

External wall collapse accident in the building demolition work in Fuji City

【On March 13th, 2003. Yoshihara Fuji-city Shizuoka-prefecture】

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On March in 2003, during demolition work of the old 7 story Yaohan-Building in Shizuoka Prefecture Fuji City, the part in external wall of the reinforced concrete fell to the prefectural road several tens of meters below. Two passenger cars waiting at a signal at that time on the prefectural road were trapped under the rubble. Two passengers in the inside in the automobile died, and two were injured. A construction worker fell and died.

That could the operational procedure was omitted so that the person responsible for construction could shorten the construction period, and that safety measures for unstable structures and deterioration of the structure were neglected are the main causes.

1. Event

Some parts of a reinforced concrete external wall (about 3m heights, about 15m width, about 37 ton weight) fell to the prefectural road several tens of meters below, at around 15:35 on March 14th 2003, 7 story old Yaohan-Building, 2-chome Yoshihara Shizuoka Prefect Fuji City.

Two passenger cars waiting at a signal at that time on the prefectural road were trapped under the rubble. Two passengers inside the automobile died, and two were injured. Two construction workers fell and died.

2. Course

Buildings were 7-storied and also had a ground floor (total area about 12700 m²) in the reinforced concrete construction (the part steel structure).

The wall was under acetylene welding work to be overthrown inside the building by heavy machine at the time of the accident. Simultaneously, the work which installed the wire by an opening hole in the 2 reinforcing steel which supported the external wall made of the concrete was carried out, and the worker went up and down the external wall. Though the wire was connected with a steel frame, but the connection to two heavy machines which pull the wall had not been over. After that, it was planed that

steel frames was made a cut by gas burner and overthrown inside, but suddenly strange sound occurred and the wall fell in the roadside. The sound seemed that the bolt which was fixing the steel frame in the plate of bed sill was broken. The fell in part was a external wall of the building and pillars, the 6th floor's floorboard and girders which supported by the pillars, they were about 3m heights, about 15m width, about 37 ton weight. The 5th floor's wall fell in was made of reinforced concrete, and the upper part of it jetted about 1.5m like eaves.

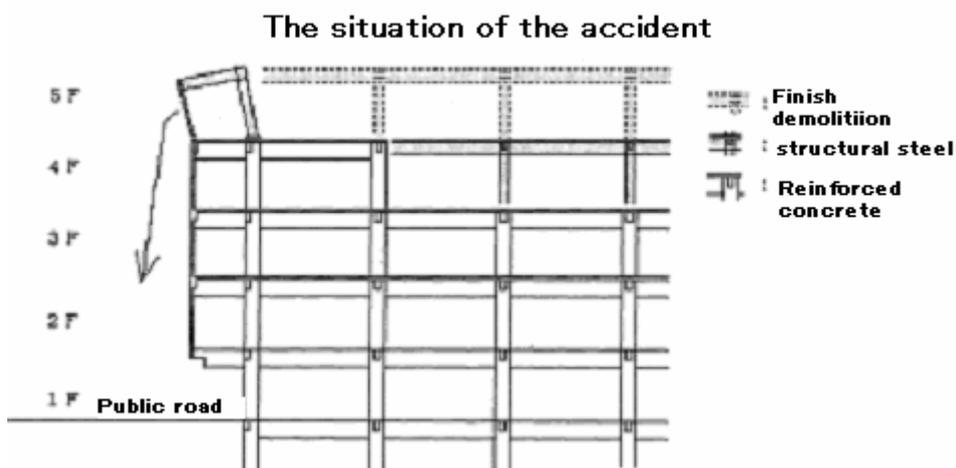


Figure 1. Situations of 2 of the accident (Source : Work safety information center home page)

Two passenger cars waiting a signal at that time on the prefectures road were trapped under the rubble. Two passengers in the inside the automobile died, and two were injured. Two construction workers fell and died.

3. Cause

1) The neglect of the disassembly procedure.

The construction schedule of this demolition work had been extended before the accident occurred, and the possibility of further delay was heightened.

Therefore, the secondary subcontract employee feared that the image of the company would deteriorate because of not keeping to the extended construction period, and in this work the disassembly procedure was not observed and work was advanced at a high pace which deals with such work in second disregarding usual, and retrieves the delay in the construction period disassemble plan it has made it beforehand, etc. And, the disassembly was carried out in the demolition work of wall surface in dismantling breast wall plane which keeps the condition that wall surface has contacted wall surface of the neighbor in order in the left circumference, from the

place where but, the hand is added for the shortening in the work period in this construction the principle. In spite of recognizing the danger in which building external wall collapses, field responsible person undertook the decommissioning operation with "there is no problem, if it is the short time". Contractor and first subcontractor together tipping over prevention, measures negotiate change.

2) The shortage in the communication.

The first subcontract or and the secondary subcontractor changed from the middle point and the communication between the subcontract or and the principle contractor was insufficient, when the construction was interrupted.

3) The lack of consideration is the structure of the building.

That in spite of taking collapse prevention measures for the building outside, the building was unstable structure because its center of gravity over external wall, but the construction manager also omitted the removing work to upper floor face so that construction terms become shorter.

4) The deterioration of the building.

This building was completed as a 4-floor building in 1969. An additional fifth floor was extended afterwards, and it became a 7-floor building in 1974. Therefore, over reinforced concrete, over the fifth floor was reinforced concrete, and the method differed different to the fourth floor in the steel build, and it was the structure that the steel column was fixed by the bolt, when the basic plate was embedded, junction. Because of becoming superannuated the building, a lot of volts connected original part and extension part had come out, so the strength of the junction part was weakened .

4 Immediate Action

After the accident was occurred, Fuji City issued the stop order of the construction based on the Building Standards Law for the construction to 2-chome area of Yoshihara Fuji-city good construction building construction union as a ordering party of demolition work, and Kiuchi construction company (Shizuoka Prefecture) as a contractor.

In the demolition work of junction between different structure, a steel frame construction and a reinforced concrete construction and precast concrete structure, etc. or junction between a part of extension or reconstruction and an original part, should be pay attention to strength for the junction, make a plan for construction and carried out.

5. Countermeasure

The guideline in which the Ministry of Land, Infrastructure and Transport depends on the prevention of recurrence countermeasure from the viewpoint of the public accident prevention is coordinated. The summaries are as follows.

1) Owner and builder carry out selection of disassembly method, which sufficiently considers the accident prevention, and preparation of scheme of execution, which has been investigated and is fully understood beforehand.

2) During the construction, if a contractor finds an unexpected structure and facilities in the estimation outside, it should suspend the work and implement necessary changes the scheme of execution.

3) In the demolition work of the building that external part jettied, selection of the method, preparation of the scheme of execution and construction are appropriately carried out in order to keep the structural stability in each stage of the construction. Especially such as buildings have sticking out periphery project curtain wall etc. which aren't structurally standing it.

4) In the demolition work of junction between different structure, a steel frame construction and a reinforced concrete construction and precast concrete structure, etc. or junction between a part of extension or reconstruction and an original part, should be pay attention to strength for the junction, make a plan for construction and carried out.

5) The owner and contractor should sufficiently understand necessity of the technology, which depends on effect and responsibility, demolition work of the accident in the demolition work of the large-scale building, and carry out appropriate contract, preparation of scheme of execution, construction, while related laws and regulations are observed.

6) That owner and manager of the Construction Department try to save that drawing and specification in new construction and extension and reconstruction and the completion figure, succession.

6. Generalization

The direct causes of this construction accident were the parson who felt a sense of crisis because of the delay in construction period, the advanced the work by

hurrying at the sacrifice of safety, and that safety measures were neglected to be naturally lectured for the unstable structure of the building to shorten the work time. However, it is also considered that "impatience" to losing generation of the deficit by the fact and confidence which can not keep the construction period by the increase in the new entry enterprise to prolonging depression of the construction industry and disassembly business, exists as an indirect cause of the accident.

The building demolition work is frequent in urban districts. In the concerned case, the slipshod work, which neglects safety in the construction done at once by the buckwheat of the life of the citizen, is carried out, and public disaster, which involves the citizen in the reason, has arisen. Such accident becomes the factor, which produces society's distrust for the whole of the construction industry, and it has a big social effect. It is necessary to do the safety management in demolition work thoroughly in order to prevent the recurrence.

7. Knowledge

1) "Hectic atmosphere" and "impatience" should be known the causes of accidents. Even if a construction schedule has been put back, the disassembly plan must be observed. The omission of the disassembly procedure is causally connected to the lowering of the safety of the construction.

2) In the old building, there is a high possibility of the unexpected cavity, flaking and the lowering of the strength of the estimation outside have been generated, and the more prudent construction must be carried out.

3) It is necessary to take appropriate and safe measures in the case of which the center of gravity applied to external parts or outside of structure, or curtain wall which aren't structurally stand itself are used.

4) To carry out the execution of the safe demolition work, it must be preserved which drawing-and-specification and completion drawing when new construction and extension and reconstruction of the building.

8. Background

In 2001 in which the concerned accident arose, there were about 35,000 demolition jobs of buildings in Japan. Following the urgent investigation after the accident of the Fuji City, there were 42 accidents of demolition work involving building constructed over 5-floor and site boundary and road boundary was within 5m, in Japan by the end of March, 2003. It concentrates in the large city.

Traders for the demolition work number 10,000 companies across the country at present. Recently, meager traders by increase in the new entry traders and experience of these companies are decrease.

In the demolition work, though it is effective for ensuring safety, when "the completion figure" which shows the last condition of the building is preserved, the cases that the completion figure is preserved are few, even if there are drawing and specification, etc... In addition, the record of the extension and reconstruction is hardly ever preserved.

Moreover, in the building demolition work, there is no standard on the concrete law, which prevents a large-scale collapse of walls, and it is the actual condition to leave safety countermeasures to traders. In the Building Standards Law, sound isolation and it is dustproof not assumed a collapse of the wall, etc. on the sheet, which is generally expensive in the wall of the building with the purpose, though the measures, which prevent the hazard by a collapse of the building to the wrecker, have been required. It not put either on traffic stop of the nearby road, if there is not considerable danger.

9. Sequel

Because this accident happened, the reconstruction business of the old Yaohan-building was suspended, the contractors of the construction work were changed by a tender and the construction was resumed over one year from schedule with the aim of completion in August, 2005.

In June, 2004, the Shizuoka working station sent the construction manager of Kinouchi Construction Company and responsible person and corporation of first subcontractor and secondary subcontractor supplier the case to the Public Prosecutor's Office on suspicion of being Occupational Health and Safety Law to the Shizuoka District Public Prosecutor's Office.

10. On the Side

The fatalities from the disassembly accidents amounted to 77 people for the previous 3 years (1998 ~ 2000). In this inside, it is 21% the result to of base on collapse and collapse of the external wall. However, there are no many on the case which came to the public disaster.

< Reference >

The Japanese economy newspaper (March 14th, 2003 morning issue, March 14th evening newspaper, March 15th morning issue, March 15th evening newspaper, March 16th morning issue, March 18th evening newspaper, March 19th morning issue).

Asahi Shim bun (March 14th, 2003 morning issue, March 14th evening newspaper, March 15th morning issue, March 15th evening newspaper, March 19th morning issue, March 27th morning issue).

The Shizuoka newspaper home page:

<http://www.shizushin.com>

The Ministry of Land, Infrastructure and Transport home page.

<http://www.mlit.go.jp>

Work safety information center home page.

<http://www.campus.ne.jp/~labor/>

"Guideline on the public accident prevention countermeasure by a collapse of the external wall of the building in demolition work, etc." (Ministry of Land, Infrastructure and Transport, 2003).

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