

INVESTIGATION REPORT
ON
THE COLLAPSE OF PORTION OF
THE MARRIED INSPECTORS' QUARTERS BUILDING
AT
THE CENTRAL POLICE STATION COMPOUND
ON 29 MAY 2016



Buildings Department
May 2017

Introduction

1. On 29 May 2016 at about 22:05 hours, the northwestern corner of the Married Inspectors' Quarters Building (MIQ Building) (i.e. Block 4) of the Central Police Station (CPS) Compound at 10 Hollywood Road, Central, Hong Kong collapsed. No casualty was reported in the incident. The Buildings Department (BD) subsequently conducted an investigation on the incident.



View towards Northwest Elevation

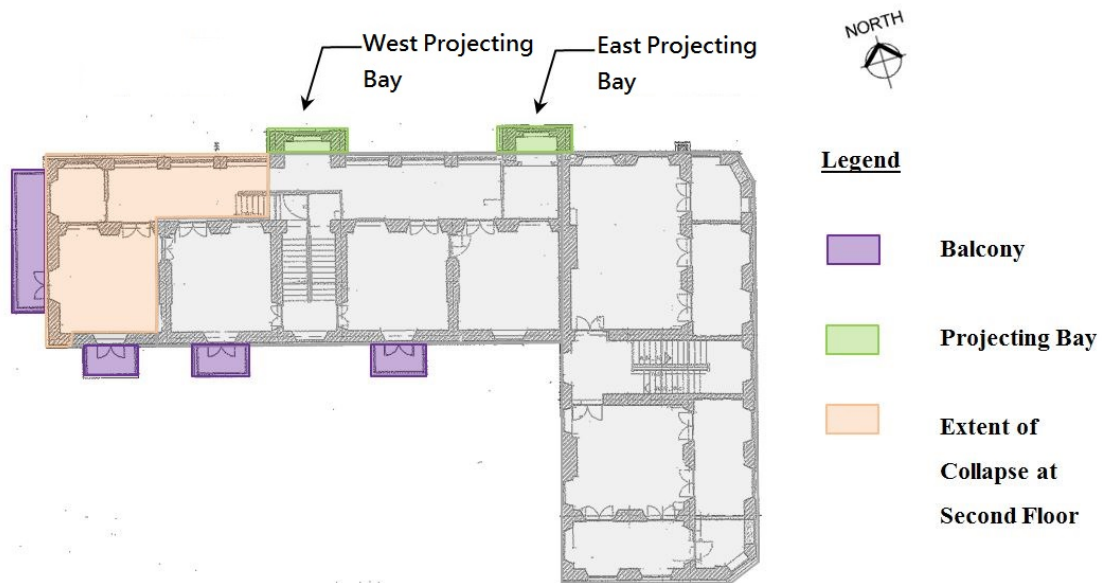


View towards Southwest Elevation

The CPS Conservation and Revitalisation Project

2. The CPS Compound is a heritage site located in Central bounded by Hollywood Road, Arbuthnot Road, Chancery Lane and Old Bailey Street. In 1995, all the 16 buildings at the CPS Compound were declared as monuments under the Antiquities and Monuments Ordinance.

3. Built between 1862 and 1864, the MIQ Building is a 3-storey, L-shaped brick masonry building. MIQ Building is mainly built of timber floors and a pitched roof supported by timber trusses. The timber floors and timber roof trusses are rested on top of brick walls and brick piers. Brick walls and brick piers are founded on either retaining walls or pad footings. At the north elevation, there are a three-storey verandah and two projecting bays which are supported by granite corbels. The balcony at its west elevation was removed subsequent to the damage caused by a fallen tree in 2008.



Second Floor Plan of MIQ Building

4. The alteration and addition (A&A) works approved under the Buildings Ordinance (BO) for upgrading the MIQ Building mainly involve strengthening of granite corbels of East and West Projecting Bays, strengthening of timber floors to meet current fire resistance and structural requirements, recast of the existing reinforced concrete slabs, addition of a new external metal staircase and new steel protective barrier, and reinstatement of the balcony on west façade.



Photomontage of North Elevation of MIQ Building
Showing Proposed A&A Works

5. In addition to the A&A works, minor works were carried out under the minor works control system of the BO for the removal and relaying of roof tiles on the existing pitch roof, repair and replacement of timber roof structures, repair and replacement of existing timber windows, removal of existing above-ground drain, and repair of external rendering on existing walls.

The Investigation

6. After the collapse incident, the BD conducted an investigation on the incident through various aspects including site inspections, analysis of samples collected on site, laboratory testing on samples, review of records and information of the A&A works and minor works submissions, review of records of CCTV footages, repair works and condition survey of buildings in CPS, and interviews with persons worked on the project, with a view to establishing the cause of the collapse and considering appropriate follow-up actions under the BO.

7. The investigation has also taken into account the incident reports prepared and submitted by the project Authorized Person and Registered Structural Engineer after the incident and the “Findings on the Partial Collapse of the Married Inspectors Quarters at the Central Police Station Compound on 29 May 2016” dated 31 October 2016 prepared by the Independent Review Panel appointed by the Hong Kong Jockey Club.

Findings

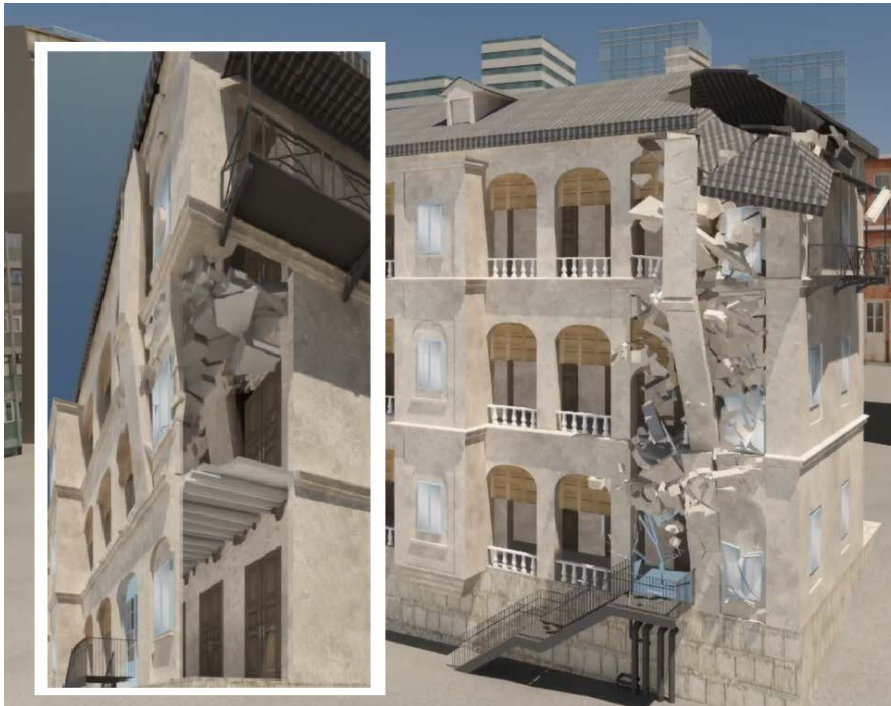
8. From the evidence available, the following situations were revealed:

- (a) Prior to the incident, the strengthening works of the timber floor of the verandah at the first floor were being carried out. Two numbers of square hollow sections (SHS) were being installed on both sides of each of the existing timber joists. Pockets were hollowed out in brick walls and brick piers on both sides of the verandah during the process of installing SHS.
- (b) The timber floor strengthening works were under the site constraint that the timber floor boards above the joists and the existing timber bearer and corbels along the northern wall had to remain in place. Coupled with existing timber joists being closely spaced at about 300mm center to center, portions of the brickwork on the face of the brick piers and brick walls had to be removed so as to provide sufficient space for the insertion of the SHS into the brick piers and brick walls.
- (c) The grouting works at both ends of the SHS during the installation process had not been fully completed, thus leading to the reduction of the effective sectional bearing area of the brick piers and brick walls.

Cause of Collapse

9. A structural assessment was conducted on the effect of pocket openings on the structural integrity of the five internal and external brick piers at the collapsed area. Due to the reduction of the effective sectional bearing area, the compressive stresses acting on these five brick piers had been increased and the stress on one of the internal brick piers with multiple pocket openings had exceeded its structural capacity and failed ahead of the others.

10. The collapse was initiated by the failure of this internal brick pier at 1/F level which was then leaned towards the northern direction, pushing the timber joists at 2/F level to cause failure of the external brick piers on north elevation, which had also been weakened by pocket openings. The failure of the internal and external brick piers then triggered the progressive collapse of the roof and other brick piers.



Computer Simulation of Failure of the Internal and External Brick Piers

11. The investigation also revealed that some other building works were completed or being carried out in the MIQ Building prior to the collapse incident. These other works included the repair of cracks in brick piers and walls, the reinstatement of the balcony at west elevation, the west corbel strengthening works and the excavation works around both the toe and the crest of the retaining wall supporting the collapsed portion. All these works were found either had been completed well before the incident or would have only localised effects to the structural integrity of individual building elements. There was no evidence to suggest that the stability of the building had been impaired by any of these building works. Hence, these works were not considered to have directly led to the collapse incident.

Conclusion

12. Based on the findings of the investigation, the key and triggering factor for the collapse is most likely attributable to the hollowing out of multiple pockets in brick piers and walls for the installation of steel members for the timber floor strengthening works at the first floor of verandah. The collapse incident was likely to be triggered by the failure of one of the internal brick piers due to significant loss of sectional bearing area.

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