QUEENSLAND COURTS

CORONERS COURT OF QUEENSLAND

FINDINGS OF INQUEST

CITATION:	**Inquest into the death of Christopher Jon WALTON**
TITLE OF COURT:	Coroners Court
JURISDICTION:	SOUTHPORT
FILE NO(s):	2012/4603
DELIVERED ON:	27 October 2016
DELIVERED AT:	SOUTHPORT
HEARING DATE(s):	4 May 2016 – 6 May 2016
FINDINGS OF:	James McDougall, Coroner
CATCHWORDS:	Coroners: inquest, awning collapse, method of construction, building inspections, building maintenance and modifications, awning scheme, significant corrosion and atmospheric factors.

REPRESENTATION:

Counsel Assisting:

Ms Rhiannon Helsen

Gold Coast City Council:

Mr John Bremhorst O/I McCullough Robertson Lawyers

Office of Industrial Relations for Workplace Health & Safety, Queensland:
Mr Andrew McCabe, Crown Law

Gregory Cavanagh:
Mr Ilan Klevansky instructed by Worcester & Co Solicitors

Kerry Shepherd:
Mr Matt Forbes, Shine Lawyers

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Introduction

1. Mr. Christopher Walton was 54 years of age at the time of his death. He resided in Currumbin Valley with his wife, Kerry Shepherd and son, Finlay. Shortly before midday on 23rd December 2012, Mr. Christopher Walton was walking along the northern side of James Street, Burleigh Heads when he stopped to speak to friends, John and Agnes Webber and their daughter Jillian Petty, who was with her children, Fletcher and Harrison. As they all talked while standing outside of 'Tides Boutique', the awning from 37 James Street ('Equity House') collapsed without warning. Mr. Webber describes hearing a loud noise, like the sound of buckling roofing iron, before the awning collapsed, falling too fast for anyone to react and move to safety. A bystander Ellie Seabrook describes the sound as a *'twisting metal type noise, a loud creaking sort of sound and also a snapping noise'.*

2. Mr. Walton became trapped against one of the building pillars, his chest taking the full force of the impact. John and Agnes Webber were also hit by the awning and knocked into an alcove. Jillian Webber was pinned under the awning for some time until it could be lifted, at which time she crawled into 'Tides Boutique', where her children had sought refuge. As a result of the awning collapse, Ms. Petty suffered multiple fractures to her right wrist, as well as fractures to her back and lacerations and bruising to her knee, shin and foot. Mrs. Webber suffered a broken wrist, as well as bruising and swelling to her right knee and lower left leg.

3. After being freed from the awning by bystanders, Mr. Walton collapsed. Despite extensive resuscitation attempts by bystanders, which were continued by attending Queensland Ambulance Service ('QAS') officers, Mr. Walton was unfortunately unable to be resuscitated. He was pronounced deceased at 12:17 pm.

Issues for inquest

4. On 20th November 2015 at a pre-inquest hearing, the following issues for the inquest were determined:

    - The findings required by s.45 (2) of the *Coroners Act 2003*; namely the identity of the deceased person, when, where and how he died and the cause of his death.

    - The circumstances and cause of the awning collapse at 37 James Street, Burleigh Heads on 23rd December 2012.

    - Whether the construction method used to attach the awning at 37 James Street, Burleigh Heads, is of common use in Queensland?

    - What further actions and safety measures can be introduced to prevent the future collapse of aged awnings attached to buildings?

    - Examine whether schemes could practicably be introduced in Queensland to prevent the collapse of awnings.

5. An inquest into Mr. Walton's death was held at the Coroners Court at Southport over three days from 4th May 2016 until 6th May 2016. Evidence was received by way of a large volume of exhibits, as well as oral evidence from 19 witnesses. A conclave of four expert engineers also provided evidence concurrently.

Findings at autopsy

6. On 27th December 2012, an external and full internal autopsy was conducted by Pathologist Dr. Beng Beng Ong. A post mortem CT scan, histology and toxicological testing were also carried out. The external examination revealed relatively mild injuries, including a head laceration and abrasions on the front of the chest, abdomen and back of the torso. In contrast, the internal examination showed extensive crushing-type injuries, including widespread damage to the left chest wall with multiple fractures to the ribs, a large laceration of the left hemidiaphragm with herniation of the abdominal organs through the laceration, a significant amount of haemorrhage in the left chest and abdominal cavities, lacerations of the spleen and mesentery and fractures of the pelvic bones. The cause of Mr. Walton's death was found to be multiple injuries due to or as a consequence of being crushed by the falling awning.

Incident location – Equity House

7. The incident occurred on the public footpath in front of 37 James Street, Burleigh Heads, which is a one way street that contains a large number of retail stores, including dining restaurants, cafes and fashion stores. A majority of the stores on James Street trade 7 days a week. There is angled vehicular parking on the northern side of the street, and parallel parking on the southern side of the street. Wide concrete footpaths are present on both sides of James Street, which are covered by large awnings. It is located some 200 - 300 metres from the beach.

8. Records from the Gold Coast City Council ('GCCC') indicate that the building was constructed in 1974. The building awning, however, was constructed at some time between June 1977 and February 1978 when the building was converted into a commercial space. It was initially unclear from the records retained by GCCC as to who the builder was at the time, subsequent information confirmed that Mr. Claus Sievers was the builder of Equity House.

9. Equity House is today a two storey commercial building housing six retail and commercial tenancies; three retail clothing stores on the ground level and three tenancies on the upper level. There is an alcove on the western side of the ground level approximately one third of the width of the building. This alcove provides the entrance to a retail clothing store called 'She Shops'. In the alcove there are stairs accessing the upper level of the building. There is a large tiled concrete pillar at the right hand entrance to the alcove and is on the leading edge of the building to the footpath. The pillar is also the corner boundary of the tenancy called 'Tides Boutique', a retail clothing store. Tides Boutique and its neighbour, 'Black Pepper' retail clothing store, occupy the centre and southern tenancies on the ground floor of the building. These tenancies have glass shop frontages with small recessed entrances. The glass shop frontages are also set back approximately 200mm from the front of the tiled pillar. There are similar pillars at the eastern and western ends of the building.

Specifications of the awning

10. Based upon the documentation held by the GCCC, the awning was constructed in 1977 of steel framework covered in tin cladding, a wooden ceiling and was supported at either side of the property by two concrete cantilever beams. There were no supporting posts to the awning at its outside extremities. It was 2.6 metres by 13.2 metres in length, and it overhung the footpath.

11. A number of torque controlled expansion anchors were used to connect the awning to the cantilever beams. Two sizes of anchors were used to connect the awning to the cantilever beams – 16 mm diameter and 10 mm diameter anchors. The specifications of the awning, when it was initially constructed, were stipulated by Engineer Antony Tod and Partners Engineers Drawings GS1953, Dwg 3 and provided to the GCCC for approval. The building plans submitted to the GCCC in 1977 in relation to 37 James Street, do not appear to indicate the depth to which the anchors were to be imbedded into the concrete. The Architect for the project was Malcolm R Cummings. The records suggest that the plan submitted was approved by the GCCC and as such was compliant with the requirements of the Factories and Shops Act 1960.

Ownership and maintenance of Equity House

12. Equity House is currently owned by Mr. Gregory Cavanagh, who purchased the property through Pelican Realty Pty Ltd, Burleigh Waters as an investment property in 2006. The visual structural and timber pest inspection report obtained by Mr. Cavanagh at the time of purchase notes that some cracks and gaps were observed in the block work of the building, however, no structural problems were found. Overall, the building was said to be in fair condition compared to other buildings of a similar age.

13. Equity House is managed through Pelican Realty Pty Ltd on Mr. Cavanagh's behalf. The agent manages the leasing and rent collection as well as the day to day management of the building tenancies. Pelican Realty Pty Ltd retains all records of the dates and payments for maintenance and repair work conducted on the building. General maintenance on the building is carried out by Peter Van Dorp, a self-employed general maintenance contractor, who is engaged by Pelican Realty. Mr. Cavanagh describes Mr. Van Dorp as a self-employed contractor who works for various real estate agents and property owners in the Burleigh area. He has worked at Equity House on dozens of occasions since Mr. Cavanagh purchased the building. He met Mr. Van Dorp through Pelican Realty who recommended him.

14. In a statement provided following the awning collapse, Mr. Van Dorp says his role at Equity House was to attend to minor repair work on buildings as requested by his clients, such as changing light bulbs, re-painting marked walls and fixing leaky taps. He holds a cabinet making trade certificate, and has been in maintenance for approximately 7 years. He was engaged by Pelican Realty to perform maintenance work on Equity House. However, he was also engaged directly by the building owner, Mr. Cavanagh in relation to other buildings he owns. He estimates that he had been requested to attend to minor maintenance repairs at Equity House for approximately 6 years. He only recalls one major renovation to 37 James Street, which was when the ground floor shop was divided into two,

which was around 2009. He asserts that in the time he has been attending the building, there has not been any work conducted on the awning aside from replacement of the roofing in May 2012, and the individual tenants installing front signage. All of the invoices issued by Mr. Van Dorp for maintenance work carried out at Equity House were subsequently provided during the course of the coronial investigation. Both Mr. Van Dorp and Mr. Cavanagh were called to give evidence during the inquest.

Modifications to Equity House

15. Records from the GCCC and information obtained from Mr. Cavanagh suggest that a number of modifications were made to the building during its lifetime. In April 1990, GCCC records suggest that approval was given for a satellite dish to be installed on the premises. Engineers from Connell Wagner carried out an independent design review of the proposed antenna installation, which included the wind loads. The installation was found to be structurally satisfactory in all respects. It does not appear that the awning was altered in anyway as a result of this installation.

16. In 1995 an office fit out was carried out for the building. This work was approved and does not appear to have structurally altered the building in anyway. In 1997 refurbishment work was approved to be carried out on the building. It appears from the plans that the only work conducted to the awning was the installation of a sign for the Bank of Queensland attached to the fascia of the awning.

17. According to Mr. Cavanagh, when he initially purchased the property in 2006, the two downstairs shops were occupied by the Bank of Queensland. After a couple of years, Bank of Queensland vacated the premises. In 2009, Mr. Cavanagh then had the space divided into two shops, one of which was used by his wife for her business, Tides Boutique. Around this time, the frontage of the building was also painted and new sheets of laminex and down lights were also placed underneath the shop awning. Changes were also made to the front glass of the shops at this time. These alterations were undertaken by Marcos Christofis for MCS Shopfitting Pty Ltd. Records held by the GCCC confirm that in 2009, an application was made for a further fit out to be carried out in the building by MCS Enterprises Pty Ltd on behalf of Mr. Cavanagh. Plans for these renovations suggest that the existing under awning signs were to be re-powder coated or painted white. The electrics were also serviced at this time to ensure they were all in working order. Records from the GCCC suggest that there were no structural elements to the internal fit out of the shop and all glazing and shopfront structure were unaltered.

18. Mr. Christofis told the inquest, his company removed all of the corrugated sheets from the underside of the awning and replaced them with a new sheeting. In addition, the front of the awning was capped in Colorbond. The purpose of these changes was to modernize the look of the awning. He stated that his brief from Mr. Cavanagh in relation to the building fit out was to *'tidy the building up, and make it look aesthetically pleasing'.*

19. Following removal of the underside of the awning, Mr. Christofis stated that he could see the internal steel frame, and did not observe any corrosion or other issues in relation to the condition of the awning which caused him concern. Mr. Christofis was questioned about the removal of the old metal corrugated sheeting.

Photographs taken following the awning collapse appear to indicate that old sheeting was still in place, but had been covered by a newer sheeting material. Mr. Christofis said it may not have been possible for all of the old sheeting to be removed due to access issues from the adjoining buildings. However photographs taken of the awning following the collapse seem to suggest that a large portion of the original corrugated metal sheeting was still in place and was simply covered by a newer material. In any event Mr. Christofis confirmed that during the course of the work he was engaged to perform on Equity House he did not see anything, which caused him to be concerned about the structural integrity of the awning.

20. In 2010 a further fit out application was sought in relation to Tides Boutique. This was subsequently approved by the GCCC, and does not appear to have included the awning.

Replacement of the roof

21. Most significantly, in March 2012 Mr. Cavanagh employed a roofing contractor, Top Stuff Plus Pty Ltd, to replace a portion of the building's roof, which included the roofing material of the awning. This work was undertaken after a number of water leaks were experienced in the upper tenancies of the building. According to evidence provided by Mr. Cavanagh during the inquest, there had been between six to eight leaks reported between 2008 and 2012. Invoices for the work performed by Mr. Van Dorp at Equity House suggest that various minor maintenance work had been carried out in response to leakages experienced by a number of tenants, as early as April 2010.

22. According to Mr. Andrew Laing, a former tenant at Equity House from 2011 until late 2012, he experienced ongoing water leaking and water damage in his office, which was on the second floor on the eastern side of the building overlooking the awning. He recalls that after a significant rain storm sometime before May 2012, there was water pooled in the corner of his office, which had soiled the carpet (an area that was approximately 1m x 1m). The area that was wet was directly under the window, which was against the wall that the awning joined on the eastern end. He recalls that the water was a dirty brown colour and appeared to contain rust. Mr. Laing also recalled seeing water pool in the gutters on the top of the awning after heavy rain. He subsequently made a number of complaints to Pelican Realty, requesting that work be done on the roof to fix the leaking from the ceiling. The ceiling in his office had started to bow as a result of the water leak. Mr. Cavanagh was aware of the water leakage in Mr. Laing's tenancy.

23. Mr. Van Dorp was asked about the water leakages at Equity House. He disagreed that water leakage was a common complaint made by the tenants and described the leaks as *'just minor leaks when it rained'*. Furthermore, he asserted that none of the water leakages were near the awning. Clearly, this does not accord with the account provided by Mr. Laing

24. Mr. Cavanagh recalls that in early 2012, Mr. Van Dorp applied silicone in one office upstairs (minor), then in another office (minor), and then to the main roof. There was then a period of rain, then no rain, after which time Mr. Van Dorp was sent back and could not find any problem. Mr. Cavanagh had a number of conversations with Mr. Van Dorp over the years about the building, and recalls requesting him to co-ordinate the roof repairs. When asked during the inquest as to why he decided to replace the roof in 2012, Mr. Cavanagh stated that due to

the disruption caused to businesses by the recurring leaks he thought it was necessary to have an expert look at the issue.

25. In 2012, Mr. Van Dorp made arrangements for Mr. Jerome Smith from Top Stuff Plus Roofing to attend Equity House to determine the source of the water leaks into the tenancies on the upper level of the building, and to quote on replacement of the affected area. Mr. Smith recommended that the roofing iron be replaced in certain areas, as it was corroded. The awning roof was still in reasonable condition and did not require immediate replacement. Nonetheless, Mr. Cavanagh directed that all of the roofing, including that on the awning, be replaced. The reason for this decision was because it was thought to be more cost effective, given it was likely going to need to be done at some point in the near future.

26. Mr. Smith was called to give evidence during the inquest. Some two to three years before replacement of the roof at Equity House, he recalled having been engaged to replace a downpipe, which ran from the higher roof onto the awning. He also replaced corroded flashing on the higher roof of the building. He describes the downpipe as running into the box gutter, which was at the back of the awning against the building. In order to provide a quote for replacement of the roof in 2012, Mr. Smith recalls accessing the roof, which included the roof of the awning. He described the higher roof as having a *'fair bit'* of surface rust, and needed to be replaced.

27. In relation to the awning, Mr. Smith noted that it appeared as though it had been refurbished. The building and awning tenancy signage at the front, as well as the vertical surface of the awning, appeared to be relatively new compared to the surrounding premises. In addition, electrical and air-conditioning work had been carried out to the upper-roof of the building, which Mr. Smith believes was accessed via the awning. The roof surface of the awning, however, was in a reasonable condition and was solid. He describes it as having *'light rust'*. He had no concern as to the state of the awning, which appeared to be a solid structure with no indication of faults.

28. A quote for the work to be performed was subsequently provided by Mr. Smith on 12th March 2012. In relation to the awning, Top Stuff Plus were to replace the metal roof surface and associated flashings. There was no structural component to the work carried out. According to Mr. Smith, all discussions in relation to the scope of the work to be carried out at Equity House were had with Mr. Van Dorp. No engineering plans were provided in relation to the replacement of the roof.

29. Upon approval of the quote, Mr. Smith undertook replacement of the higher roof and awning at Equity House. Ladders were used to access the roof surfaces for the purpose of replacing the roofing. As it was a relatively small job, it was completed in four days, one of which was spent on the awning. A normal practice for the replacement of the roof was followed, in that the workers were standing on the roof areas to remove the existing roof sheet and then installing the new sheet. As James Street is a heavy traffic area, and due to power lines running above the front of the building, Mr. Smith made the decision to lift all of the roof sheets up by crane from the car park at the rear of the building, The roof sheeting was then stored on the upper roof, and passed down to the awning as needed. The new roofing installed was "Stratco Superdek" with a per square metre weight of approximately 4.28 kg/sqm. The original roofing, which was replaced was "Kliplock" with a per square metre weight of approximately 5.62 kg/sqm.

30. Mr. Smith describes removing the roof of the awning by pulling off the roof sheeting, following which parts of the inside of the awning were visible. He recalls that the awning had a long steel beam at the front (street side), which he thought was unusual. He stated in evidence at the inquest that there was nothing he saw inside the awning, which gave him cause to raise any concern as to its structural integrity with the building owners. However, he did notice that the box gutter which ran along the front wall of the building on the awning appeared to have been leaking, as bitumen coating had been used to repair it.

31. During the inquest, Mr. Cavanagh was asked whether he had considered engaging someone suitably qualified to assess the building structurally, given the leakages. Mr. Cavanagh stated that based upon the feedback he had received from Mr. Van Dorp, he thought the leaks were very minor. Furthermore, Mr. Cavanagh claims that he had never observed or heard about anything that may have been structurally unsound in relation to the awning or any other part of the building, nor had he ever received any complaint or advice from any tenant in the building in relation to the integrity of the awning.

Police Investigation

32. Following the awning collapse, it was determined that the investigation into the incident would be collaborative between Police and Workplace Health and Safety Queensland ('WHSQ'). Police were tasked with obtaining any available CCTV footage of the incident, as well as statements from those that had witnessed the awning collapse, whereas WHSQ were responsible for determining the cause of the collapse.

33. On 15th May 2014, Police submitted a Coronial Report in relation to the investigation conducted following Mr. Walton's death. The investigation was conducted by Plain Clothes Senior Constable Barry McAuliffe of the Gold Coast District Criminal Investigation Branch.

34. On the day of the incident, Police attended the scene after receiving a number of 000 calls from the public. The Queensland Fire and Rescue Service were already in attendance, and had secured the collapsed awning preventing it from further movement. A forensic examination of the incident location was subsequently conducted and photographs of the scene were taken. A number of statements were obtained from various witnesses who had seen the awning collapse. While at the scene, Police contacted WHSQ to advise them of the incident. Police also contacted the GCCC, who advised that there were no CCTV cameras, which captured the incident location. Further enquiries were then made with other businesses on James Street, however, no CCTV footage of the incident was able to be obtained.

Workplace Health and Safety Queensland Investigation

35. WHSQ subsequently completed an investigation into the cause of the awning collapse. On 2nd August 2013, a Coronial Investigation Report, with various annexures, signed by Regional Investigations Manager, K Archer, was submitted. WHSQ Principal Inspector, Mr. Allan Goodwin was the nominated officer responsible for investigating the cause of the awning collapse at James Street. He

attended the scene on the date of the collapse after being notified of the incident by Police. Upon arriving at the scene, Inspector Goodwin noticed that the large awning had fallen, however was still attached to the front of the building completely blocking the entire front entrance. The awning was later removed and stored. On 20th February 2013, Inspector Goodwin conducted a further inspection of portions of the collapsed awning at Frater Demolition Yard. He observed that the steel pieces of awning were sections of the end pieces that contained the bolts that attached the steel beam to the masonry block beam of the building. Inspector Goodwin subsequently seized the pieces of steel awning and sheeting.

36. On 12th April 2013, Inspector Goodwin met with Dr. Richard Clegg, Principal Consultant to Bureau Veritas, engineering consultants engaged by GCCC. During this meeting, Dr. Clegg inspected the pieces of steel awning and photographed the bolts used to attach the steel.

37. During the course of Inspector Goodwin's investigation he made a number of inquiries and sought various documentation from different parties including, Mr. Cavanagh, the GCCC, the Calliden Group (insurers), Top Stuff Plus Pty Ltd and Pelican Realty. Inspector Goodwin also spoke to several tenants of Equity House in relation to their opinions of the building and awning prior to the collapse. These statements suggest that none of the tenants had any concerns as to the condition of the awning prior to the incident. The only concerns expressed were in relation to water leaks into the upper level tenancies.

Technical Report by WHSQ Principal Advisor Engineer, Mr. Stuart Davis

38. On 27th May 2013, WHSQ Principal Advisor Engineer, Mr. Stuart Davis prepared a technical report in relation to the cause of the awning collapse. Mr. Davis also commented upon the suitability of the awning design from a safety perspective. Mr. Davis did not attend the scene of the awning collapse, rather he accessed information from Mr. Goodwin, other engineering reports and photographs of the scene as taken by Police.

39. Mr. Davis gave evidence during the inquest. In relation to the sequence of the awning collapse, Mr. Davis was of the view it occurred as follows:

    (a) Progressive corrosion of the fascia beam end plate and packing plate at the western and outside end of the awning, has caused the expansion anchors that pass through the plate to be partially prised out of the concrete cantilever beam.

    (b) Due to self-weight of the awning and possible wind loading, the face of the block work on the western concrete cantilever has started to fail (crack and fall apart) in the vicinity of the expansion anchors connecting the awning fascia beam to the end of the cantilever.

    (c) After the western end failed, the remaining embedment depth was inadequate to hold the anchors and they have pulled out of the concrete.

    (d) The western end of the awning has then started to drop downwards and this has initiated failure of the block work at the eastern end of the awning.

(e) The connections between the back edge of the awning to the shop façade beam have prevented the back of the awning dropping to the ground.
(f) The awning has then pivoted downwards coming to rest in front of the building.

40. Mr. Davis notes that a number of torque controlled anchors were used to connect the awning to the cantilever beams. Two sizes of anchors were used to connect the awning to the cantilever beams – 16 mm diameter and 10 mm diameter anchors. He notes that although all of the anchors from the awning, which are now in the possession of WHSQ, are severely corroded, it appears that the anchors have the following nominal dimensions:

(a) <u>16 mm diameter anchors:</u>

- *Anchor diameter (end): 16 mm*
- *Overall length: 75 mm*
- *Shield Length: 55 mm estimated*
- *Thread diameter: 12 mm*

(b) <u>10 mm diameter anchors:</u>

- *Anchor diameter (end): 10 mm*
- *Overall length: 65 mm*
- *Shield length: 50 mm*
- *Thread diameter: 8 mm*

41. Mr. Davis notes that the main structural member that runs along the outside edge of the awning is a 380mm deep by 100mm wide steel channel fascia beam. Both ends of this beam have 10 mm thick steel plate welded at right angles to the length of the beam. Two holes have been drilled through the ends of the steel plate so that the 16 mm expansion anchors can pass from the fascia beam to the concrete cantilever beams. At the western end of the fascia beam a 10 mm packing plate had been inserted between the end of the fascia beam and the concrete cantilever beam. This packing plate was slotted to allow for the expansion anchors to pass through.

42. Mr. Davis notes that in terms of awning design from a safety perspective, the greatest risk posed is that parts of the awning may be dislodged and either fall or be blown onto persons or vehicles, or that the awning itself will collapse, as was the case in this incident. An awning designer needs to consider loadings for the awning, including the dead load from the self-weight of the awning, live loads applied by persons that need to access the awning, wind loading and environmental factors.

43. The awning in this case remained in place for some 35 years, which Mr. Davis suggests indicates that the original design was able to resist environmental loads for some time. However, when the awning did fail this occurred catastrophically with no warning. When compared to other awning structures on small retail businesses, the main part of the awning itself is a typical structure, consisting of steel framework, metal roofing and cosmetic features. However, Mr. Davis notes that the *<u>means of supporting</u>* the awning is relatively unique in that the awning itself is supported by a re-enforced concrete cantilever beam at each end of the

awning and with a number of expansion anchors between the awning and the concrete beams.

44. Mr. Davis notes that this system seems to be unusual and as has been demonstrated the structure relies on the ongoing structural adequacy of the expansion anchors and the way in which the anchors are embedded in the cantilever beam. The cantilever beams in this case appear to be functional and are in reasonable condition.

45. Mr. Davis notes that the key flaws in the design of the awning were as follows:

    (a) *Anchor specification*: The use of expansion anchors of inadequate embedment depth and of a material that did not adequately resist corrosion.

        The expansion anchors used to connect the awning fascia beam to the cantilever beams in this case were 16mm diameter with an overall length of 75 mm. The outside shield is of a diameter of approximately 16 mm and is approximately 55 mm long. These anchors had an inadequate embedment depth and were unsuitable anchor coating for the environment and application.

    (b) *Embedment of anchors in block work shell:* Expansion anchors normally require a minimum concrete strength of 20 megapascals (MPa) to operate effectively. The actual strength of the block work shell is unlikely to have exceeded 15 MPa and may have been significantly less.

        The reports and photographs from the scene indicate that the anchors at the eastern end of the fascia beam protruded approximately 40 and 47 mm, while the anchors at the western end only protruded 30 mm from the steel packing plate. The outside surface of both of the cantilever beams consisted of block work shell of a minimum of 30 mm thick. Therefore, the anchors on the eastern end may have extended into the core filled concrete to a maximum of 10 mm and 17 mm at the eastern end. At the western end, the anchors would not have extended into the core filled concrete at all immediately prior to the incident, based on the block work shell of 30 mm thick. The effect of the rust between the fascia beam end plate and packing plate has partly pulled the anchors out of the cantilever beam.

        Mr. Davis notes that at the time of the initial installation, prior to corrosion occurring on the end of the packing plates, it is most likely that the anchors at the western end only marginally extended into the core filled concrete, if at all. The existence of holes in the core filled concrete of the western cantilever beam does not prove that the anchors initially extended to the core fill rather that at the time of installation, the installer drilled the holes deeper than the anchors would extend.

        Mr Davis is of the view that the anchors should have extended for at least 55mm into the core fill concrete, making them reliant on the strength of the core fill instead of the strength of the block work shell. Mr. Davis is of the view that the use of any expansion anchors to connect the concrete cantilever beams to the awning is not a preferred

system of design. He believes that 'through' bolts would give superior life and improved safety in the long-term.

(c) *End plates and packing plates prone to corrosion*: The use of steel members in the vicinity of the expansion anchors that allowed corrosion to occur, which led to critical anchors being partially prised out of the cantilever beams.

Mr. Davis notes that in this case, the corrosion between the end plate and packing plate is so severe in places that it has prised the steel plates apart up to a maximum of 7mm. The corrosion between the plates has in turn caused the expansion anchors to be partially prised out of the holes in the block work shell. The effect of the corrosion itself appears to have initiated the collapse of the awning.

(d) *Inspection difficulties:* Designing a long-life structure without the ability for easy inspection and maintenance of critical connections.

Mr. Davis notes that the awning involved in this incident has a relatively unusual design in that the main awning is suspended between two concrete cantilever beams, which are hidden from view. Given the top and bottom of the awning was covered, ongoing inspection of the critical bolt connections would be extremely unlikely. He is of the view that it would be unreasonable to expect that the roof sheet and decorative sheeting be removed for inspection purposes.

46. Mr. Davis is of the view that given the age of the building, it is very unlikely that the current owner or building occupiers were aware of the types of connections used in the awning. Whilst he notes that Mr. Jeffrey Hills from Jeffrey Hills and Associates Pty Ltd inspected the building on 8th June 2006, it is likely that as there was no indication externally of any fault in the awning, he would not have made further internal inspections, which is common practice.

47. Mr. Davis notes that if the anchors had sufficient embedment depth, the awning would not have collapsed when it did. Notwithstanding this, the anchors would have eventually failed when the corrosion continued through the anchor body to the extent that the shear strength of the steel itself was exceeded. This would have eventually occurred although perhaps after a significant period of time. Therefore, Mr. Davis is of the view that it is extremely important that the anchors have both adequate embedment depth and are constructed from a long-term corrosion resistant material.

48. Mr. Davis recommends that other awnings with a support system consisting of the main awning structure suspended between two cantilever concrete beams be inspected as a matter of urgency to determine that the connections preventing the awning from collapsing are structurally adequate. This inspection needs to include removal of the roof sheeting on the top or decorative sheeting underneath, so that all connections can be clearly observed. On identification of the use of expansion anchors in critical and concealed locations, the awnings should be modified so that potential hazards are suitably controlled.

49. Mr. Davis also provided information in relation to two other awning collapses in Queensland, which involved commercial premises. The anchorage system used

and the installation of those anchors, which annexed the awnings to the building in both cases, were a contributing factor to the collapse.

WHSQ's findings

50. As a result of the investigation conducted, WHSQ drew the following conclusions in relation to the incident:

    (a) On the day of the incident the weather conditions appear to have had little to no effect on the awning, as there was little or no wind and it was dry.

    (b) There was no prior warning prior to collapse of the awning.

    (c) The Engineer's reports provided suggest that the likely cause of the collapse was the failing of the anchors that attached the awning to the masonry beams of the building.

    (d) GCCC records indicate that Equity House was constructed in 1977. Engineers drawings that were obtained from GCCC and were submitted as part of the development application in 1977 do not state the length of anchors that were to be used to attach the awning to the masonry block beams. WHSQ note that it is questionable whether the Engineer's drawings ought to have provided this particular information.

51. Ultimately, WHSQ determined that the building owner, Mr. Cavanagh did not have prior knowledge that the awning was attached to the masonry beams by inadequate anchors or that the anchors had become corroded. As such, no prosecution proceedings were commenced in relation to the incident.

52. Mr. Davis agreed that an awning inspection program, with a developed process, in Queensland was an *'excellent idea that needs to take place'*.

Further actions undertaken by WHSQ since the awning collapse

53. Following the awning collapse at Equity House, and in light of the other previous collapses on commercial premises, WHSQ undertook the following actions in response:

    (a) WHSQ consulted extensively with a number of relevant stakeholders, including GCCC, Master Builders Association of Queensland, Local Government Association of Queensland ('LGAQ'), Queensland Building and Construction Commission ('QBCC') and Building Codes Queensland. Through this consultation, WHSQ developed and published a **safety alert** on the subject, which aims to highlight the risks associated with any awning that may collapse, and to raise awareness of the requirements for installing and maintaining awnings. The alert notes that there have been at least three awning collapses since 2006, including this incident, whereby awnings have collapsed due to anchorage points or structural support system failing.

    The alert identifies actions required from a number of duty holders including, persons installing anchors, principal contractor, designers

and building owners. These actions include the need to inspect and maintain all existing awnings regularly. Where the awning has a support system that cannot be readily inspected, parts of the awning may need to be removed so that an adequate inspection can be completed, and without risk to the inspector or members of the public. The building certifier should also engage a competent person to verify the design of the structure and to inspect the structure at critical times during construction. The safety alert has subsequently been distributed to the LGAQ to be provided to their members, construction industry sector stakeholder groups, inspectorate within WHSQ and interstate workplace health and safety regulators.

(b) In July 2014, a letter was also written to the LGAQ with respect to the awning collapse. The correspondence set out the reasons for the collapse and the need for awnings with hidden structural connections, which are prone to degradation to be inspected.

54. WHSQ confirmed that there were no issues identified from the investigation conducted to suggest that there was a broad workplace health and safety issue, which required an organisational response.

The Gold Coast City Council Response

55. In light of the issues to be examined during the inquest, information in relation to Equity House, particularly the awning structure, the requisite by-laws in place at the time of its construction, as well as the internal investigation conducted into the cause of the collapse, were subsequently provided by the GCCC.

Awning Construction and By-Laws

56. A statement was provided by GCCC Professional Engineer, Mr. Mehran Sadegh-Vaziri, who is the Supervisor of Development Compliance (Building). Mr. Sadegh-Vaziri was called to give evidence during the inquest. In relation to the building requirements in place at the time the awning was constructed, Mr. Sadegh-Vaziri notes that in 1977, when the building approvals were sought, GCCC was the building authority under the *Building Act 1975*. The *Building Act* includes in its schedule the Standard Building By-Laws 1975.

57. Having reviewed the By-Laws applicable in 1977, Mr. Sadegh-Vaziri notes the following in relation to the building requirements for the awning as they existed in 1977:

(a) ***By-Law 15.5:*** an awning could project beyond the road alignment subject to Part 54.106

(b) ***By-Law 54.2(1):*** no awning was to be constructed unless, among other things, *'structural calculations for the awning…and for their attachment to the building were submitted prior to the plans, drawings and specification for the structure approved'*.

(c) ***By-Law 54.2(2):*** no awning was to be constructed over a road unless, among other things, it was cantilevered or otherwise entirely supported from the building.

(d) ***By-Law 8.1(2) (b) (Responsible Design):*** provided that where an application for approval related to the erection of a building in the course of which it is necessary to build any reinforced concrete frame or steel frame or construction, the drawings and other required documents were to be prepared by a registered architect or registered professional engineer.

58. Chapter 5 of the By-Laws of the GCCC at the time was entitled, *'Encroachments, Projections and Awnings* and provided that:

(a) Required that any new building abutting or within 9ft of a road have an attached awning over the adjacent footway;

(b) Required that any such awning was to be erected *'only on the cantilever or suspended principle of construction'*.

(c) Specified some design requirements, for example, *'The plate and fascia of each awning shall together be not more than 24 inches deep and shall be sufficient strength and thickness, and the rafters shall not be lower than the bottom edges of the fascia'*; and

(d) Provided that construction was not to commence until a plan and specification showing dimension, materials and proposed position relative to the footway and the building had been submitted and approved by the Council.

59. In relation to the construction of the awning at Equity House, Mr. Sadegh-Vaziri confirmed the following relevant information:

(a) The awning was constructed at sometime between June 1977 and February 1978. During the 1977 building approval process, engineering and architectural drawings for the shops and offices were provided to the GCCC. Architectural drawing WD-2, contains the notation *'awning framing to engineer's detail'*. The drawings are stamped 'Gold Coast City Council Approved Permit 76/77'.

(b) Town planning permits had been obtained in relation to the construction of the building. Town Planning permit no. 9/116 was granted on 6th June 1977 for a two story building with shops at ground level and offices above.

(c) The application lodged with the GCCC for the approval of the building was signed on behalf of the then owners, Associated Legal Investments Pty Ltd on 8th June 1977. The application includes an undertaking by the owners that the construction, *'will be carried out in accordance with approved plans, specification and other documents and in accordance with the Building Act 1975 and By Laws made under the Act.'*

(d) A certification from the Inspector of Factories and Shops dated 24th June 1977 indicates that upon review of the plan of 37 James Street he

is, *'satisfied that the building, when completed, will comply with the requirements of the Factories and Shops Act 1960 to 1973'*.

(e) The certificate of approval was issued by the GCCC for the construction of the building on 28th June 1977.

(f) A letter written to Hill, Collas and Gilliver Solicitors on 2nd February 1978 by Town Clerk, A Angove states that further documentation was required in relation to the application for building work, which included a certificate of supervision by a structural engineer. In a letter written to the GCCC on 15th February 1977, Antony Tod and Partners Consultant Engineers state that they carried out supervision for the building work conducted, and certify that all construction was carried out in a very satisfactory manner and in accordance with the approved engineering documentation.

GCCC Investigation

60. GCCC were notified of the awning collapse on 23rd December 2012. On 24th December 2012, GCCC Development Compliance Engineer, Mr. Aidin Shayk and Development Compliance Officer, Mr. Mark Sullivan attended the site of the incident to conduct a preliminary visual inspection of the collapsed awning. The purpose of this inspection was to ensure that there was no risk posed to the public and other adjoining properties as a result of the collapse. The site had been barricaded off by the Queensland Fire Department, and as such Mr. Shayk was satisfied that the collapsed awning no longer posed an immediate safety risk to the public. Their findings were generally in accord with the evidence set out above.

Further actions undertaken by GCCC

61. Following the awning collapse, the GCCC undertook a number of review processes in relation to awning safety in the Gold Coast area. These investigations were mainly focused on public safety. The relevant information provided in relation to these reviews are summarised below.

Bureau Veritas Engineering Report

62. Following the awning collapse at Equity House, the GCCC commissioned an engineering report from Dr Richard Clegg of Bureau Veritas Asset Integrity and Reliability Services ('Bureau Veritas') primarily to ascertain the cause of the collapse and the parameters of a program to monitor the safety of awnings, should one be introduced. Dr Clegg subsequently provided a report outlining his findings, dated 7th January 2014.

63. As Dr Clegg participated in the expert engineering conclave, who provided an agreed set of facts in relation to the cause of the awning collapse at Equity House, all of the findings made by Dr Clegg have not been summarised. Relevantly, Dr Clegg does note that whilst there is little information available regarding the expected design life of the awning, he calculates that the Dynabolt System used at 37 James Street had an expected design life of 20 to 25 years. One of the key factors identified as relevant to the expected life of the system is the proximity of James St to the surf beach, which would increase the chloride levels in the

vicinity. Dr Clegg notes that in 1977 when the awning was built there was less understood about the degradation behaviour of Dynabolts in concrete. As such, it is unlikely that the builder and designer of the original awning would have had good guidance on the long term reliability of Dynabolts in this application.

64. In relation to the future monitoring of the safety of awnings, Dr Clegg recommends the following key elements be determined for any monitoring program:

    (a) Establish if the Dynabolts or similar fixing mechanisms have been used to fix the awning and determine if they are the primary fixing mechanism.

    (b) Determine if the design of the awning incorporates secondary support mechanisms and determine if these are sufficient to hold the weight of the awning in the event of a failure in the primary fixing mechanism. For instance, do adequate Tie Rods exist or is there a secondary support mechanism such as a ledge?

    (c) Determine if there is visible cracking of the masonry in the area of the Dynabolts or other fixings.

    (d) Determine the age of the awning and the corrosiveness of the environment in accordance with AS4312.

    (e) Determine whether or not corrosion of Dynabolts or other fixing mechanism is occurring. This may indicate that the system has reached the corrosion Propagation stage.

    (f) Determine if any major structural modifications have been made to the awning since construction.

    (g) In the case where adequate design data has not been lodged with the Council, it is recommended that the awning be assessed structurally by a qualified structural engineer (RPEQ) on the basis of the design of the awning and considering any modifications made to the awning since construction. This assessment should include a commentary on the likely degradation behaviour of the awning and recommendation on re-inspection intervals and methods.

65. In relation to the In-service inspection of awnings, which have been approved by GCCC on the basis of adequate design data, Dr Clegg recommends that if the awning has not been assessed by a structural engineer, then it should be assessed in accordance with the relevant standards by an RPEQ. The design assessment (including assessment of modifications) should be kept by the GCCC. Dr Clegg notes that the aim of the In-service Inspection is to assess the ongoing condition of awnings that have met the requirements of GCCC at the design stage and have been in service for a period of time. The interval for in-service inspection should be set by GCCC and Government on the basis of the risk profile of the awning.

66. Dr Clegg noted that one of the difficulties in establishing an inspection program for determining whether or not similar corrosion of the fixings (such as Dynabolts) is occurring is that it is likely that the corroding areas will be covered and inaccessible. As a result, the most efficient approach would be to measure the

general condition of the awning and extrapolate from that an expectation of the condition of the awning. More direct methods of assessing the condition of the fixtures is possible, but would be expensive and may be of limited value. He is of the view that the criteria for assessment of the awnings needs to be established based on the recommendations of an RPEQ.

67. Dr Clegg provides the following suggestion for in-service inspections:

    (a) *Visual inspection* – this should include detailed photography of the condition of the awning and should establish:

        - Whether or not significant modifications have been made to the awning since construction.
        - The mechanism of fixing.
        - Whether or not superficial rust of the structural components has occurred.
        - Whether or not the masonry is cracked in the region of the fixing.
        - The presence of rust stains on external surfaces of the masonry.
        - The quality of roofing and rain protection for critical areas.

    (b) *Borescope examination:* A borescope is an inspection tool which is attached to a fibre optic or flexible cable. A borescope usually has a diameter of 5-10 mm and a cable length of over 1 m. As many of the awnings in question consist of an enclosed box section, it is considered important to examine the inside of the box section, which could be done with an appropriate borescope. This would allow for the extent and severity of the corrosion on the inside of the awning to be determined.

68. Dr Clegg further recommends that the results of these examinations could then be incorporated into a risk matrix, which then could be used to assess awnings for possible further examination. If an awning is identified as being at risk, further more extensive testing could then be carried out, such as concrete carbonation (assessing core samples of concrete) and fixing depth (ultrasonic testing or x-ray of the depth of the fixings).

Bureau Veritas Visual Inspection Program of Awnings across the Gold Coast

69. Following receipt of Dr Clegg's report, Bureau Veritas were further engaged to conduct a preliminary survey, inspection and assessment of shop awnings in the GCCC area. The objective was to understand and classify the main types of awning designs and the prevalence of each design. The survey also observed the approximate age distribution and general condition of the awnings.

70. Engineer, Mr. Fahim Kaisuzzaman from Bureau Veritas subsequently carried out a survey and visual inspection of a cross section of the awnings currently in use from 12th May 2014 to 15th May 2014.

71. The structural integrity inspection incorporated the following:

(a) *General:* categorisation of awning design and estimate of age.

(b) *General damage and corrosion:* visual inspection of structural members for twist, straightness or local damage and corrosion.

(c) *Bolted connections:* Slippage of facing surfaces, corrosion of between facing surfaces, corrosion of bolt head/nut, and check for loose or missing bolts.

(d) *Connections:* visual inspections for damage, wear and corrosion.

(e) *Welds:* visual inspection for flaking or cracking of paint covering weld.

72. Four main types of awnings were identified, namely; cantilever, rod suspended, trussed and post supported.

73. Typically, awnings are designed for the following loads:

(a) ***Live loads*** – Australian standard AS/NZS1170 Part 1(2002 edition) *"Permanent, imposed and other actions"* classifies street awnings as R1 and in Table 3.2 specifies the following reference values for roof live load actions:

- Awnings accessible from adjacent windows, roofs or balconies – a uniformly distributed action of 1.5 kPa and a concentrated action of 1.8 kN.

- Awnings accessible only from ground level – a uniformly distributed action of 1.0 kPa and a concentrated action of 1.8 kN.

Previous editions of AS 1170 Part 1 called for a uniformly distributed action (1.8/A+0.12) kPa but not less than 0.25 kPa and a concentrated action of 1.4 kN, in common with other roofs. The design loads nominated in AS/NZS 1170 Part 1:2002 should be adequate to allow for any ponding of water or accumulation of hail on the roof during rain storms.

(b) ***Wind Load*** – Wind loads are assessed using AS/NZ 1170 Part 2:2002 and both uplift and downward pressure cases should be considered.

74. It was noted that other Councils have adopted different policies regarding the safety of awnings over public roads. Examples of these policies are as follows:

- *Wagga Wagga City Council:* Council encouraged the owner of an awning to obtain and provide a structural engineering report to Council from a suitable engineering expert demonstrating that the awning is structurally sound and safe on a recurrent five year basis for all awnings more than 10 years old.

- *Cessnock City Council:* Council is advising building owners that awnings are to be thoroughly inspected by a suitably qualified professional and issued with a certificate of structural adequacy. Visual inspections by the

building owner may not reveal critical loading or fixing faults that may impact on the performance of the awning during a storm event or earthquake.

75. The inspections conducted on the GCCC were mainly visual from ground level utilising no additional access. In total, 72 awnings were inspected with the assistance of GCCC representatives Mr. Shayk and Mr. Darren Barnett. Inspection areas were selected by consulting with GCCC Engineers prior to the inspection. The inspections concentrated on the shop awnings located close to the coastal areas and aged more than 20 years old.

76. From the total 72 awnings inspected, 38 were cantilever, 20 were rod suspended, 8 were truss and 6 were post supported.

77. Structures were initially assessed on a fitness for purpose basis and if structural inadequacies were detected then the relevant acceptable standard was referred to. It was assumed that all structures and modifications thereof, were engineer designed in full compliance with all relevant Australian Standards, building codes and good engineering practices.

78. The failure mode analysis for different types of awnings, as well as the checklist used to assess them, was detailed in the report. The following elements of the structure were considered during the observation: the awning support beam, support rod/post, awning frame, rod anchor plate and bolts, beam support/connection, number of advertising sign/other load, facade/parapet and paint condition.

79. Each awning inspected was given a classification of critical, poor or satisfactory. An awning in critical condition was said to be in poor condition and represented a high to extreme risk. Short term intervention was recommended. An awning in poor condition was held to represent a moderate risk that if left to develop or worsen, will likely develop into critical condition. An awning in satisfactory condition was found to represent a low to moderate risk as they were generally in satisfactory condition. In total there were 27 awnings found to be in satisfactory condition, 35 in poor condition and 10 in critical condition. These awnings were followed up by the Council and the owners took action to rectify the defects.

80. In relation to steel corrosion, more than 90% of the inspected awning were located close to the coastal areas. The main issues identified from the inspection are corrosion of the awning framing members, tie rods, anchor plates, bolts and welded connections. The extent of corrosion varies from minor to heavy corrosion in different areas. Presence of high chloride content, airborne salt and lack of maintenance could have initiated and accelerated this corrosion over the years. It is noted that if appropriate preventative measures are not taken severe corrosion could result in the failure of awning frame or members.

81. Timber decay and rotting were also identified for a number of awnings and fascia frames. These awnings are exposed to the exterior environment. High moisture content in the air, fungal attack and termites are probably the main agents for this timber deterioration. An average shop awning frame could weigh more than 50 kg and sudden failure of the frame could pose a serious risk to the public.

82. Vertical and diagonal crack in the existing building brickwork/blockwork façade and wall where the awning frames, beams or tie rods are supported was also identified during the time of inspection for a number of awnings. Moving of awning

elements under wind force, thermal movements, overloading and load reversal could have initiated these vertical and diagonal cracks in the masonry wall over the years.

83. It was noted that awning design live load has increased significantly with the introduction of AS 1170 Part 1 – 2002, compared to earlier editions of this standard. Older awnings would have been designed to previous editions of this standard. Installing an air-conditioning unit on top could possibly overload the section of the awning. In addition, in heavy rain or hail, if gutters not able to drain water fully and ponding may occur. These could cause the awning to collapse due to overloading.

84. Relevantly, it was observed that approximately 60% of the inspected awning frames were enclosed by cladding during the time of inspection. The awning framing fully enclosed by roof sheeting at the top face and lining at the bottom face, restricted the ability to inspect and measure awning framing member sizes or connection details, or to assess the level of steel corrosion or decaying timber members of the awning framing. Defects such as corrosion in the bolted and welded connections between the awning frame and main support beam were not visible due to the presence of cladding.

85. Similarly, the masonry wall ties, which are anchored in the wall or parapets of the cavity masonry construction, were not accessible for inspection.

Recommendations

86. Bureau Veritas notes that awnings are part of the building to which they are attached and are the responsibility of the owner of the building, even when an awning is located over a public pathway. Nonetheless, it is recommended that the following actions be implemented for the safety of the awning over public lands:

    I. *Defect repairs:* During the inspection, critical and poor condition awnings were identified. It is recommended that the owners of the awnings in a critical condition should be identified and necessary actions taken to rectify the issues for continued safe use of the awning. It is also recommended that the owners of the awnings in poor condition be notified of the condition of their awnings and recommended to take necessary action to reinstate the overall structural integrity of the awnings.

    II. *Detailed visual inspection:* As 60% of the inspected awning frames were enclosed by cladding, it is recommended that a more detailed inspection on a selected number of each type of awning design be undertaken after removing the cladding from the top and bottom face. The inspection will then comment on the general condition of the awning and document any obvious evidence of structural damage, corrosion, major modifications, design deficiencies and other obvious threats to the integrity of the awnings. For each awning inspected, an attempt will be made to obtain any relevant structural drawings before the inspector travels to site. However, it is accepted that in many cases, these drawings may not be located or the actual awning may differ significantly from the original design or ‘as-built’ drawings. The inspection is to be non-intrusive and

visual only. In some cases a borescope may be used to obtain a close visual inspection of what would otherwise be hidden structural elements. This may require a small hole to be drilled and later plugged.

III. *Inspection program:* It is noted that any policies and inspection programs should aim to strike a balance between thoroughness and practicality to achieve the maximum stakeholder engagement and the maximum reduction in risk of awning collapse across the GCCC. Bureau Veritas notes that they can provide ongoing advice on options and implications to assist the GCCC in developing policies and programs to manage the risk of awning collapse. This may include the development of awareness programs for building owners, the development of procedures to determine the structural adequacy of awnings, and the development of ongoing inspection programs.

87. Mr. Kaisuzzaman was called to give evidence during the inquest. In relation to the recommendation made as to an ongoing awning inspection program, he agreed that some type of ongoing program was necessary to proactively manage the risk posed to the community by aged awnings.

GCCC response to Bureau Veritas Report

88. Following the Awning Inspection Report, the GCCC's Development Compliance unit, whose primary role is to respond to development related complaints within Council's jurisdiction, commenced a list of dilapidated, dangerous or poorly constructed awnings that were identified and within Council's knowledge. This list has continued to be updated since its creation and as matters develop and are completed. A copy of the list was provided for the purpose of the inquest and clearly demonstrates that action has been taken by the GCCC's Development Compliance unit in relation to over awnings in the Gold Coast area.

89. The enforcement powers of the GCCC, as actioned by the Development Compliance unit, are derived from the *Building Act 1975*, and are enlivened once a non-compliance is detected or building work is identified as being dilapidated or dangerous. This generally occurs when a complaint is received and then investigated. This investigation generally entails an officer attending the site and conducting a visual inspection to determine whether any further action is warranted. Officers are not empowered to make invasive inspections at this initial stage of the investigation. Depending upon the outcome of the initial assessment and the level of dilapidation and danger observed, the Officer can order various levels of interventions, such as an informal letter or show cause notice to the owner requiring rectification or repair work. It is now common practice for a show cause notice or enforcement notice to request certification information be provided from an RPEQ or other competent person. Once the remedial work has been carried out and the GCCC has been notified of such, the matter is considered to be finalised.

90. In the absence of non-compliance or a complaint, Development Compliance Officers do not have general powers to require building owners to provide information to them periodically as to the structural adequacy of buildings or attached structures.

91. Following the Bureau Veritas review, Development Compliance Officers inspected all of the awnings identified and took action against those identified as critical or in poor condition. In addition, the GCCC sent out letters to a further 504 owners of properties who were identified as having an awning over the road or footpath reminding them to be aware of the condition of their awnings and to undertake inspection and maintenance as necessary to maintain the awning's structural adequacy.

Roadside dining venue permit application review

92. Following the awning collapse, the GCCC commenced the process of renewing and bringing online new permit applications for roadside dining venues, to include an additional criteria in relation to public safety associated with awnings. A visual audit was also undertaken by officers to identify awnings over roadside dining areas.

93. In 2015-2016, as part of the renewal application process, a condition was imposed on each roadside dining permit application requiring the holder to submit a report from a RPEQ. Roadside dining permit holders in GCCC's area who were known to have awnings over the roadside dining areas were sent a letter requiring them to provide a report from a RPEQ about the structural adequacy of an awning that was over a roadside dining area. Should the report provided by the RPEQ not satisfy the necessary requirements, the matter could then be referred to the Development Compliance unit of the GCCC for further enforcement action.

Building Certifier Report

94. During the course of the coronial investigation, the GCCC commissioned a report by Building Certifier, Mr. Michael Moran in relation to the building legislation compliance for construction of the awning at Equity House. Mr. Moran subsequently provided a report dated 3rd February 2016. Mr. Moran was called to give evidence during the inquest.

95. In relation to the Building Certification Process in place in 1977/1978 when the awning to Equity House was constructed, Mr. Moran noted that the applicable legislation in place at the time was the *Building Act 1975*, the Standard Building By-Laws and the Australian Standards. Building approvals were the responsibility of the Building Surveyor as a delegate of Council, and Building Inspectors who were also employed by Council.

96. The building process at the time involved the following two steps:

    I. *Obtaining building approval:* this was done through the necessary application lodge with the Local Authority for approval. The Local Authority would then appoint a building surveyor to review the design documentation in accordance with the relevant legislation. Upon completion of their assessment, the surveyor would then produce a report for the Local Authority as to whether the approval is compliant. The Local Authority would then issue the building approval if satisfied that the proposed building work will achieve compliance. This approval confirms whether the building work is

constructed in accordance with the approved documentation and it will comply with building law.

II. *Obtaining a Certificate of Classification:* The Building Inspector subsequently undertakes an inspection of the completed building work against the building approval documentation and the building law. For matters outside their competence, Inspectors accept certificates, which confirm that the completed work complies with the building law. The Building Inspector then notifies the building surveyor and Local Authority once the building work has reached substantial completion and complies with the building approval documentation and building law. The Local Authority then issues a certificate of classification once they are satisfied the completed building work achieves compliance.

97. In relation to Equity House, the Local Authority in 1977 was the GCCC. Records confirm that the requisite building application was made, which included structural drawings of the proposed building, as well as architectural drawings. A building surveyor was appointed by the GCCC, and a subsequent Certificate for Approval was issued on 28th June 1977. On 2nd February 1978, the GCCC requested a certificate of supervision from the structural engineer. On 7th February 1978, a certificate was provided by Structural Engineers, Antony Tod and Partners confirming that they had supervised the building work on Equity House, and that the construction was carried out in a very satisfactory manner and in accordance with the approved engineering drawings. A Certificate of Classification was subsequently issued by the GCCC.

98. In Mr. Moran's opinion, the building application submitted for Equity House in 1977 complied with the building law and Clause 8.1(1)-(3) of the Standard Building By-Laws 1975 in place at the time, and contained the level of design documentation typical for a building application made at this time.

99. Mr. Moran notes that the current approval process and statutory regime for obtaining building approval is largely the same as it was in 1975. However, from July 1998, building approvals are now issued by a private certifier or Council. Unless Council employees are the certifiers, the role played by Council is now purely administrative. Pursuant to s.45 of the *Building Act*, building assessment work must be carried out by a building certifier. This means that Local government no longer have much of a role, unless they offer a certification service, in the technical assessment of building approvals. Rather, they act as a means of archiving building approvals.

100. In evidence at the inquest, Mr. Moran agreed that an awning inspection program would be valuable in Queensland, following widespread consultation between a number of different interest groups to ensure any scheme formulated was workable. He said this was a matter of policy and not for him to determine.

Expert Engineers Conclave

101. For the purpose of the inquest, concurrent evidence was provided by the following expert engineers ('the engineers'), all of whom had previously been engaged to

provide expert reports as to the cause of the awning collapse for various parties to the proceeding:

- Dr. Richard Clegg – Bureau Veritas
- Mr. Jon Murphy – NJA Consulting Pty Ltd
- Mr. Alex Milligan – XSD Engineering
- Mr. Alan Wolski – GHD Pty Ltd

102. Following a conference with Counsel Assisting, an Agreed Set of Facts detailing the awning construction and sequence of the collapse, as well as general observations of the awning following the collapse, likely causes/contributing factors of the sudden awning collapse and suggestions for future actions, was subsequently prepared and signed by all of the engineers.

103. In relation to the cause of the awning collapse, the engineers agreed as follows:

(a) <u>Awning construction and the sequence of the collapse:</u>

- The awning had a steel frame, which extended the width of the building, supported by two concrete cantilever beams (AB2 and AB5) extending from each main side wall to the outermost edge of the awning. The cantilever beams comprised reinforced and core filled block masonry units. A 381 x 102 channel section steel beam (AB1) was then placed between the two cantilever beams to span the full width of the building shopfront. This beam was bolted at each end to the concrete cantilever supports by two masonry expansion anchors.

- The awning was primarily supported by masonry expansion anchors (‘the anchors’) in the wall, and in the blockwork support beams.

- A packing plate was used at the western end of the fascia beam, which was approximately 10 mm thick, at the time of the original installation.

- Penetration of the fascia beam anchors into the blockwork at the western end of the awning was only approximately 20 -30 mm, and did not penetrate into the core of the support beams. At the eastern end of the awning, the anchorage points had just penetrated further and into the support beam. This lack of penetration was because of the packing plate that had been used.

- Corrosion of the anchorages led to an expansion of the anchorage points in the holes, which caused the blockwork to crack radially, particularly at DB1 and DB2.

  Mr. Murphy notes that there is a possibility that the initial fracture of the face-shell blockwork may have occurred in the course of the initial installation of the expansion anchors, due to tensile stresses induced in the concrete in the course of the anchor installation. Mr. Wolski and Dr Clegg conceded that this was a

possibility, it was thought that it was extremely unlikely from their experience. Dr Clegg noted that given the awning stood for 34 years before it failed, it would be expected that a pre-existing defect, as suggested by Mr. Murphy, would have caused a crack to form at an earlier stage.

- The face-shell blockwork on the cantilever beams restraining the anchors failed, which likely began at the western end of the awning. This was due to the progression of corrosion of the fastening anchors.

- The initial failure at the western end shed additional load onto the anchors at the eastern end of the fascia beam, causing the anchors on the eastern cantilever beam to fail. The anchors at the eastern end failed in pull out.

- While the anchors used had sufficient strength to meet the requirements of the relevant standards, they became inadequate after 35 years in use because of a change in circumstance, namely the presence of corrosion.

- The construction of the awning was very unusual and a potentially expensive method.

(b) <u>General observations of the awning following the collapse:</u>

- Significant corrosion of the packing plate and the fascia beam anchors in the awning was noted. 'Significant corrosion', for the purpose of this incident, is to be defined as beyond superficial corrosion, which had a structural consequence on the bolt. During the inquest, Mr. Wolski further noted that the packing plate used created a reservoir for water and salts, which greatly magnified the severity of the corrosion and caused it to accelerate over time.

- Failure of the blockwork surrounding the anchorage points to the fascia beam had occurred.

- The installation of the packing plate at the western end of the awning caused the anchorage points at the western end to penetrate only through the face-shell blockwork on the western support beam and not into the core of the beam.

- The awning had no redundant structural capacity of alternative load path in the event of failure of a critical member or connection. As such, the awning relied on the integrity of the anchors used.

- It would have been difficult to inspect the awning connections due to the awning design.

(c) <u>Likely causes/contributing factors of the sudden awning collapse:</u>

- The fracture of the concrete blocks at the western end (AB2 and AB5) was a contributing factor to the collapse. The final failure of the concrete blocks was due to corrosion of the anchors. Once the concrete blocks at AB2 and AB5 had fractured, the remaining anchors did not have sufficient strength to support the awning, and the awning then fell towards the wall.

- Corrosion of the awning and anchors due to ingress of atmospheric pollutants and salts from the surrounding marine environment, and observed water damage from roof leakage, was a contributing factor to the collapse. Had the ingress of water at the western end of the awning not occurred, it is unlikely that the awning would have failed when it did. However, it cannot be determined how long the leak at the western end of the awning had been present, based upon the level of corrosion observed.

- The short embedment depth of the anchors into the end cantilever beams was a contributing factor to the collapse. Had the anchors used been longer, the collapse of the awning may not have been catastrophic and without warning.

- The construction method used for the end cantilever beam support to the outer edge beam of the awning was a contributing factor to the collapse.

- The lack of complete specifications for the bolted connections to be used and installation requirements to the primary connections on the original design documents, was a contributing factor to the collapse. The connection system used to support the fascia beam was inadequate for the emergent environment.

- Lack of appropriate maintenance to the structural framing and key components of the awning, such as bolted connections, was a contributing factor to the collapse. However, it should be noted that inspection of the level of degradation of the anchors prior to the collapse was very difficult, as critical components were embedded in concrete and obscured behind steel plates.

- The poor bonding between the blockwork and the core of the cantilever support beams (AB2 and AB5) may have contributed to the awning collapse. Had the core and blockwork been fully bonded, the cracking of the blockwork may have been less severe, and the awning may have collapsed gradually, providing some warning prior to a catastrophic failure.

- Modifications made to the awning during its lifetime, particularly the installation of new roofing, advertising and minor maintenance work, may have contributed to the failure mechanics of the awning.

- It was a combination of the aforementioned contributing factors, which caused the awning to collapse catastrophically without warning.

104. In relation to possible future action that could be taken in relation to the risks posed by aged awnings, the engineers made the following suggestions:

I. The creation of an awning inspection program in Queensland to be administered locally. It was agreed that an inspection program is needed to protect the safety of the community. At the inquest, Dr Clegg also noted that there are a lot of awnings, which are cantilever-type that are reaching the end of their design life (30 to 40years).

Following extensive consultation with relevant stakeholders, a Departmental taskforce could consider the inclusion of the following features:

- The establishment of an awning database identifying owners of premises from which awnings project or are suspended over lands. Information could be obtained through self-reporting and Council records etc.

- The development of a risk management framework in relation to the condition assessment and inspection of awnings. This would allow awnings to be categorised depending upon a number of relevant factors including, the design, the location, the age of the structure, the accessibility of access points and any prior damage.

- Once the database and a risk assessment framework have been developed and the awnings categorised, those in certain risk categories may require an inspection to determine the condition of the awning and future action required.

- Mandatory rectification measures to those awnings, which are considered to be at significant risk of structural collapse.

- Regular awning inspection and certification requirements can then follow, which may be triggered at certain ages of the awning or when other factors, such as when the building is sold or leased, or modifications and/or repairs are carried out.

- If the primary fixings of the awnings cannot be inspected and their condition adequately assessed, it could be a requirement that the awnings need to be provided with alternative load paths to support the awnings in the event of failure of the fixings, such as support posts.

- Consideration of the development of an independent design review at the time awnings are constructed, if they are located over lands.

II. State awareness campaign in relation to the potential risks associated with aged awning structures.

III. Request that, where necessary, consideration be given to amending the relevant Australian Standards in relation to awnings to ensure that issues, such as minimum required design life prior to major maintenance, corrosion protection, facilitation of the inspection of primary support fixings, the specification of minimum mechanical anchor embedment at the time of the design, and the incorporation of secondary support mechanisms into the design where practically possible, are adequately addressed.

105. During the course of the inquest, Mr. Wolski and Dr Clegg noted that given how diverse and expansive Queensland is as a State, any awning inspection program commenced should be administered locally, as opposed to at a State level.

Evidence of Robert Lewis, Incode Pty Ltd

106. Following the awning collapse, Mr. Cavanagh sought engineering reports from Forensic Engineer, Mr. Robert Lewis, who owned Incode Pty Ltd. Mr. Lewis had practiced as a Forensic Engineer for 40 years all over the world. In total, Mr. Lewis prepared five different reports in relation to the cause of the awning collapse and the redesign of the new awning to be affixed to Equity House. Ultimately, Mr. Lewis' initial findings, as to the cause of the awning collapse, largely accord with that of the expert engineers conclave.

Inquest into the death of Craig Taylor (2219/07) NSW

107. It is of interest to note that in August 2010, an inquest into the death of Craig Taylor was convened in the State Coroner's Court at Glebe before Deputy State Coroner H.C.B Dillon. Mr. Taylor died on 7th December 2007 on the footpath outside a premises on Sydney Road, Balgowlah after being struck by the awning, suspended from the façade of the premises, which collapsed together with brickwork that faced onto the footpath.

108. Deputy State Coroner Dillon acknowledged that generally, awnings are attached to privately owned buildings, and as such, the primary responsibility for the maintenance and repair of awnings lies with the owner. However, many of these awnings are also suspended over public footpaths owned and/or controlled by local councils.

109. When determining what could be done to ensure awnings did not pose a risk to the public, Deputy State Coroner Dillon noted that awning safety is likely to be a *'general and widespread problem, particularly in coastal areas of the State…'* He found that it was reasonable to infer that the structural integrity of other awnings and the buildings to which they were attached, were likely to have been affected to a similar degree by building and awning design weakness, as well as dilapidation, and in the absence of a proper inspection program.

110. Deputy State Coroner Dillon recommended that the Manly Council maintain its inspection program and that Ministers for Local Government and Planning take

steps to have all local authorities implement such inspection and rectification programs and that appropriate legislation be introduced to put those measures into effect across the state.

ANALYSIS OF THE CORONIAL ISSUES

The findings required by s45 of the Coroners Act 2003

111. In accordance with section 45 of the *Coroners Act 2003* ('the Act'), a coroner who is investigating a suspected death must, if possible, make certain findings. On the evidence presented at the inquest, I make the following findings:

    (a) The identity of the deceased person is Christopher Jon Walton.

    (b) Mr. Walton died after the awning attached to 37 James Street, Burleigh Heads collapsed trapping him against one of the building pillars below;

    (c) The date of Mr Walton's death was 23rd December 2012;

    (d) The place of Mr Walton's death was 37 James Street, Burleigh Heads, Queensland; and

    (e) The cause of Mr. Walton's death was multiple injuries due to or as a consequence of being crushed by the falling awning.

The circumstances and cause of the awning collapse at 37 James Street, Burleigh Heads on 23rd December 2012.

112. The technical cause and sequence of the awning collapse at Equity House has been addressed in detail in the evidence of the expert engineers.

113. It is clear from the evidence that corrosion of the awning and anchors due to the coastal location of the building, and observed water damage from the roof leaking, contributed to some extent to the awnings catastrophic collapse. Evidence from Mr. Van Dorp, Mr. Cavanagh and Mr. Laing during the inquest suggest that water leakages in Equity House had occurred on a number of occasions since 2008.

114. A significant water leak was experienced sometime before May 2012 in Mr. Laing's tenancy which adjoined the awning. Evidence from Mr. Cavanagh during the inquest suggests that whilst he knew of the leakages, he relied substantially on the advice provided by Mr. Van Dorp, as to whether a maintenance issue at Equity House required further expert consideration. It is the responsibility of a building owner to ensure that their premises are adequately maintained. It was the view of the engineers in this case that a lack of appropriate maintenance to the structural framing and key components of the awning was a contributing factor to the awning collapse. It was recognised, however, that the construction of the awning was very unusual, and that inspection of the level of degradation of the anchors that attached the awning to the building, would have been very difficult as critical components were obscured from view and not easily accessible.

115. The awning was 34 years old and, having regard to its design, was probably well beyond its design life when it tragically collapsed killing Mr. Walton and injuring

other pedestrians. The results of the inspections conducted by Mr. Kaisuzzaman of a sample of awnings on the Gold Coast demonstrates there is a significant risk posed to the community by aged awnings, not properly maintained by their owners, particularly those for which connection points are not readily accessible.

Whether the construction method used to attach the awning at 37 James Street, Burleigh Heads, is of common use in Queensland?

116. From the evidence provided by the expert engineers, the construction of the awning at Equity House was unique and likely not common place in Queensland. However, from general observation, cantilevered awnings over public footpaths are common. In addition to the design, the method of fastening the awning to the cantilever beams using torque controlled expansion bolts, was both inappropriate in design and in execution, having regard to their length and the depth of their embedment into the concrete beams and the use of those bolts in a corrosive environment. Safe design requirements and building practices already exist and should be enforced before approval is given to commence construction. Ignoring safe design and building requirements leading to serious injury or death, could be the subject of criminal prosecution.

117. The inspections undertaken by Mr. Kaisuzzaman at the behest of the GCCC, highlight that there are a significant number of awnings in the Gold Coast region, which are in a critical condition, and pose a substantial risk to the community if not appropriately remedied in the near future. According to the GCCC, these faulty awnings have since been rectified and made safe.

What further actions and safety measures can be introduced to prevent the future collapse of aged awnings attached to buildings?

118. It is clear that aged awnings on the Gold Coast, and indeed throughout the state, especially in a coastal environment, pose a significant risk to the community and will continue to do so in future, without intervention by Government. The actions taken by the GCCC since the awning collapse at Equity House, including the ongoing inspections and monitoring conducted by the Development Compliance Unit, are commendable. The inspections undertaken by Bureau Veritas, as commissioned by the GCCC, highlight the need for a formal, long-term awning inspection program to be established state wide.

119. The introduction of an ongoing awning inspection program in Queensland, to be administered locally, is necessary and needs to be further considered by the Department of Infrastructure, Local Government and Planning in consultation with local councils and other relevant stakeholders. Initially, such a program should be directed to those awnings over public land as this would effectively address the most significant risk posed by aged awnings to the wider community, as was the circumstances in this case, and may allow for a more workable program to be established in the first instance.

120. Having regard to the findings of the Bureau Veritas inspection results, there needs to be immediate and extensive consultation with relevant stakeholders to determine how the program is to be administered, its function and scope and to impress upon all parties that this needs to be undertaken urgently. Obviously, the suggestions made as to possible features of the programs by the engineers in this case should be considered.

121. It may be that a Departmental Taskforce established by the Department of Infrastructure, Local Government and Planning in relation to the introduction of an awning inspection program/scheme, would assist to ensure that the scheme to be introduced sufficiently addresses the risk posed to the community by aged awnings. It will be essential that the Local Authority/Council required to administer the awning inspection program has the power to adequately inspect awnings over public lands to ensure they are structurally adequate and do not present a risk of collapse. They will also need to have the powers to ensure effective compliance by building owners with any enforcement/remedial action deemed necessary.

122. Consideration should also be given to amending the relevant Australian Standards in relation to awnings to ensure that issues, such as minimum required design life prior to major maintenance, corrosion protection, facilitation of the inspection of primary support fixings, the specification of minimum mechanical anchor embedment at the time of the design, and the incorporation of secondary support mechanisms into the design where practically possible, are adequately addressed.

RECOMMENDATIONS IN ACCORDANCE WITH S46

Section 46 of the Act provides that a coroner may comment on anything connected with a death that relates to:

(a) public health and safety,

(b) the administration of justice, or

(c) ways to prevent deaths from happening in similar circumstances in the future.

I make the following recommendations pursuant to s.46:

1. All local authorities, or their suitably qualified and authorised nominee, at the direction of and with the assistance of the Department of Infrastructure, Local Government and Planning conduct an immediate inspection of all awnings over public footpaths in Queensland.

2. That where necessary, appropriate orders be made to rectify any awnings presenting a danger of collapse, and that appropriate legislation be put in place to enforce such orders.

3. That an ongoing awning inspection program should be introduced in Queensland for structures over public land, to be administered by Local Authorities. The Minister for the Department of Infrastructure, Local Government and Planning should consider the establishment of a Departmental Taskforce to develop a suitable program, which can effectively reduce the risk posed to the community by aged awnings. The suggestions made by the expert engineers in this case as to the features that could be included in such a program, should be considered by the taskforce. It is crucial that any program introduced ensures that Local Authorities/Councils have the power to conduct effective inspections of awnings over public lands, and can ensure effective

compliance by building owners with any enforcement/remedial action that is deemed necessary to remove the risk posed.

4. That a review of Australian Building Standards be undertaken in relation to awnings generally and cantilevered awnings particularly, to ensure that issues, such as minimum required design life prior to major maintenance, corrosion protection, facilitation of the inspection of primary support fixings, the specification of minimum mechanical anchor embedment and structural soundness are adequately addressed.

I close the Inquest.

James McDougall
Coroner
SOUTHPORT
27 October 2016