New Zealand House to be built, including dispensations so that it could exceed the Council's prescribed height and bulk regulations, because of concern that if it did not meet the developers' demands, then they might withdraw from the project.

The completion of the building confirmed all the concerns regarding increased wind speeds at the base of Air New Zealand House and its shading of QEII Square at times when members of the public were most likely to use it. Post-occupancy comments affirmed that the wind tunnel investigations made by Cook, Cook and Mitchell in 1968 had been correct in their results and conclusions.

At the time of writing, the whole of the Downtown site is again under comprehensive redevelopment. Given the dissatisfaction about the wind and shading effects, it is perhaps surprising that it took 50 years to address the issues. Even so, Air New Zealand House (HSBC House) stays, while most of the public space to its south goes, to be replaced by more tall buildings.

Notes

- ¹ T. V. Lawson, *Wind Effects on Building: Volume 1, Design Applications* (London: Applied Science Publishers Ltd, 1980), 268-269.
- ² Angus J MacDonald, *Wind Loading on Buildings* (London: Applied Science Publishers Ltd, 1975), 19; D. E Sexton, "Design and Performance of Wind Tunnel for Building Research", *Building Science*, 1 (1965): 141-151.
- ³ Robert A. C. Hanson, "Urban Renewal and the Downtown Area," BArch unpublished sub-thesis, University of Auckland, 1968; John Sutherland, "Downtown Auckland," *NZIA Journal* 43, no.5, (October 1976): 8-27; and Dennis Smith, "A Short History of the Sixties Downtown," *Architecture New Zealand*, no. 2 (2013): 25-37.
- ⁴ From 1967, sun-path diagrams for the latitude of Auckland (36.8°S) were available in Lyndon Bastings, *Sunshine and Shade: A Handbook for New Zealand* (New Zealand: Building Research Bureau of New Zealand Inc., 1967).
- ⁵ "Queen Elizabeth Square," *Te Ara*. Accessed May 28, 2018, <https://teara.govt.nz/en/photograph/22956/queen-elizabeth-square>.
- ⁶ R.T. Kennedy, *Auckland Central Area Properties: Report and Redevelopment Plan*, January 1964, Kennedy Papers, Box 21, Architecture Archive, University of Auckland; and Smith, "A Short History of the Sixties Downtown," 26.
- ⁷ "City Gateway Worthy of Best Country Can Offer In Fine Buildings," *New Zealand Herald*, February 26, 1964.
- ⁸ Auckland Harbour Board, "Invitation to a Tender for Central Area Properties Development Scheme, Stage 1," Prospectus, Part 1, 1965.
- ⁹ Smith, "A Short History of the Sixties Downtown," 33.
- ¹⁰ Auckland Harbour Board Loan and Empowering 1967, no. 7, 1462-1463.
- ¹¹ Letter, A. J. Dickson, Director of Works and City Engineer, Auckland City Council, to the Town Clerk, 27.07.1966, 5, ACC 275, Auckland Council Archives.
- ¹² Letter, Dickson to Town Clerk, 6.
- ¹³ Letter, Dickson to Town Clerk, 8.
- ¹⁴ Memorandum for the Director of Works and City Engineer, August 25, 1966, ACC 219, Auckland Council Archives.
- ¹⁵ Letter, Finlay, Shieff, Angland & Maclaren, to the Town Clerk, April 18, 1968, ACC 275, Auckland Council Archives.
- ¹⁶ Letter, A. J. Dickson to the Town Clerk, May 22, 1968, ACC 275, Auckland Council Archives.
- ¹⁷ Letter, Finlay, Shieff, Angland & Maclaren, to the Town Clerk, June 4, 1968, ACC 275, Auckland Council Archives.
- ¹⁸ Memorandum of Discussion, June 5, 1968, ACC 275, Auckland Council Archives.
- ¹⁹ "Downtown' Dispensation," *Auckland Star*, June 19, 1968.
- ²⁰ "Dispensation on Downtown Plans Criticized," *Auckland Star*, June 22, 1968.
- ²¹ "Builders Oppose Scheme Delay," *New Zealand Herald*, July 30, 1968; "Objection Can Delay Scheme," *Auckland Star*, July 23, 1968.
- ²² Letter, A. J. Dickson to the Town Clerk, August 5, 1968, ACC 275, Auckland Council Archives.
- ²³ Letters of objections, July 26, 1968, 4, Auckland Council Archives.
- ²⁴ Minutes of Meeting of Council, Downtown Scheme, August 13, 1968, 12, ACC 275, Auckland Council Archives.
- ²⁵ Minutes of Meeting of Council, 12.
- ²⁶ Minutes of Meeting of Council, 13.
- ²⁷ "Downtown," *AA Bulletin*, 22 (1968): n.p.
- ²⁸ Minutes of Meeting of Council, Downtown Scheme, August 13, 1968, 21-25, ACC 275, Auckland Council Archives.
- ²⁹ Minutes of Meeting of Council. 27.
- ³⁰ Minutes of Meeting of Council, 27.
- ³¹ A. F. E. Wise, D. E. Sexton and M. S. T. Lillywhite, "Urban Planning Research: Studies of Air Flow Round Buildings," *Architects' Journal*, Vol. 141 (19 May 1965): 1185-1189, 1186.
- ³⁵ Wise, Sexton and Lillywhite, "Urban Planning Research," 1185.
- ³³ Sexton, "Design and Performance of a Wind Tunnel for Building Research", 141.
- ³⁴ D. E. Sexton, "A Simple Wind Tunnel for Studying Air-Flow Round Buildings," *Architect and Building News* (June 26 1968): 983-985.
- ³⁵ Minutes of Meeting of Council. Downtown Scheme, August 13, 1968, 27-29, ACC 275, Auckland Council Archives.

³⁶ Letter, G.O. Sims (the Town Clerk) to the Objectors, August 15, 1968, ACC 275, Auckland Council Archives.

³⁷ "Objectors Revisit QEII Wind-Tunnel," *New Zealand Herald*, October 5, 1996.

³⁸ Pers. comm. Nigel Cook to authors, May 30, 2018.

³⁹ "Objectors Revisit QEII Wind-Tunnel."

⁴⁰ The Town and Country Planning Appeal Board, Decision, November 21, 1968, ACC 275, Auckland Council Archives.

⁴¹ "Calm Down! The Boffins are Doing Something about it," *Auckland Star*, December 12, 1974.

⁴² "Calm Down! The Boffins are Doing Something about it."

⁴³ Letter, Fletcher-Mainline Downtown Limited to the City Planner, J. R. Betts, Auckland City Council, October 29, 1974, ACC 275, Auckland Council Archives. In 1971, as condition in allowing the construction of the Office Block 2, Council required the redesign of the covered pedestrian way shown on the original plans, and that it "shall be completed no later than the date of completion of the main building". Letter, J. R. Betts, Principal Planner – Projects, to the City Secretary, November 22, 1974, ACC 275, Auckland Council Archives.

⁴⁴ Letter, J. R. Betts, Principal Planner – Projects, to the City Secretary, December 2, 1974, ACC 275, Auckland Council Archives.

⁴⁵ Pers. comm. Professor Richard Flay to the authors, April 20, 2018.

⁴⁶ John Sutherland, "Downtown Auckland," *NZIA Journal* 43, no.5 (October 1976), 24.

⁴⁷ John D. Mackay, *Walking Around Town: Planning for Pedestrians in New Zealand* (Wellington: Town and Country Planning Division, Ministry of Works and Development, 1977), 22.

⁴⁸ Mackay, *Walking Around Town*, 46.

⁴⁹ RESET Urban Design, *Downtown Public Open Space Evaluation: Final Report*, September 4, 2014. Report commissioned by the Auckland Council.