INTRODUCTION

A recent collapse of a tied awning in Balgowlah resulted in the death of a man standing under the awning at the time of the collapse. The accident happened during a storm involving high wind and heavy rain and is the subject of a coronial enquiry at the time of drafting this Practice Note.

Based on available press reports, the awning in question appeared to be a conventional steel frame awning with tie-rod supports, the tie-rods being anchored at the front masonry wall to the premises in an undefined manner. There are many such similar awnings throughout NSW.

As a result of the collapse, a number of Councils are now requiring owners of premises with similar existing awnings to engage structural engineers to provide certification of such awnings. Property owners are legally liable for damage caused by their property not being properly maintained and Councils are enforcing the law in respect of awnings. Awnings should be regularly inspected as part of normal building maintenance in any case.

This Practice Note is intended to provide some guidance on the approach that might be used by structural engineers engaged in the task of inspecting, reporting on or certifying existing tied awnings.

THE ISSUES

The issues central to evaluating the strength and serviceability of existing awnings which are tied back to masonry walls are seen to be as follows:

1. the design live load has increased considerably 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

2. wind loading may be the critical design loading

3. reliable documentation of the construction details are generally not available

4. older masonry walls may have lime mortar rather than cementitious mortar or may have a combination of both if repairs have been undertaken previously

5. corrosion of the tie-rods and/or corrosion around the anchor plates and/or corrosion of masonry ties is often the main issue. Awnings close to salt-laden spray will be more liable to corrosion than those in other locations

6. the tie-rods to the awning generally penetrate the external masonry wall and the tierods are generally not accessible for inspection at points beyond where they penetrate the masonry wall

7. the awning framing is fully enclosed by roof sheeting at the top face and lining at the bottom face so that there is no access available for a structural engineer to measure awning framing member sizes or connection details nor to assess the level of steel corrosion of the awning framing

8. the masonry wall ties are not accessible for inspection around the point where the awning tie-rods are anchored in walls or parapets of cavity masonry construction

9. premises or any party wall between the adjacent premises and these anchor plates are generally not accessible for inspection

10. if the tie-rods are anchored into a parapet , then the parapet strength will have to be assessed despite the fact that the construction and condition of the parapet masonry may not be readily accessible.

11. in heavy rain or hail , gutters may not be able to drain water fully and ponding may occur (not all awnings will have an overflow system for the gutters). Hail may also collect on the awning

12. awnings that are part of a "row" where tie-rods may support two adjacent awnings to adjacent premises may be susceptible to adverse loading should one awning on one side fail

13. whether load-testing of any structural elements (either within the awning framing or of the tie-rod or tie-rod anchors) is required. In order to avoid removing masonry in order to examine tie-rod anchors , load-testing may be employed.

DESIGN LOADS

If certification to the BCA is required, then reference to Part B1 of Volume 1 of the BCA is necessary in order to determine the appropriate codes – refer to Practice Note 16. Clause B1.2 of the BCA refers to AS/NZS 1170 Part 1 for permanent actions.

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 of (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 ,where A= the plan projection of the surface area of roof supported by the member under analysis.

If for some reason , the structural engineer is not certifying to the BCA but only certifying to a previous edition of AS 1170 Part 1 by agreement of the authority requesting the certificate, then these lesser loads may be used but the loads used need to be stated on any certificate. However, consideration should be given to the fact that these older loads may not adequately allow for crowd loading , ponding of rainwater or accumulation of hail on the awning.

The Commentary to AS/NZS 1170 Part 1:2002 states that :

> *"Roof Category R1 is intended to cover situations where people may gain unauthorized access through their own efforts to a roof not intended for such use. The lower load of 1.0 kPa allows for greater difficulty in gaining access compared to the value of 1.5 (kPa) where access may be facilitated by adjacent windows, balconies or other awnings. An example is a street awning on a multi-storey building with openable windows."*

The design load used should also consider whether significant numbers of people may access an awning to watch a parade on the street below, in which case the above loads might be increased. 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.

Wind loads should be assessed using AS/NZS 1170 Part 2 : 2002 , and both uplift and downward pressure cases should be considered . Pressure caused by wind hitting a near-by multi-storey result in higher design downwards loads than the above design live loads. Uplift due to wind may result in the tie-rods being considered inadequate due to compression force in the slender tie-rod.

The effect of wind loads from nearby buildings may need special consideration 9 for example a funnell effect causing increased wind speeds.

RECOMMENDED PROCEDURE

The recommended procedure involves the following stages:

- stage 1 initial inspection and appraisal
- stage 2 second inspection after opening up
- stage 3 reporting and detailing of any rectification requirements
- stage 4 final inspection
- stage 5 certification

The recommended procedure is intended to ensure that: (i) all visible and hidden structural elements in the awning have been inspected and evaluated for structural adequacy; (ii) any deficiencies have been reported and rectification procedures have been advised; and (iii) all rectification work has been inspected after completion by a builder. The final step is to issue a certificate once the structural engineer is satisfied as to the structural adequacy of the awning after any necessary repairs have been done.

STAGE 1 -- INITIAL INSPECTION AND APPRAISAL

The initial inspection entails the establishment for the awning of interest of the dimensions, likely age, external configuration, existence of main support walls and cross walls, drainage from the gutter and any other relevant information.

Extensive site photography should be undertaken for use with subsequent reports.

An investigation should be made as to the existence of any structural drawings for the awning, generally through Council records, although in many instances, no such drawings will be available. Even if drawings are available, no great reliance should be placed on these as actual conditions may well vary from those indicated on the drawings.

STAGE 2 -- SECOND INSPECTION

It is considered essential that a second detailed inspection will be undertaken following on from Stage 1. The information gained at the Stage 1 inspection can be used to draft instructions for the opening up of the awning for a detailed inspection at this stage.

The awning will generally need to be propped at the front edge. This will require Council approval and will require barriers to be installed. It may also require to be tied down against wind uplift which will involve concrete weight blocks. The Council is likely to require information on the length of time the barriers will be in place, measures to be taken to protect the public, and certification of the barriers to withstand vehicular impact. Such propping and its certification could be left to specialist providers who are familiar with the requirements. A fee would normally need to be paid to Council.

Areas of roofing and/or lining will need to be identified for removal to allow determination of the sizes and condition of the rafters and purlins. An area equivalent to 4 to 6 bricks of the parapet/front wall masonry will need to be removed around the areas where the tie-rods penetrate the masonry. Access scaffolds and ladders complying with Workcover requirements will need to be installed to allow the structural engineer to carry out an inspection.

A detailed set of requirements, probably with photographs, will need to be drawn up by the structural engineer based on the detailed inspection requirements to be undertaken as set out below.

The requirements will need to include methods of reinstatement of the affected areas once any required rectification work is completed.

The Client would need to engage a licensed Builder to carry out the work, including the engagement of the specialist firm to supply and certify the propping. It is likely that the structural engineer may have to project manage the building work as many Clients will not have the expertise to do so.

The detailed inspection of the opened-up awning can then be made. This will involve the following:

- sketching the framing of the structural elements;
- measurement of the member sizes and level of corrosion on the structural steel;
- sketching and measuring the connection details for the structural steel;
- measurement of the size and level of corrosion of the tie-rods;
- sketching and measuring the connection details for the tie-rods , top and bottom;
- measuring the connection plates and fixing details within the masonry;
- assessing details of the masonry and condition of the masonry ties .
- Extensive photography of all areas would normally be undertaken.

STAGE 3 -- REPORTING AND RECTIFICATION INSTRUCTIONS

After the second inspection, any necessary calculations should be carried out using AS 4100, AS 4600 and AS 3700 as required. Allowance can be made for corrosion of steel elements by using the net thickness remaining of an element at the time of the inspection less a further corrosion allowance based on the remaining design life as advised by the Client. Any corrosion will require a corrosion removal and protection system to be devised, which may require input from paint supply companies.

Load testing of the anchors of the tie rods could be considered at this point if there is insufficient access for inspection or there is any question about the adequacy of the anchors following the inspection and/or the result of the calculations.

Load testing should be based on a proof load determined in accordance with AS 4100 and should be based on the critical load case.

At this point a report should be prepared advising the Client of the status of the awning and of any repairs to, strengthening of or replacement of structural elements that are considered necessary.

Detailed instructions will need to be prepared for any rectification work including corrosion protection. Substantial rectification works may require a Development Application to be submitted to Council.

Consideration might be given to recommending the fixing of a sign on the awning roof sheeting indicating the load that the awning can sustain. Such a sign should indicate the Design Roof Loading for distributed loads (in kgs per square metre) and for concentrated loads (in kilograms).

Recommendations for ongoing regular maintenance and inspections should also be included in the report.

STAGE 4 -- FINAL INSPECTION

Inspection(s) as necessary will need to be carried out on any rectification work and on the making - good work in order to ensure that the structural integrity of the works is to the structural engineer's satisfaction and is accordance with all drawings, sketches, specifications and instructions issued by the structural engineer.

STAGE 5 -- CERTIFICATION

Certification can be issued once the final inspection has taken place. Certification should detail the loads that have been used, any assumptions made in the calculations that are relevant and any qualifications that the structural engineer thinks is appropriate. Any drawings, sketches or specifications issued could be referenced.

If only periodic inspections of the work was carried out, the certificate should make clear that only periodic inspections were carried out and that no supervision was involved.

Certification should clearly define the scope of what was undertaken by the structural engineer so that it is clear what is being certified and what is not being certified. If necessary, reasons for some elements not being certified could be given (e.g not accessible). Certification should be restricted to what the structural engineer knows.

Recommendations for ongoing inspections (say every five(5) years) could be included in the certificate.

Structural engineers should be wary of using pro-forma certificates issued by Council unless the structural engineer is satisfied with the wording used.

Any certificate should make it clear that the certificate does not relieve any other party of its responsibilities, liabilities or contractual obligations.