UNDER	**THE COMMISSIONS OF INQUIRY ACT 1908**
IN THE MATTER OF	**ROYAL COMMISSION OF INQUIRY INTO BUILDING FAILURE CAUSED BY CANTERBURY EARTHQUAKES** **KOMIHANA A TE KARAUNA HEI TIROTIRO I NGA WHARE I HORO I NGA RUWHENUA O WAITAHA**

SECOND STATEMENT OF EVIDENCE OF ROBERT HEYWOOD IN RELATION TO THE CTV BUILDING

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1. My full name is Robert James Heywood. I have previously provided a statement of evidence to the Royal Commission in relation to the CTV Building **[WIT.HEYWOOD.0001]**.

2. This second statement of evidence covers observations I made during a visit to the remains of the CTV Building at Burwood, Christchurch, on 28 June 2012 with Graham Frost.

3. I will also include some additional observations regarding the South Wall and the Level 2 steel trimmer beam, that I made during the search and rescue operation at the CTV Building site.

General Observations

4. I was not able to sight the exhibits that Graham and I had set aside at the CTV site in the days after the collapse, at Burwood.

5. The remnants of the CTV building had been dumped in a series of closely spaced piles at Burwood (refer Figure 1 **[BUI.MAD249.0520.1]**). Only the surface of these piles was visible. In one location the piles had been flattened by the passage of a tracked vehicle.

Western Wall

6. I observed sealant on the side faces of some rectangular columns from Level 4 and below as detailed on Section 3 of drawing S17 **[BUI.MAD249.0284.18]**. This was in a position consistent with the 140mm blockwork. I also observed a segment of blockwork with sealant attached (refer Figure 2 **[BUI.MAD249.0520.2]**)

7. S17 Section 3 also specifies a backing strip and asbestos tape. There was no sign of the backing strip but the markings in the paint suggested that there had been some form of tape over the joint (refer Figure 2(a) **[BUI.MAD249.0520.2]**).

8. There was no sign of ties or reinforcement connecting the rectangular column and the blockwork in columns identified to be from Level 4 or below (e.g., refer Figure 2(a) **[BUI.MAD249.0520.2]**).

9. A number of small segments of 140mm blockwork were observed. These were core filled and contained vertical and horizontal D12 reinforcement. I observed no segments of blockwork that did not have the cores filled. (e.g., refer Figure 3 **[BUI.MAD249.0520.3]**)

10. I did not see any remnants of the sill beams that supported the western block walls at Burwood.

11. One complete and one part sample of what appeared to be Fixing A on drawing S39 was found at Burwood and this was provided to the Royal Commission (refer Figure 4(a) **[BUI.MAD249.0520.4]**). Fixing A (refer Fixing 4(c) **[BUI.MAD249.0520.4]**) was intended to connect the precast sill beams to the top of the blockwall, as detailed in Section 1 on drawing S23 (refer Figure 4(b)) **[BUI.MAD249.0520.4]**

12. Section 1 on drawing S23 shows R10 stirrups @ 200 centres (refer Figure 4(b)). These bars were protruding from a floor slab in Figure 16 (**[WIT.HEYWOOD.0001.45]**) of my previous brief of evidence. Section 1 shows an 180 degree hook around the bottom bar whereas the ends of the bars evident in Figure 16 are straight.

Columns

13. I observed sliced circular and rectangular columns which revealed some sections with the reinforcement cage eccentric to the column, i.e. low cover on one side and high cover on the other side (refer Figure 5 **[BUI.MAD249.0520.5]**).

14. I also observed a column which was oval in shape (refer Figure 5(b)).

Beams

15. I observed a number of internal and edge beams in the rubble. The "wings" of these beams were broken at the ends of the beams where the beams provided the formwork for the internal circular columns (refer Figure 6(a) **[BUI.MAD249.0520.6]**). The remaining semi-circular faces at the ends of the beams were essentially as formed – there was no surface roughening and no evidence of substantial bond between the semi-circular faces and the column concrete (refer Figure 6(b)). The loss of these "wings" was also observed during the USAR operations.

16. I did not observe any internal or edge beams with cored holes through the beams. The number of internal beams where the vertical faces were observed during USAR

operations was relatively small, approximately 10, as most of the internal beams were removed after I left the site. A similar number would have been observed at Burwood. It is not possible to identify which floor the beams are from as the beams were generally the same on all floors. More edge beams were observed but these are unlikely to have been cored for cabling purposes.

17. The vertical internal faces of one edge beam were smooth but the bottom surface of the shell beams appeared to have been roughened (refer Figure 7 **[BUI.MAD249.0520.7]**). The top surface of an internal beam was also observed not to have a roughened surface.

South Wall

18. Figure 8 **[BUI.MAD249.0520.8]** is a view of the South Wall looking towards the North Core during USAR operations to remove the steel escape stair and before the South Wall was broken up for removal. Steel roof framing and roof sheeting is visible between the end of the South Wall and the North Core. An edge beam is evident lying parallel to the right (east) of the South Wall. It appears that there is only one flight of stairs remaining to be removed, indicating the photograph was taken from around Level 3 with levels as indicated on Figure 8. The cracking in the South Wall appears to be more severe on the eastern side.

Level 2 Trimmer Beam

19. The Steel trimmer beam installed around the hole cut through the Level 2 slab for the stairwell in the south-east corner of the building was in relatively sound condition (Figure 9 **[BUI.MAD249.0520.9]**). The masonry anchors that connected the steel trimmer beam to the concrete structure had pulled from the concrete.

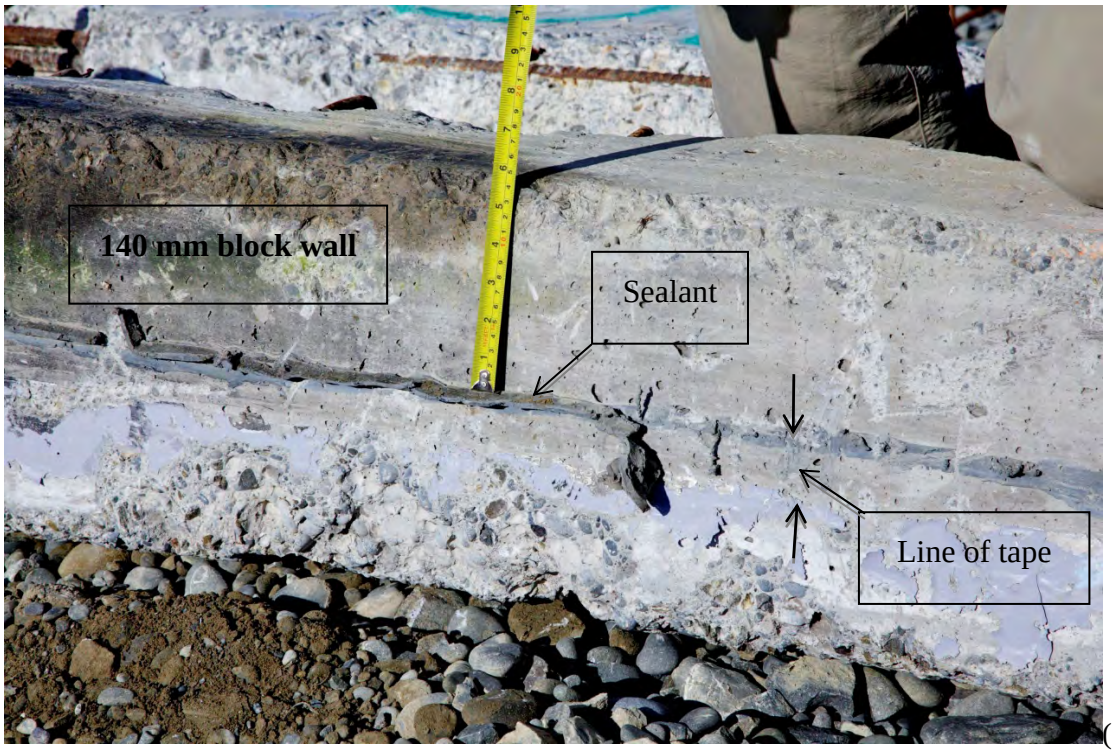
20. The D12 reinforcement and "664" mesh is evident in the broken edge of the slab. The imprint of the top reinforcement of an edge beam is visible immediately below the "664" reinforcement. The two D12 reinforcing bars evident have pulled from the edge beam infill concrete rather than broken.

Signed: R J Heywood

Robert Heywood

Date: 9 July 2012

Figure 1 Remains of CTV Building at Burwood



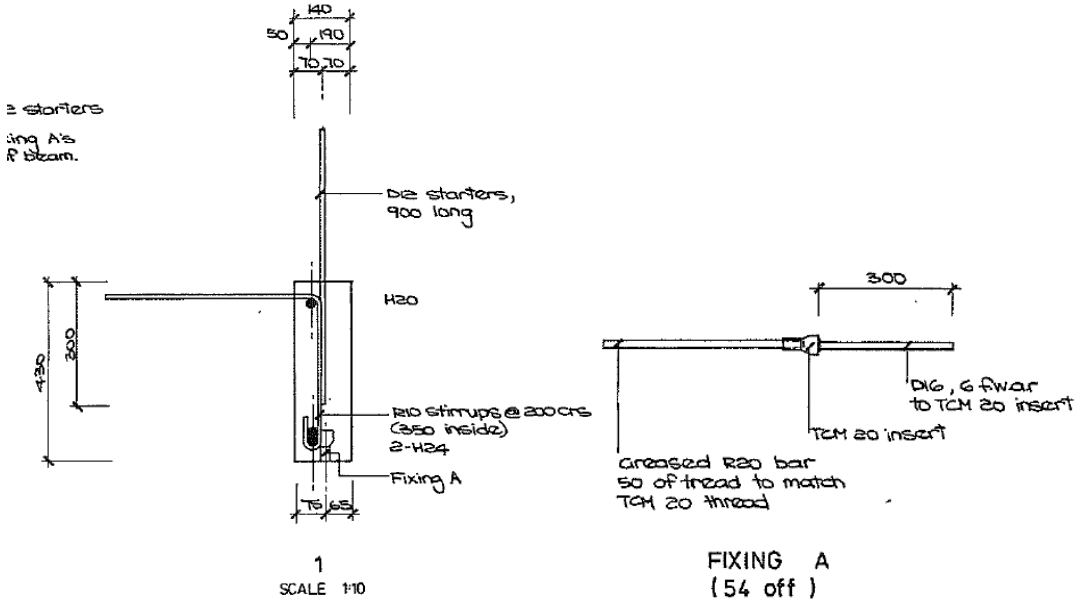
a) Remnant of sealant on face of rectangular column

b) Remnant of sealant on reinforced core filled blocks

Figure 2 Remnant of sealant between the rectangular columns and western the block wall

Figure 3 Remnant of 140 mm block wall

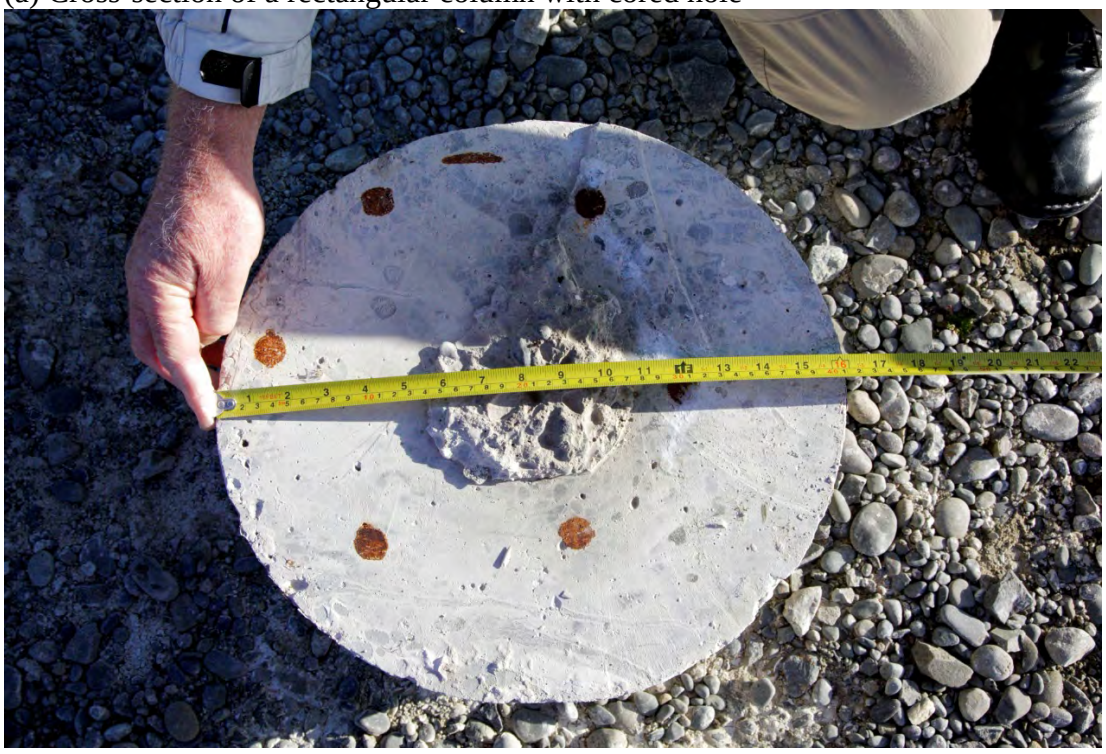
(a) Fixing A at Burwood



(b) Dwg S23 Section 1 (c) Dwg S39 Fixing A

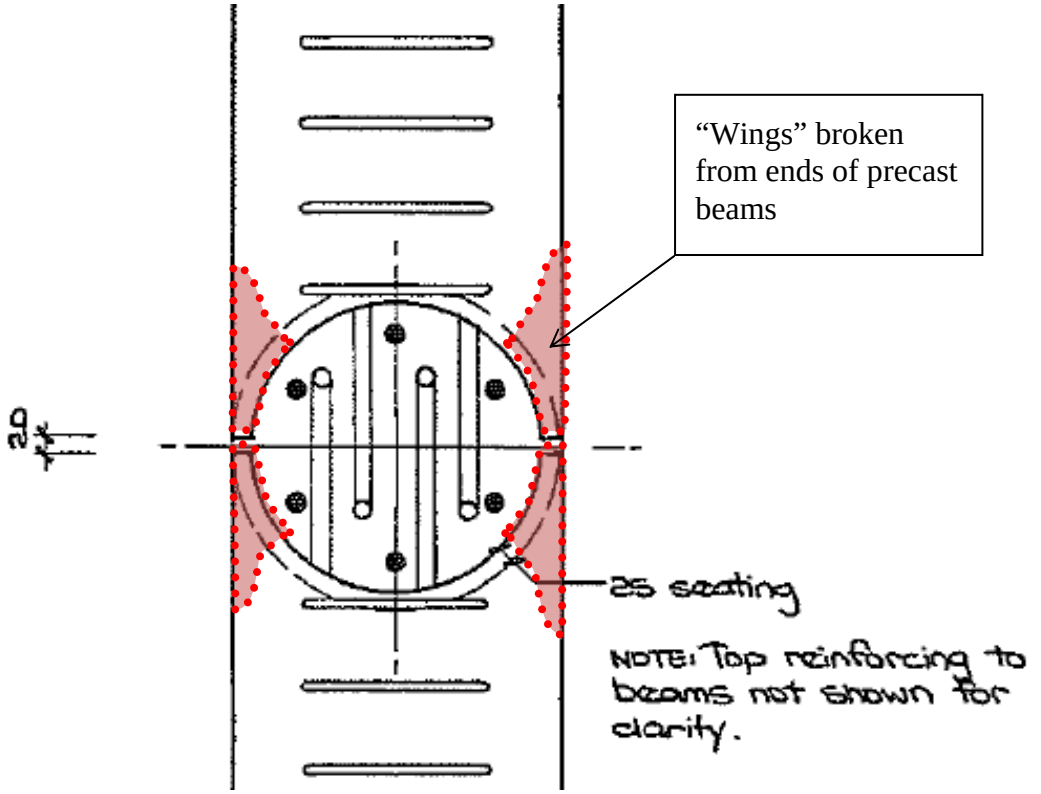
Figure 4 A deformed assembly consistent with Fixing A

(a) Cross-section of a rectangular column with cored hole



(b) Slightly oval cross-section of a circular column

Figure 5 Examples of columns with low and high cover



(a) Plan of a typical connection between a precast internal beam and an internal circular column showing "wings" (Dwg S18 Detail 7)

(b) Examples of internal beams with broken "wings"

Figure 6 Broken "wings" on internal beams.

(a) Overview of edge beam showing shell beam broken away from the infill concrete

(b) Close-up of smooth and rough surfaces of infill concrete. The concrete of the shell beam had been broken to reveal the shell beam reinforcement.

Figure 7 An upside down broken edge beam

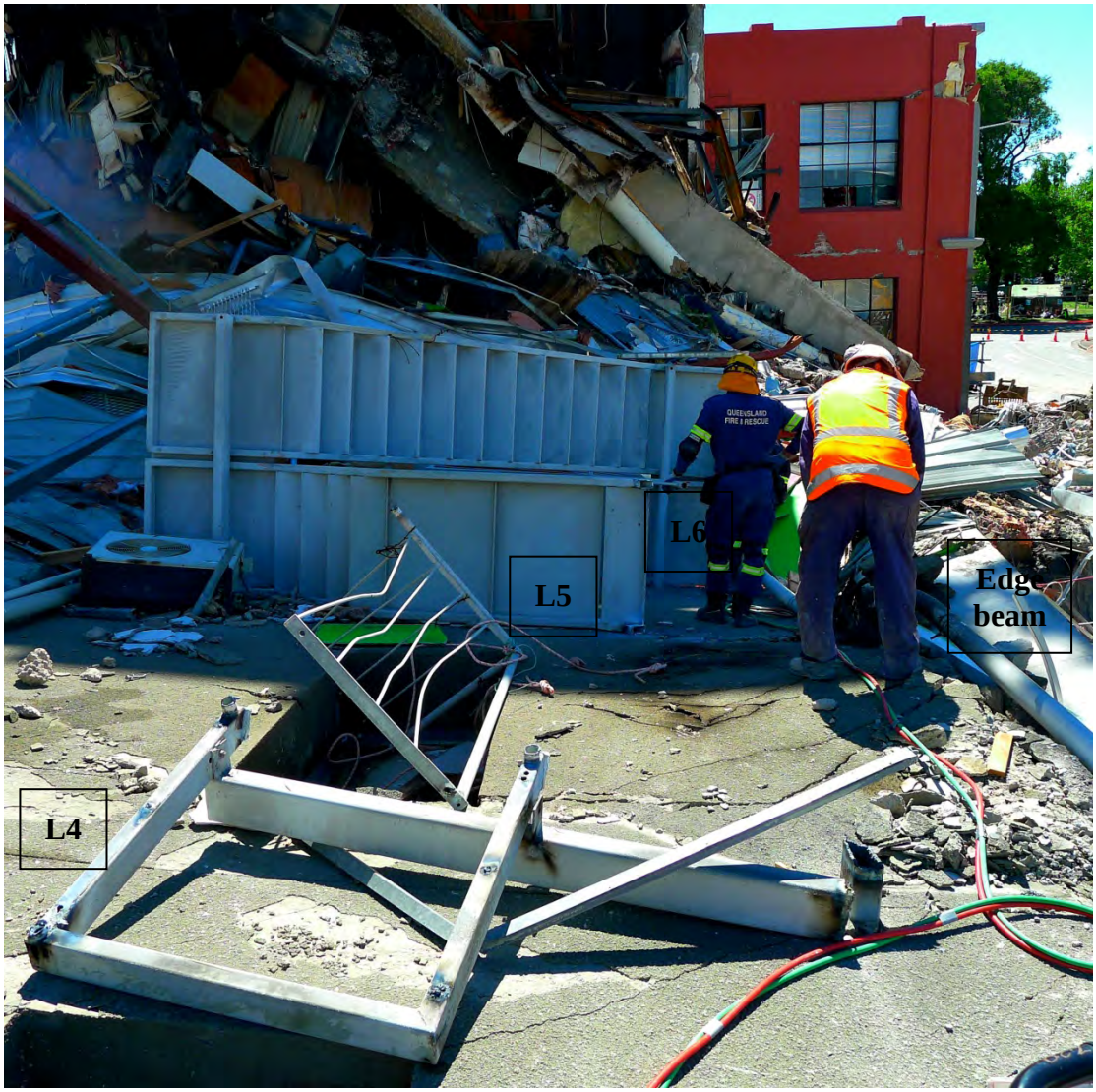


Figure 8 View of South Wall during operations to remove escape stair (Photo by John Reid)

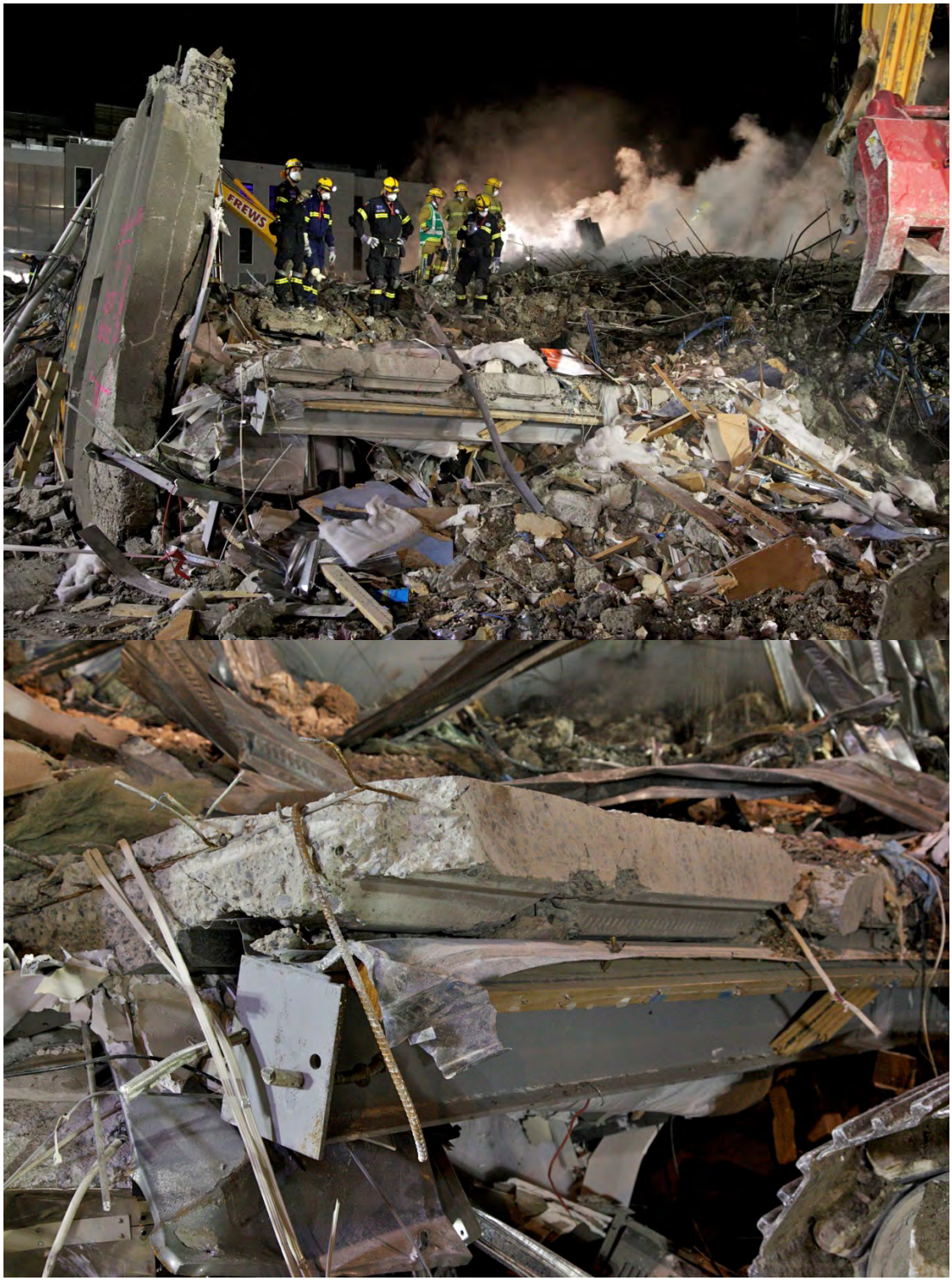


Figure 9 Steel trimming beam: Level 2, south-east corner of the Building