



MACDONALDTOWN GASWORKS REMEDIATION

Structural stability assessment of southern gasholder



Preliminary phase

for

RailCorp NSW

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1. Project description

1.1 The Brief

By Order No. Y45683, dated 26 August 2010, RailCorp NSW has appointed Bill Jordan & Associates to undertake a structural stability assessment of the gasholder remaining at the former Macdonaldtown Gasworks site. The gasholder is listed as having State significance under the NSW Heritage Act and could be the only intact one remaining in Australia.

The gasholder is on a site which has soil contaminated from the plant's operations: the soil contamination has to be mitigated by excavation and treatment. The primary purpose of the brief is therefore to determine the structural stability of the gasholder while the soil is being excavated and specify the means of keeping the structure safe from damage.

The brief was extended by an email from Daniel Wedgwood of RailCorp dated 25 August 2010 requesting that a preliminary report be prepared comprising a "Conceptual Mitigation Plan" which was to include the structural stability assessment of buildings on the adjoining properties fronting Burren Street, Erskineville.

This report is intended to fulfil the preliminary report requirements.

1.2 Work undertaken

The work undertaken to prepare this report comprised:

- a site visit in the company of Mr Luke Speechley of RailCorp to take measurements required for the preliminary structural analysis;
- study of the geotechnical data contained in the report of Pells Sullivan Meynink (PSM)¹ and the site contamination data in the CH2MHill report²;
- preparation of a preliminary model of the gasholder structure and its analysis using the program "Microstran" (it is noted that Microstran is not necessarily the best analysis tool for a structure such as the gasholder brickwork, but it is considered adequate for the preliminary assessment);
- plotting of boundaries of properties in Burren Street Erskineville on a gasholder site plan to determine proximities of likely site excavation.

2. Gasholder analysis

2.1 Model and parameters

A simplified model was prepared with the following parameters and limitations:

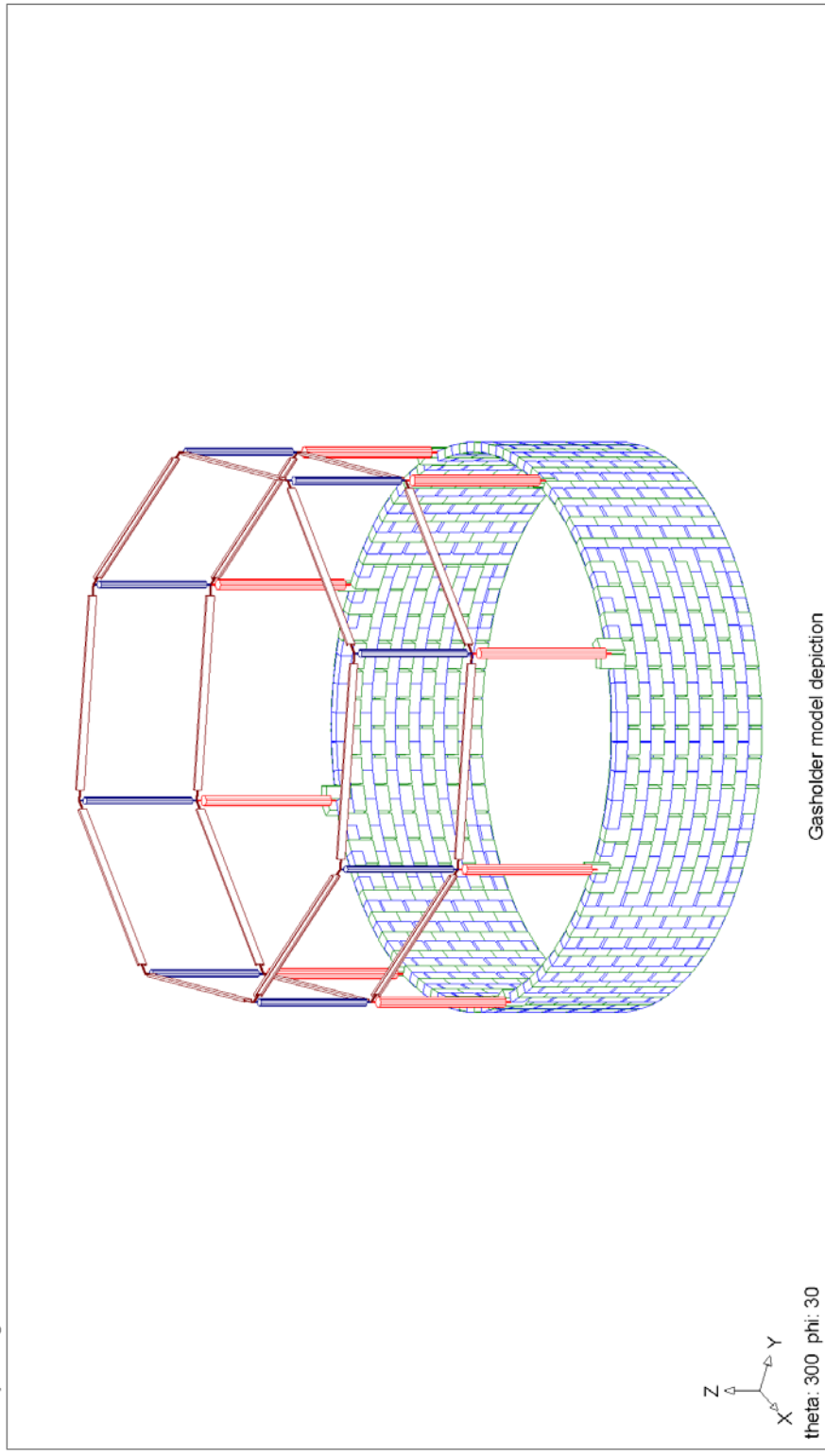
- the peripheral brick wall to the gasholder was modelled with a brickwork thickness of 350 mm, the same as at the top, as a "worst case" even though it is likely that the brickwork becomes thicker with depth;
- the depth of the brickwork was taken as a "worst case" 6 metres determined from the reports in the brief (it is noted, however, that CH2MHill measured 5 m);
- brickwork properties were taken from the properties determined from previous tests on NSW Railways brickwork in bridges of a similar age and appearance;
- for the preliminary analysis only, the iron/steel structure was modelled with assumptions as to the column wall thickness and with the trussed beams replaced with single sections of similar stiffness;
- soil properties were taken from the PSM recommendations to use the "at rest" factor of K_0 .

A depiction of the model used is at Figure 1.

¹ *Macdonaldtown Gasworks Remediation Project Geotechnical Investigation*, Pells Sullivan Myernink, Reference PSM1444R1 Draft 15 July 2010

² *Delineation & Characterisation Sampling and Review of Remedial Options*, CH2MHill, Reference: 347496, March 2007

Bill Jordan & Associates Pty Ltd
Job: T005 Macdonaldtown gasholder, prelim analysis
T005 - Structural analysis of gas holder
Stability during site remediation
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theta: 300 phi: 30

Microstran V8.21.004x {783451}

Gasholder model depiction

...T005 Macdonaldtown gasholder prelim analysis

Figure 1: Microstran model used for preliminary analysis

To best fulfil the conceptual mitigation plan requirements, the following loading states and combinations were considered:

- soil load on one half of the brick structure only, to replicate the worst likely scenario of the maximum unbalanced external load on the structure, both with and without internal water pressure (this also coincides with the CH2MHill Figure 6 showing the need to remove soil over the half to the north-west of the gasholder);
- internal water pressure alone, with no soil pressure;
- loading combinations in accordance with AS 1170.0 were used.

2.2 Gasholder results

The analysis results show that soil excavation can proceed around the gasholder to the depth of the brickwork providing the gasholder is first emptied of water.

In order to determine the limits for excavation with water not removed, analyses have also been carried out with three metre and one metre sections of the soil outside the annulus structure excavated and the water still in the tank. This was done to simulate excavation required for further investigation, again in a “worst case” scenario as no trench is likely to exceed an excavator bucket width at right angles to the wall. The three metre excavation produced tensile stresses in the brickwork which could be too high; the one metre excavation was acceptable, with only minimal tensile stresses which should not be maintained for a period. It is therefore considered prudent that investigation trenches be kept narrow and backfilled as soon as possible.

For planning purposes, the depth of excavation during remediation beside the gasholder should be limited to the depth to the bottom of the brickwork (yet to be determined) and sloped away from the base at angle of 45°.

3. Neighbouring properties

3.1 General

Of the critical neighbouring properties on Burren Street, Nos. 33-35 and 37 to 43 are going to be affected to some extent in accordance with Figure 7 of the CH2MHill report which shows the need for deep remediation from the centre of the southern gasholder northwards. The centre of the southern gasholder coincides with the original boundary between Nos. 33 and 35. None of these properties is shown to have been remediated, if the provided drawings truly show that extent, with the last remediated backyard being at No. 27.

3.2 No. 33 to 35 Burren Street

Of the properties concerned, Nos. 33-35 comprises a new development built to the boundary with a basement car park with a floor at RL 14.75. This compares with a site ground level at the gasholder of approximately RL 18.5 m. Scaling from the drawings for distance from the boundary to the remediation area and assuming a shallow depth of footing below the car park floor, suggests a conservative maximum excavation depth beside the boundary of 7.6 m. The gasholder may limit this depth to a greater extent.

3.3 Nos. 37 to 43 Burren Street

The principal concerns relate to properties at Nos. 37 to 43 where deep excavation will be required near the rear boundaries to remediate the soils in the area coloured orange and purple on the CH2MHill Figure 7. Improvements on these properties appear to comprise fencing and various lightweight garden structures.

Negotiations with the property owners will be required to determine the best means of remediating these sites. The options are:

1. temporarily remove lightweight structures and replace following remediation;
2. support the soil along the boundary with temporary sheet piling (this would be noisy to install and may not be acceptable to the property owners);
3. remediate by digging a series of narrow trenches at right angles to the boundary under geotechnical supervision (some temporary bridging support may be needed for some of the structures).

4. Conclusions

Remediation of the old gasworks site by excavation and treatment of the soil can proceed with minimal restrictions as follows:

1. the gasholder should be emptied of water;

2. excavation adjacent to the boundary of properties from 37 to 43 Burren Street should be done after negotiations with the property owners to determine the acceptable means of excavation, which will probably consist of a series of narrow trenches a right angles to the boundary which would be backfilled and compacted prior to adjacent trenches;
3. where adjacent property controls are not a factor, excavation beside the gasholder can proceed to the depth of the brickwork and then be sloped out at batter of 45°—such an excavation should be backfilled to the base of the brickwork as soon as possible.

The methodology for excavation and remediation will need refinement as the specification for the work is prepared and it would be prudent to involve all parties in the final planning.

A handwritten signature in blue ink that reads "Bill Jordan". The signature is written in a cursive style with a large, looping flourish at the end of the name.

J.W. Jordan FIEAust CPEng

15 October 2010