THE PLASCO BUILDING COLLAPSE IN TEHRAN

A Preliminary Assessment

FEBRUARY 20, 2017

ARCHITECTS & ENGINEERS for 9/11 TRUTH

The Plasco Building fire, explosion, and collapse incident in Tehran on January 19, 2017, was a national tragedy that will impact the country of Iran for years to come.

Sixteen firefighters and 10 civilians were killed.[1] In addition to the loss of life, over 500 garment and other businesses had much or all of their property destroyed, nearly 3,000 workers had their employment impacted, and the city of Tehran lost its earliest-built, iconic high-rise.[2]

Architects & Engineers for 9/11 Truth, which represents more than 2,750 architects and engineers, is an organization dedicated to finding the truth about the destruction of the three World Trade Center skyscrapers on September 11, 2001. Upon reviewing videos of the Plasco Building collapse and observing the improper rush to judgment about what caused it, we determined that it was our ethical responsibility to bring our expertise to bear on this matter as well.

The goal of this report, therefore, is to help the people of Iran in their effort to understand the cause of this tragic incident.

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1 http://www.ae911truth.org/images/PDFs/Plasco-final-death-toll_Fox-News.pdf

2 http://www.meinsurancereview.com/News/View-NewsLetter-Article?id=38090&Type=MiddleEast

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INTRODUCTION

The 15-story Plasco Building is seen on fire prior to its collapse on January 19, 2017.

On January 19, 2017, the iconic 15-story Plasco Building in Tehran caught fire at around 8:00 AM local time (4:30 GMT). After fighting the fires for a little over three hours, the Tehran fire department believed that it had extinguished the fires. Then, at around 11:20 AM, a series of explosions reportedly occurred inside the building. Within a few minutes of the first reported explosion, the building suffered a total collapse over a period of about 15 seconds.

1.1 Purpose and Recommendations

The purpose of this report is to analyze the publicly available data concerning the Plasco Building fire, explosion, and collapse incident and to provide a recommendation as to the most likely hypothesis that investigators should pursue as they attempt to determine the cause of the building's collapse.

On January 20, 2017, one day after the incident, Architects & Engineers for 9/11 Truth (AE911Truth) issued a statement[3] in which we cautioned against rushing to any conclusions and urged President Rouhani, Iranian authorities, and the people of Iran to thoroughly investigate the possible use of explosives.

Based on the data we have collected and analyzed over the past month, we can now recommend with a high degree of confidence that investigators should consider controlled demolition involving a combination of explosives and incendiaries as the most likely hypothesis for the Plasco Building's destruction.

3 http://www.prnewswire.com/news-releases/tehran-building-collapse-investigators-must-consider-explosives-says-architects--engineers-for-911-truth-300394148.html

Under such a scenario, the fires that started at around 8:00 AM would have been set intentionally to create the false appearance that the building came down as a result of those fires.

Given this hypothesis, great care should be taken to follow the scientific procedures outlined in NFPA 921 Chapter 23 (Explosions) and Chapter 24 (Incendiary Fires), cited in Section 1.2 below. Those procedures should be combined with interviews of individuals who had access to the building before reaching a final hypothesis.

We also recommend that fire or accidental explosions—or a combination of the two—not be ruled out while investigators continue to collect and analyze data. However, we have seen no evidence so far to suggest that the building collapsed due to either fire or accidental explosions. From a scientific standpoint, the fact that fires occurred and then a total collapse occurred is not, by itself, a sufficient basis to make collapse due to fire the most likely hypothesis.

1.2 Applying NFPA 921

To the extent possible and appropriate, this report will draw from the principles set forth in *NPFA 921: Guide for Fire and Explosion Investigations*. Published by the U.S. National Fire Protection Association, NFPA 921 is the national guide for fire and explosion investigations in the United States.

According to NFPA 921, it is "designed to assist individuals who are charged with the responsibility of investigating and analyzing fire and explosion incidents and rendering opinions as to the origin, cause, responsibility, or prevention of such incidents, and the damage and injuries which arise from such incidents." It does so by providing "a systematic, working framework or outline by which effective fire and explosion investigation and cause analysis can be accomplished." Further, "It contains specific procedures to assist in the investigation of fires and explosions.... Deviations from these procedures, however, are not necessarily wrong or inferior but need to be justified."

Because AE911Truth is not officially charged with investigating the Plasco Building incident and does not have access to the scene, much of NFPA 921 will not apply to this report. However, this report will cite sections of NFPA 921 (shown below) that can be applied in analyzing the publicly available data. It will also highlight sections of NFPA 921 that should be most relevant to investigators in Iran.

Relevant Sections of NFPA 921

Chapter 4 Basic Methodology

4.1 Nature of Fire Investigations. *A fire or explosion investigation is a complex endeavor involving skill, technology, knowledge, and science. The compilation of factual data, as well as an analysis of those facts, should be accomplished objectively, truthfully, and without expectation bias, preconception, or prejudice.... With few exceptions, the proper methodology for a fire or explosion investigation is to first determine and establish the origin(s), then investigate the cause: circumstances, conditions, or agencies that brought the ignition source, fuel, and oxidant together.*

4.3 Relating Fire Investigation to the Scientific Method. *The scientific method is a principle of inquiry that forms a basis for legitimate scientific and engineering processes, including fire incident investigation. It is applied using the following steps outlined in 4.3.1 through 4.3.9.*

4.3.1 Recognize the Need.

4.3.2 Define the Problem.

4.3.3 Collect Data.

4.3.4 Analyze the Data.

4.3.5 Develop a Hypothesis (Inductive Reasoning).

4.3.6 Test the Hypothesis (Deductive Reasoning).

4.3.7 Avoid Presumption. *Until data have been collected, no specific hypothesis can be reasonably formed or tested. All investigations of fire and explosion incidents should be approached by the investigator without presumption . . . until the use of the scientific method has yielded testable hypotheses, which cannot be disproved by rigorous testing.*

4.3.8 Expectation Bias. *Expectation bias is a well-established phenomenon that occurs in scientific analysis when investigator(s) reach a premature conclusion without having examined or considered all of the relevant data. Instead of collecting and examining all of the data in a logical and unbiased manner to reach a scientifically reliable conclusion, the investigator(s) uses premature determination to dictate investigative processes, analyses, and, ultimately, conclusions, in a way that is not scientifically valid. The introduction of expectation bias into the investigation results in the use of only that data that supports this previously formed conclusion and often results in the misinterpretation and/or the discarding of data that does not support the original opinion. Investigators are strongly cautioned to avoid expectation bias through proper use of the scientific method.*

4.3.9 Confirmation Bias. *Different hypotheses may be compatible with the same data. When using the scientific method, testing of hypotheses should be designed to disprove the hypothesis (falsification of the hypothesis). Confirmation bias occurs when the investigator instead tries to prove the hypothesis. This can result in failure to consider alternate hypotheses, or prematurely discounting seemingly contradictory data without an appropriate assessment. A hypothesis can be said to be valid only when rigorous testing has failed to disprove the hypothesis.*

4.4 Basic Method of a Fire Investigation. *Using the scientific method in most fire or explosion incidents should involve the steps shown in 4.4.1 to 4.4.6.*

4.4.1 Receiving the Assignment

4.4.2 Preparing for the Investigation

4.4.3 Conducting the Investigation

4.4.4 Collecting and Preserving Evidence. *Valuable physical evidence should be recognized, documented, properly collected, and preserved for further testing and evaluation or courtroom presentation.*

4.4.5 Analyzing the Incident. *All collected and available data should be analyzed using the principles of the scientific method....*

4.4.6 Conclusions. *Conclusions, which are final hypotheses, are drawn as a result of testing the hypotheses....*

Chapter 10 Building Fuel Gas Systems

10.1 Introduction. *Fuel gas systems are found in or near most dwelling, storage, commercial, or industrial structures. These systems commonly provide fuel for environmental comfort, water heating, cooking, and manufacturing processes. They can also be fuel sources for fires and explosions in these structures....*

10.2 Fuel Gases. *Fuel gases by definition include natural gas, liquefied petroleum gas in the vapor phase only, liquefied petroleum gas-air mixtures, manufactured gases, and mixtures of these gases, plus gas-air mixtures within the flammable range, with the fuel gas or the flammable components of a mixture being a commercially distributed product. The fuel gases most commonly encountered by the fire and explosion investigator will be natural gas and commercial propane.*

Chapter 23 Explosions

23.2 Types of Explosions. *There are two major types of explosions with which investigators are routinely involved: mechanical and chemical, with several subtypes with these types. These types are differentiated by the source or mechanism by which the blast overpressure is produced.*

23.2.1 Mechanical Explosions. *A mechanical explosion is the rupture of a closed container, cylinder, tank, boiler, or similar storage vessel resulting in the release of pressurized gas or vapor. The pressure within the confining container, structure, or vessel is not due to a chemical reaction or change in chemical composition of the substances in the container.*

23.2.2 BLEVEs. *The boiling liquid expanding vapor explosion (BLEVE) is the type of mechanical explosion that will be encountered most frequently by the fire investigator. These are explosions involving vessels that contain liquids under pressure at temperatures above their atmospheric boiling points....*

23.2.2.1 *A BLEVE frequently occurs when the temperature of a liquid and vapor within a confining tank or vessel is raised by an exposure fire to the point where the increasing internal pressure can no longer be contained and the vessel explodes.*

23.2.3 Chemical Explosions.

23.2.3.1 *In chemical explosions, the generation of the overpressure is the result of exothermic reactions wherein the fundamental chemical nature of the fuel is changed....*

23.2.4 Electrical Explosions. *High-energy electrical arcs may generate sufficient heat to cause an explosion. The rapid heating of the surrounding gases results in a mechanical explosion that may or may not cause a fire. The clap of thunder accompanying a lightening bolt is an example of an electrical explosion effect. High-energy electrical arcs require high voltage and are not covered in this chapter.*

23.3 Characterization of Explosion Damage. *For descriptive and investigative purposes, it can be helpful to characterize incidents, particularly in structures, on the basis of the type of damage noted. The terms high-order damage and low-order damage have been used by the fire investigation community to characterize explosion damage....*

23.3.2 Low-Order Damage. *Low-order damage is characterized by walls bulged out or laid down, virtually intact, next to the structure. Roofs may be lifted slightly and returned to their approximate original position. Windows may be dislodged, sometimes without glass being broken. Debris produced is generally large and is moved short distances. Low-order damage is produced when the blast load is sufficient fail structural connections of large surfaces, such as walls or roof, but insufficient to break up larger surfaces and accelerate debris to significant velocities.*

23.3.3 High-Order Damage. *High-order damage is characterized by shattering of the structure, producing small debris pieces. Walls, roofs, and structural members are broken apart with some members splintered or shattered, and with the building completely demolished. Debris is thrown considerable distances, possibly hundreds of feet. High-order damage is the result of relatively high blast loads.*

23.12 Explosives. *Explosives are any chemical compound, mixture, or device, the primary purpose of which is to function by explosion. Explosives are categorized into two main types: low explosives and high explosives....*

23.14 Investigating the Explosion Scene.

23.14.3 Initial Scene Assessment.

23.14.3.1 General. *Once the explosion scene has been established, the investigator should make an initial assessment of the type of incident with which he or she is dealing.*

23.14.3.2 Identify Explosion or Fire. *An early task in the initial assessment is to determine whether the incident was a fire, explosion, or both. It may be a lengthy process to determine what type of event occurred and which came first.*

Often the evidence of an explosion is not obvious, for example, where a weak explosion of a gaseous fuel is involved.

23.14.3.5 Identify Type of Explosion. *The investigators should identify the type of explosion involved (e.g., mechanical, combustion, other chemical reaction, or BLEVE).*

23.14.3.6 Identify Potential General Fuel Type.

23.14.3.6.1 *The investigator should identify which types of fuel were potentially available at the explosion scene by identifying the condition and location of utility services including fuel gases, and sources of other fuels such as ignitable dusts or liquids.*

23.14.3.6.2 *The investigator should analyze the nature of damage in comparison to the typical damage patterns available from the following:*

(1) *Gases*

(2) *Liquid vapors*

(3) *Dusts*

(4) *Explosives*

(5) *Backdrafts*

(6) *BLEVEs*

23.16 Analyze Fuel Source. *Once the origin or epicenter of the explosion has been identified, the investigator should determine the fuel. This determination is made by a comparison of the nature and type of damage to the known available fuels at the scene.*

23.16.1 *All available fuel sources should be considered and eliminated until one fuel can be identified as meeting all of the physical damage criteria as well as any other significant data.*

23.16.2 *Chemical analysis of debris, soot, soil, or air samples can be helpful in identifying the fuel. With explosives or liquid fuels, gas chromatography, mass spectroscopy, or other chemical tests of properly collected samples may be able to identify their presence.*

23.16.4 *Once a fuel is identified, the investigator should determine its source.*

23.17 Analyze Ignition Source. *When the area of origin and fuel are identified, the means of ignition should be analyzed.*

23.18 Analyze to Establish Cause.

23.18.1 General. *Having identified the origin, fuel, and ignition source, the investigator should analyze and determine what brought together the fuel and ignition at the origin. The circumstances that brought these elements together at that time and place are the cause....*

23.18.2 Time Line Analysis. *Based on the background information gathered (e.g., statements and logs), a sequence of events should be tabulated for the time both prior to the explosion and during the explosion. Consistencies and inconsistencies with causation theories can then be examined and a "best fit" hypothesis established.*

23.18.3 Damage Pattern Analysis. *Various types of damage patterns, principally debris and structural damage, should be documented for further analysis.*

Chapter 24 Incendiary Fires

24.1 Introduction. *An incendiary fire is a fire that is deliberately set with the intent to cause the fire to occur in an area where the fire should not be.*

24.2 Incendiary Fires Indicators. *There are a number of conditions related to fire origin and spread that may provide physical evidence of an incendiary fire cause.*

24.2.4 Exotic Accelerants. *Mixtures of fuels and Class 3 or Class 4 oxidizers (see NFPA 430, Code for the Storage of Liquid and Solid Oxidizers) may produce an exceedingly hot fire and may be used to start or accelerate a fire. Some of these oxidizers, depending on various conditions, can self ignite and will cause the same type of fire growth. Thermite mixtures also produce exceedingly hot fires. Such accelerants generally leave residues that may be visually or chemically identifiable. Presence of remains from the oxidizers does not in itself constitute an intentionally set fire.*

24.2.4.1 *Exotic accelerants have been hypothesized as having been used to start or accelerate some rapidly growing fires and were referred to in these particular instances as "high temperature accelerants" (HTA). Indicators of exotic accelerants include an exceedingly rapid rate of fire growth, brilliant flares (particularly at the start of the fire), and melted steel or concrete.*

1.3 Building Description

The Plasco Building was completed in 1962. It was a steel-frame high-rise containing 15 stories above ground and two stories below ground.[4] It was listed as 42 meters in height.[5] While no source seems to give the length and width, from photos it appears to have been approximately 20 meters in width along the north and south faces and 22 meters in length along the east and west faces. The south face was positioned adjacent to the street. The north face was connected to a four-story-high by approximately 60-meter-long shopping mall, as shown in the photos below.

The south and north faces of the building used steel columns with diagonals between them for lateral support at each story. The east and west faces used steel columns with horizontal braces tying them together for lateral support. As shown in the approximated plan view in Figure 2 below, the north and south faces contained eleven bays and the east and west faces contained twelve bays, with columns between each bay. Alto-

4 Some reports say the Plasco Building had 17 stories while other reports say it had 15 stories. Counting the stories visible in photographs indicates it had 15 stories above ground. It reportedly had basement floors, suggesting two stories below ground.

5 https://en.wikipedia.org/wiki/Plasco_Building

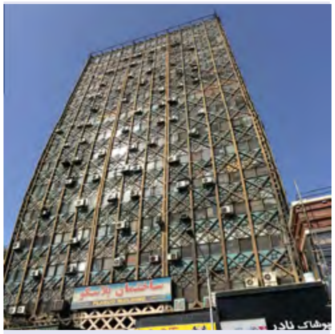


Figure 1: South face (street side) of the Plasco Building in Tehran, Iran.

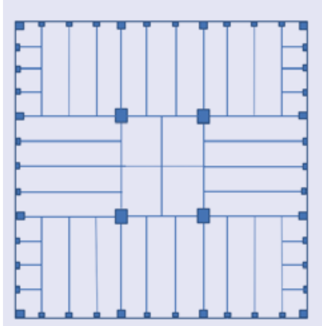


Figure 2: Approximated plan view showing 46 perimeter columns and 4 interior columns.

Figure 3: Aerial view of the building during the fire on January 19, 2017, showing the shopping mall at rear.

Figure 4: View of the four-story shopping mall from the entrance to it at the north side of the 15-story tower.

gether, there were 50 vertical columns. The north and south faces each contained 10 columns. The east and west faces each contained 11 columns. In addition, there were four perimeter corner columns and four large interior columns.

As shown in Figure 2 above, the corner columns and two perimeter columns near the middle of each face were double the size of the other, thinner 34 perimeter columns. The double-sized perimeter columns near the middle of each face appear to have been aligned with the four large interior core columns, as shown in Figure 2.

It is assumed that stair wells and elevators were congregated in the area in between the four interior columns. The shopping mall was enterable from several points, including from the interior of the tower on the tower's north side, which shoppers and retailers could access after entering the building at the south-side street entrance.

The two columns shown in Figure 4 above are the double-sized perimeter columns near the middle of the north face of the tower.

The building was occupied primarily by garment businesses. Large amounts of fabric were stored on the premises. Reportedly, the building's owners were warned on numerous occasions that the building was unsafe due to the storage of flammable materials throughout the building and the lack of fire safety measures.[6] There was no central heating system in the building and each tenant had its own heating system, reportedly fueled with gas or propane.

The building was owned by the Mostazafan Foundation, a large, government-owned nonprofit entity with over 200,000 employees and 350 subsidiary and affiliate companies in numerous industries. It was originally constructed and owned by an Iranian Jewish businessman named Habib Elghanayan, who was executed during the Islamic Revolution in 1979 after being accused of spying on behalf of Israel.

1.4 Timeline and Event Summary

The Plasco Building caught fire on the 9th floor at around 8:00 AM local time (4:30 GMT) on January 19, 2017.[7] It was occupied at the time by garment shop workers and tour guides leading visitors through the building.[8]

Ten brigades were dispatched and fought the blaze for a little over three hours.[9] During that time the fires traveled upward through the upper six stories. The fires did not travel to any stories below the 9th floor.[10] As reported by BBC Persian and by fire department spokesperson Jalal Maleki, the fire department believed it had successfully extinguished the fires.

> **Kasra Naji, BBC Persian:** *"And then they did manage to put out the fire, or they thought they had. And then more firefighters went in. Even civilians, people who had businesses there, went in to check. And then suddenly the whole thing collapses again after the fire restarted."*[11]

> **Jalal Maleki:** *"The extinguishing process was going pretty well. We were at the end of our job. Everything was under control, then all of a sudden, and unexpectedly, two or three major explosions took place in the upper floors at intervals*

6 http://www.meinsurancereview.com/News/View-NewsLetter-Article?id=38090&Type=MiddleEast

7 http://www.bbc.com/news/world-middle-east-38675628

8 http://www.latimes.com/world/la-fg-iran-high-rise-20170119-story.html

9 http://www.telegraph.co.uk/news/2017/01/19/high-rise-tower-fire-iranian-capital-collapses/

10 http://www.cnn.com/2017/01/19/middleeast/iran-tehran-building-fire-collapse/

11 http://www.bbc.com/news/world-middle-east-38675628

of two or three minutes."[12]

Mr. Maleki went on to describe the nature of the first explosion and the fire department's decision to evacuate its personnel from the building.

> *"The first explosion caused the massive destruction of the building's windows and soon after that under the order of the chief administrator of the operation, we were to evacuate the building. Because we found that this place had substances and materials that are prone to explosion."*

Mr. Maleki's account is corroborated by the account of firefighter Saeid Kamani, who had been fighting the fires from a fire truck crane, and who also heard smaller explosions prior to the first large explosion.

> *"But where I was high up there, I would hear small explosions and to my amazement, behind every one of the windows there was a gas canister.... I can't remember clearly, but after the white smoke started coming out, there was a massive explosion to the point that it shook me. And there, after a couple of minutes, the fire returned.... After that they ordered us to evacuate the building.... All of this that I'm recounting took place in two or three minutes at most, and suddenly the whole building started to shake and then I saw that the building collapsed...."*[13]

One video appears to show either the smaller explosions or the large explosion described in Mr. Kamani's account.[14] Meanwhile, the shaking of the building was corroborated by an unnamed firefighter, who said the shaking occurred one minute before the complete collapse occurred.

> *"I was inside and suddenly I felt the building was shaking and was about to collapse. We gathered colleagues and got out, and a minute later the building collapsed."*[15]

According to Mr. Kamani's account, some firefighters evacuated through the stairwells while some, as is corroborated by videos, were apparently forced to attempt their escape through the windows, in some cases unsuccessfully.

> *"Some of the firemen came out through the stairwells and some of them came out on the big ladders from the facade of the building. And the most heart-wrenching scenes were those shops on the 11th, 12th, and 13th floors that had fence*

Figure 5: Firefighters are seen escaping through windows and climbing down the side of the building after a large explosion prompted the fire department to evacuate its personnel.

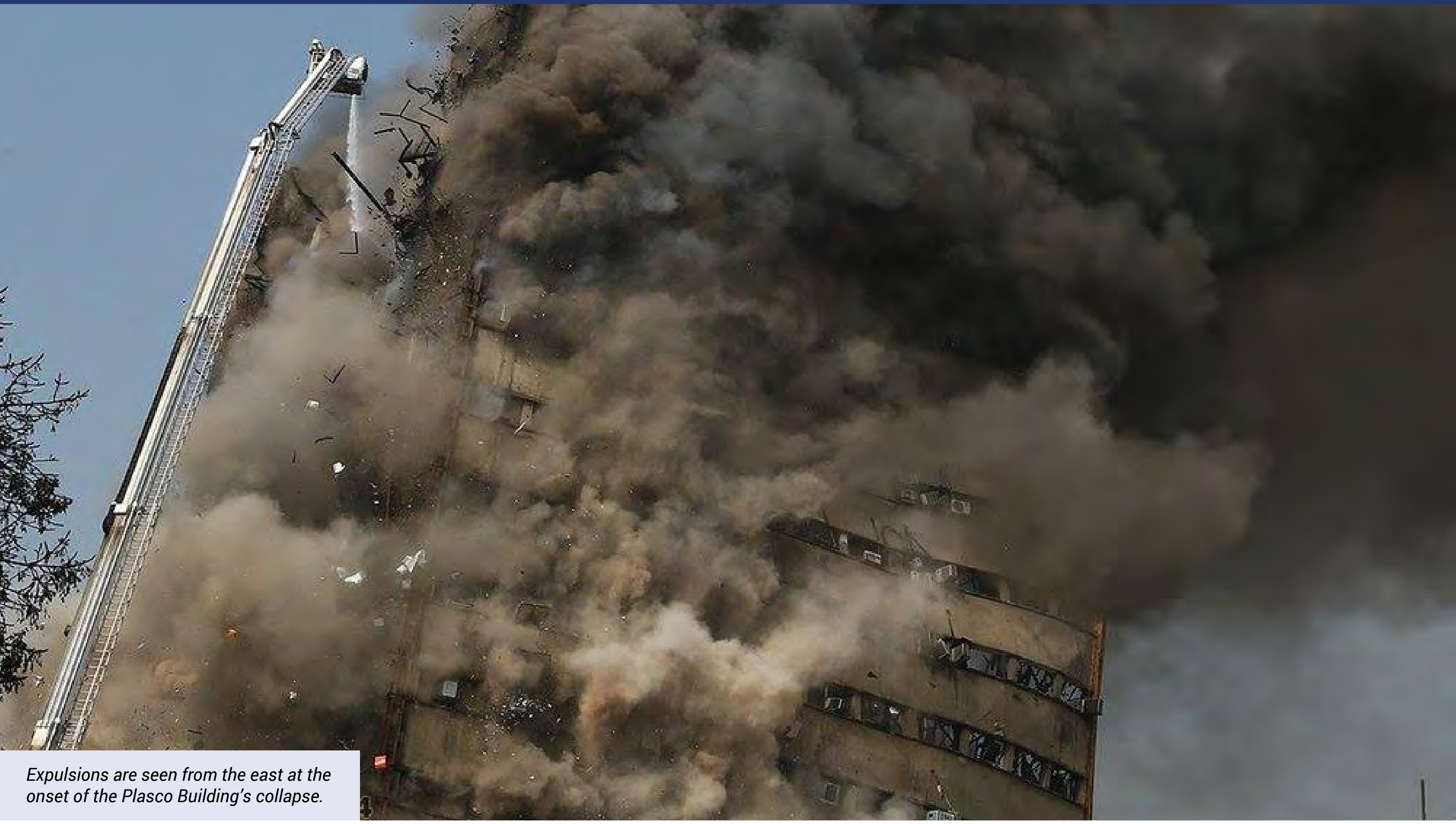
> *on their windows. And our team got stuck behind these windows."*

According to one BBC report, the north wall collapsed first, which then brought down the rest of the structure.[16] Unfortunately, there appear to be no publicly available videos showing the north face during the collapse. Videos from the west, south, and east generally show the collapse initiating on the south face with what appears to be an explosion around the 11th floor, followed by the roof caving in from the middle.[17] As shown in numerous videos, every part of the building fell to the ground within about 15 seconds after the collapse initiated.[18]

12 https://youtu.be/MEN8z7wQ8lQ
13 https://youtu.be/qJmF-KxcQCw
14 https://youtu.be/gdcG0GX7rrk?t=28s
15 http://www.bbc.com/news/world-middle-east-38675628

16 http://www.bbc.com/news/world-middle-east-38675628
17 https://youtu.be/_MgJTa7SDaY
18 https://www.youtube.com/playlist?list=PLUshF3H0xxH3WcOFW-zcSg_gmce0wrDolF

EVIDENCE CONSISTENT WITH DEMOLITION



Expulsions are seen from the east at the onset of the Plasco Building's collapse.

The purpose of this chapter is to analyze the publicly available data—collected in the first month since the Plasco Building incident—that appear to be consistent with the hypothesis that controlled demolition, involving a combination of explosives and incendiaries, was responsible for the Plasco Building's collapse.

As NFPA 921 advises (see Section 1.2), a fire or explosion investigation is a complex endeavor. The compilation of factual data, as well as an analysis of those facts, should be accomplished objectively, truthfully, and without expectation bias, preconception, or prejudice. Expectation bias is a well-established phenomenon that occurs in scientific analysis when investigators reach a premature conclusion without having examined or considered all of the relevant data. Investigators are strongly cautioned to avoid expectation bias through the proper use of the scientific method.

AE911Truth has endeavored to adhere firmly to these principles in preparing this report.

2.1 Explosions Before Collapse

NFPA 921 advises that an early task in the initial assessment of a fire or explosion incident is to determine whether the incident was a fire, an explosion, or both. **Based on eyewitness accounts, as well as subsequent public discourse in Iran concerning the cause of reported explosions, we have determined it was a fire and explosion incident.**

First, there appear to have been small, periodic explosions occurring over an extended period of time before the collapse. This is indicated by the account of Saeid Kamani, who had been fighting the fires from a fire truck crane:

"But where I was high up there, I would hear small explosions and to my amazement, behind every one of the windows there was a gas canister."

Second, there appears to have been a series of larger explosions that started a few minutes before the collapse. This is indicated by at least two eyewitness accounts and by video evidence.

Saeid Kamani: *"I can't remember clearly, but after the white smoke started coming out, there was a massive explosion to the point that it shook me."*

Jalal Maleki *(Fire Department Spokesman): "Everything was under control, then all of a sudden, and unexpectedly, two or three explosions took place in the upper floors at intervals of two or three minutes."*

Also, in one video, there are apparent explosions emanating from the northeast corner of the building around what appears to be Floors 3 through 6.[1] It is unclear if they are the smaller explosions described by Mr. Kamani or the larger explosions described by both Mr. Kamani and Mr. Maleki. In addition, numerous videos—in particular this one[2]—show what appears to be a large explosion emanating from the middle of the south face around the 11th floor immediately prior to the collapse. The occurrence of a large explosion immediately prior to collapse is corroborated by another account from Mr. Maleki: "The fire was about to be completely extinguished when all of a sudden an explosion took place in the upper floors and after a few seconds the whole building collapsed."[3]

Cause

A valid hypothesis for the cause of the Plasco Building fire, explosion, and collapse incident must explain the cause or causes of the explosions that occurred before the collapse.

In seeking to determine the cause of these explosions, we can look primarily to potential fuel sources known to exist in the building, as well as to the physical damage produced by the explosions and to the characteristics of the explosions. We can also look for consistency with other data discussed later in this chapter.

NFPA 921 advises, "All available fuel sources should be considered and eliminated until one fuel can be identified as meeting all of the physical damage criteria as well as any other significant data."

So far, no plausible fuel source other than explosives has been identified. Initially, a gas leak or gas tank explosion (i.e., a boiling liquid expanding vapor explosion or "BLEVE") was suspected. For example, "Mehdi Chamrun, the chairman of Tehran City Council, claimed that the explosion that occurred in the building was due to gasoline tanks in the upper floors."[4] However, a National Iranian Gas Company spokesman subsequently advised that the building was not connected to the gas network,[5] and the building's board of trustees claimed that there were no gas tanks in the upper floors.[6] As a result, government officials appear to have ruled out the hypothesis of a gas-related BLEVE.[7] [8] We have been unable to find news reports about any other suspected fuel sources.

Unfortunately, we have no further information on what fire department spokesman Jalal Maleki was referring to when he said, "Because we found that this place had substances and materials that are prone to explosion." The fire department may have simply deduced that there were "substances and materials that are prone to explosion," or department personnel may have directly observed such substances and materials.

It is also very important to note that because the fires burned only on Floors 9 through 15, the explosions that occurred on Floors 3 through 6 prior to the collapse had no apparent ignition source other than explosives. This fact alone appears to rule out the hypothesis that the explosions were caused by fire.

With regard to physical damage, the first large explosion, according to Mr. Maleki, "caused the massive destruction of the building's windows." Based on the fact that firefighters were attempting to escape through windows after the first large explosion, it may be that the first large explosion destroyed the stairwells and elevators as well. Alternatively, severe fires and smoke, perhaps caused by the explosion, may have prevented the firefighters from exiting through the stairwells.

If, given the temporal proximity of the larger explosions to the collapse, we postulate that explosion-related damage directly contributed to the collapse, we can deduce that the explosions

1 https://youtu.be/gdcG0GX7rrk?t=28s

2 https://youtu.be/0jz-GXXkxI8

3 http://www.ae911truth.org/images/PDFs/Maleki-statement.pdf

4 http://www.ae911truth.org/images/PDFs/Chamrun-statement.pdf

5 http://www.ae911truth.org/images/PDFs/Plasco-Building-not-connected-to-gas-supply-network.pdf

6 http://www.ae911truth.org/images/PDFs/Chamrun-statement.pdf

7 http://www.ae911truth.org/images/PDFs/Qenaati-statement.pdf

8 http://www.ae911truth.org/images/PDFs/Masjed-Jamei-statement.pdf

resulted in high-order damage (see Section 1.2). NFPA 921 advises that high-order damage "is the result of relatively high blast loads."

In terms of the explosions' characteristics, we know there were multiple explosions. It was not a single explosion event. Further, we know the larger explosions were powerful enough that they were felt by firefighters both inside and outside the building. Moreover, the explosions were powerful enough that the fire department believed they were capable of directly causing the collapse. For example, Mashregh News reported fire department spokesman Jalal Maleki as saying, "The cause of the collapse were some severe explosions...."[9] The explosions are also likely to have been responsible for the shaking of the entire building that was reported by at least two firefighters (see Section 1.4). Shaking prior to collapse is not consistent with a progressive collapse, where creaking, titling, or sagging would instead be expected.

Audio Analysis

Taking the analysis of explosion characteristics one step further, an audio analysis[10] of the large explosion event immediately prior to collapse—both captured in videos and reported by fire department spokesperson Jalal Maleki—in fact reveals seven spikes or impulses that occurred within a period of .511 seconds. Table 1 below shows (1) the time of each impulse in the video, (2) the interval between each impulse, and (3) the cumulative time elapsed since the first impulse. Figure 6 is a visualization of the audio analysis.

Table 1: Audio Impulses Detected in the Explosion Event Preceding Collapse

Pulse	Time Occurred	Interval (seconds)	Accumulated Time (seconds)
1	2.144	0	
2	2.232	.088	.088
3	2.321	.089	.177
4	2.442	.121	.298
5	2.544	.102	.4
6	2.589	.045	.445
7	2.655	.066	.511

9 http://www.ae911truth.org/images/PDFs/Some-big-bangs-caused-the-collapse-of-Plasco.pdf

10 The audio analysis application Photosounder was used to conduct an analysis of the audio from this video: https://youtu.be/0jz-GXX-kxI8.

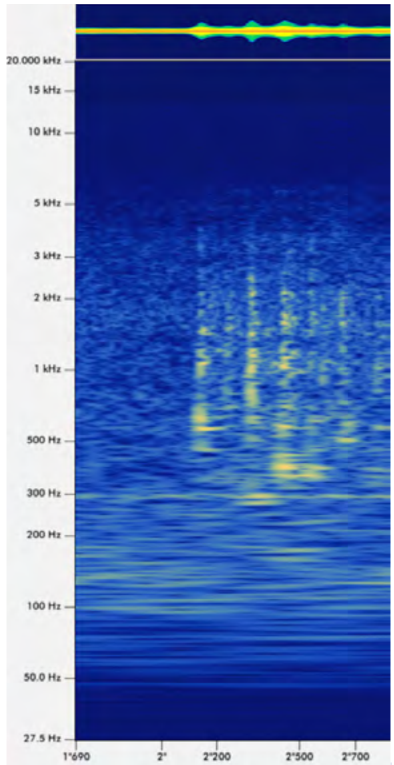


Figure 6: Audio analysis visualization. Y-axis: audio frequency. X-axis: time elapsed in the video.

Four characteristics rule out the possibility that these impulses were produced by a single BLEVE or other spontaneous explosion, or by collapsing floors:

1. The occurrence of seven impulses, as opposed to one, rules out a single, spontaneous explosion.
2. The intervals between the impulses are too short for the impulses to have been the result of falling floors impacting one another. For a single floor to fall an estimated 2.34 meters of head space, it would take .69 seconds, which is longer than the total period in which all seven impulses occurred.
3. The impulses are each too short in duration to be impact-generated noise. The impulses are more consistent with explosive-generated noise.[11]
4. The pulses are too similar to each other in magnitude and quality to be the result of separate spontaneous events.

The occurrence of seven separate impulses is consistent with video of the south face taken directly from the south,[12] which does not show an explosion emanating from one point. Rather, it shows a number of explosions emanating along the same floor from the center of the south face to the east side of the south face.

In summary, the data that have been collected to date regarding possible fuel sources, actual physical damage, and the explosions' characteristics suggest that explosives are the only viable explanation put forward so far for the well-documented explosions that occurred before the collapse.

11 Hansen, Colin: "Fundamentals of Acoustics," (January 1951), p. 48.

12 https://youtu.be/_MgJTa7SDaY?t=58s


Figure 7: Video taken from the southeast. https://youtu.be/XoyH_wYGpJ8


Figure 8: Video taken from the east. https://youtu.be/_MgJTa7SDaY

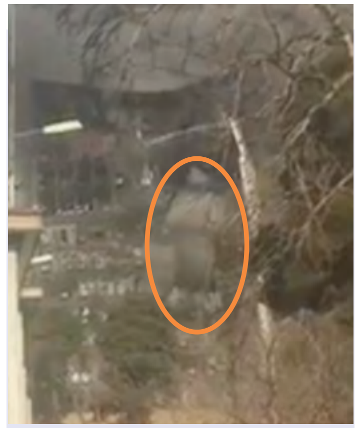


Figure 9: Video taken from the south. https://youtu.be/_MgJTa7S-DaY?t=58s


Figure 10: Video taken from the southwest closer to the building. https://youtu.be/jzB-QE8Emt0

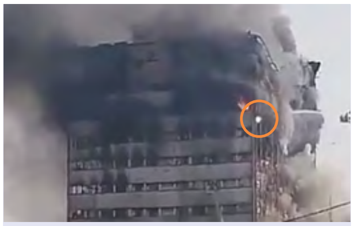


Figure 11: Video taken from the southwest showing a flash. A further examination of the flashes in this video is presented at https://youtu.be/SVZDtsl51dM.

2.2 Explosions During Collapse

Within one to two seconds after the final large, audible explosion event that emanated from the south face around the 11th floor, other apparent explosions began to emanate from various parts of the building as it underwent total collapse.

Video taken from the southeast (Figure 7) shows two energetic plumes rapidly emanating from the south and east faces approximately two seconds before the roof began to cave in along the south face. Then, just as the roof began to cave in, we see two series of expulsions run down the eastern side of the south face and down the middle of the east face, roughly below where the first energetic plumes occurred.

Video taken directly from the east (Figure 8) shows the same series of expulsions running down the middle of the east face.

Video taken directly from the south (Figure 9) shows the same series of expulsions running down the eastern side of the south face. That series of expulsions is then followed by a similar series of expulsions running down the opposite, western side of the south face.

Video taken from the southwest, much closer to the building (Figure 10), shows the two separate series of expulsions that ran down the eastern and western sides of the south face. In this video we also see an isolated expulsion that occurs closer to the bottom of the building on the western side—at the same time that the first series of expulsions begins to travel down the eastern side. This isolated expulsion is followed by a second isolated expulsion near the ground level, before the second series of expulsions runs down the western side of the south face.

Another video taken from the southwest, but further away from the building (Figure 11), shows the second series of expulsions that ran down the south face. It also shows a less-pronounced series of expulsions running down the southern side of the west face. It is likely this less-pronounced series of expulsions was caused by the same phenomena that was causing the series of expulsions that ran down the western side of the south face.

Also, this video shows what appear to be at least three flashes. A screenshot displaying the most visible flash is shown in Figure 11.

As mentioned in Section 1.4, there appear to be no publicly available videos showing the north face during the collapse. Video taken from the east, which provides a profile view of the north face, does not show expulsions similar to those on the east, south, and west faces.

Cause

Two causes of the observed expulsions that occurred during the collapse have been posited in discussions of the Plasco Building incident. One hypothesis is that they were blasts associated with explosive charges that were being detonated in order to destroy the building. The other hypothesis is that they resulted from floor-wide air compression caused by pancaking floors.

Several factors and characteristics of the expulsions cast extreme doubt on the air compression hypothesis and make

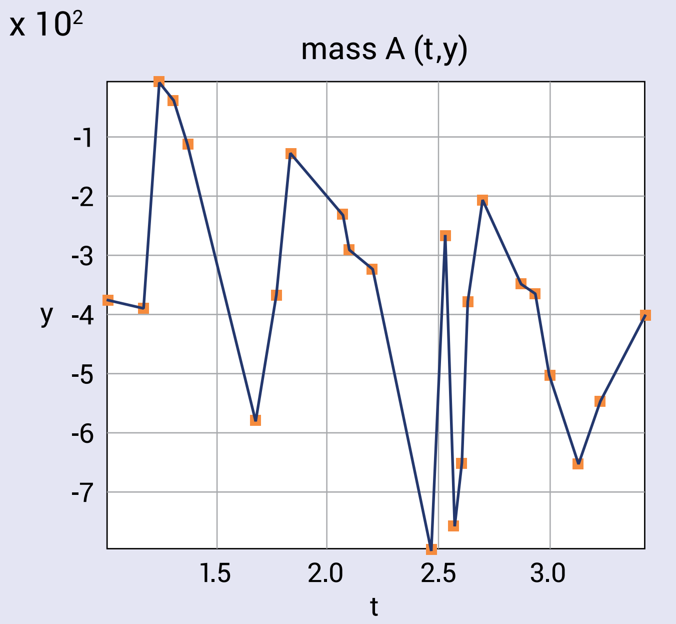


Figure 12: Map of east face expulsions. Y-axis: Location of expulsions relative to each other vertically. X-axis: time elapsed in the video (https://youtu.be/_MgJTa7SDaY).

explosives the most likely hypothesis:

1. Due to the well-documented occurrence of explosions *before* collapse, it is more logical, given the observed expulsions, that explosions continued to occur *during* collapse. The air compression hypothesis requires a scenario where explosions occurred up to the point of collapse initiation and then all phenomena ceased to be explosion-related.
2. The air compression hypothesis requires widespread failures of floor connections to be rapidly occurring inside the building with minimal deformation of the building's exterior. From a structural standpoint, this scenario is exceedingly improbable.
3. Each expulsion emanates rapidly and consists of a thick cloud of apparently already-pulverized material, often accompanied by intact pieces of debris traveling away from the building at high speeds.
4. The expulsions emanate from point-like sources. In a floor-wide air compression scenario, we would expect compressed air to be pushed out more uniformly.
5. A careful analysis of the series of expulsions that appear to travel down the east face of the building in a somewhat neat pattern reveals that, in fact, the expulsions occur in a disorderly sequence. As shown in Figure 12, which maps the time and vertical location of each expulsion on the east face, we see expulsions occurring high and low in the building, with no apparent order. We also see expulsions occurring seconds apart on the same floor. If the expulsions were caused by floor-wide air compression from successively pancaking floors, we would expect expulsions to progress from one floor to the next downward. Also, we would not expect expulsions to occur on the same floor seconds apart, because the first expulsion on a given floor would relieve the air pressure on that floor, preventing later expulsions from that floor.
6. Finally, the event produced thick, energetic, rapidly forming plumes that are consistent with the plumes produced during controlled demolitions, where large numbers of explosive charges are detonated in a very short period of time. These plumes contain large quantities of pulverized materials and expand rapidly due to the release of energy from the detonation of explosive charges.

In summary, the data collected to date regarding the expulsions observed during the collapse and the occurrence of explosions prior to collapse suggest that these expulsions were explosions and that explosives are the only viable explanation put forward thus far.

2.3 Debris Field Pattern

The debris field of the Plasco Building collapse was contained mostly inside its footprint, with the building's west and south walls lying on top of the debris pile. This fact is illustrated in numerous photographs (see the inside cover).

The debris was deposited into the building's footprint because the building's core appears to have failed first, which then caused the walls to fall inward.

This kind of failure and debris field is typical of the method of controlled demolition known as "implosion," where core columns are removed first so that they pull inward on the exterior, which prevents the exterior from falling outward and damaging adjacent structures. This kind of failure and debris field is also highly *atypical* of natural building collapses, irrespective of cause.

The debris field pattern is, therefore, another reason to consider controlled demolition the most likely hypothesis for the Plasco Building's destruction.

2.4 Molten Metal

During the debris removal operation, the Iranian news media reported large amounts of molten metal being found in the debris. The Mehr News Agency and Press TV wrote:

> *"As the ruins removal process reaches final steps, excava-*

tors and mechanical equipment pull out a layer of molten iron from the rubble. The volume of molten metal underneath goes beyond imagination...."[13]

"[T]he operation slowed down on Thursday as workers found a large amount of molten metal gathered in the location, spokesman for the crisis committee Jalal Maleki said."[14]

Also, numerous videos show the observed molten metal being dug up.[15]

Fires in open air cannot achieve temperatures above 1,800°F (1,000°C). Iron and steel melt at approximately 2,750°F (1,510°C). The fires that occurred in the Plasco Building, therefore, cannot account for the observed molten metal.

NFPA 921 advises that melted steel or concrete is an indicator of exotic accelerants. Therefore, at this time, the most plausible explanation for the large amounts of molten metal appears to be a high-temperature incendiary such as thermite, which, when ignited, produces temperatures around 4,500°F (2,482°C). Thermite is composed of elemental aluminum and iron oxide. When activated, the aluminum sucks the oxygen out of the iron oxide in an extreme exothermic reaction, leaving molten iron as a by-product.

If the molten metal were created during the Plasco Building incident, it could have remained in a molten state as a result of being covered by gypsum and lightweight concrete, which have low thermal conductivity. Calculations show the insulation properties of lightweight concrete and gypsum would not require a heavy thickness to keep the iron molten for days. In addition, there appears to be no plausible scenario under which the molten metal could have been created *after* the incident.

Controlled demolitions are usually accomplished without the use of incendiaries. However, in a situation where the goal is to conceal a controlled demolition, thermite would serve the purpose of weakening support columns and structural joints, allowing for the minimal use of explosives and, therefore, minimal noise generation. Thermite, or another exotic accelerant, could also be used in such a scenario to help start the fires that were set as a cover for the controlled demolition. NFPA 921 advises that such accelerants generally leave residues that may be visually or chemically identifiable.

13 http://en.mehrnews.com/news/123013/8th-firefighter-s-body-recovered-number-rises-to-10

14 http://www.presstv.ir/Detail/2017/01/26/507841/Iran-Tehran-Plasco-fire-collapse-rescue

15 https://youtu.be/fJeQghFOe9E

Figure 13: An excavator scooping up molten metal from the scene of the Plasco Building incident.

Motives for Firesetting Behavior

Chapter 24 of NFPA 921 advises fire investigators about recognizing and investigating incendiary fires, which it defines as fires that are set with the intent to cause the fire to occur in an area where the fire should not be (see Section 1.2).

One of several possible motives for firesetting behavior it outlines is crime concealment. This category, it notes, "involves firesetting that is a secondary or collateral criminal activity, perpetuated for the purpose of concealing the primary criminal activity." The examples it gives are concealing a murder or burglary, or destroying records or documents. But the crime concealment motive also applies to the hypothesis presented here, where the primary goal was to completely destroy the Plasco Building for political or economic gain (also identified in Chapter 24 of NFPA 921) and with the fires being set to create the false appearance that the building came down as a result of those fires.

EVALUATING THE FIRE HYPOTHESIS

Limited to the top six stories, the Plasco Building's fires cannot account for the explosions on Floors 3 through 6.

The purpose of this chapter is to evaluate, based on the currently available data, the feasibility of the hypothesis that fires and/or accidental explosions were responsible for the destruction of the Plasco Building. It is important that we consider the fire hypothesis carefully—but that we be willing to evaluate it critically if it does not pass the first test of being consistent with the data collected to date.

3.1 Inconsistency with the Data

In Sections 2.1 and 2.4, we summarized two categories of data that open air fires are fundamentally incapable of accounting for: numerous small and large explosions that occurred prior to the collapse, and large amounts of molten metal in the debris. We will look at both in more detail below.

Explosions Before Collapse

As discussed in Sections 1.4 and 2.1, there were numerous small and large explosions that occurred prior to collapse.

NFPA 921 advises that a BLEVE is the type of explosion encountered most frequently by fire investigators. These are mechanical explosions (i.e., where the fundamental chemical nature of the fuel is *not* changed) involving vessels that contain liquids under pressure at temperatures above their atmospheric boiling points.

BLEVEs involving the gas canisters that Plasco Building tenants used as fuel for heating could possibly explain the smaller periodic explosions that were observed by Saeid Kamani. However, BLEVEs involving gas canisters cannot account for the larger explosions that occurred in the two to three minutes prior to the collapse.

Explosions caused by gas leaks that are ignited by fires are sometimes capable of producing the amount of force apparently associated with the large pre-collapse explosions in the building. But it has been reported that the Plasco Building was not connected to the gas network and there were no gas tanks in the upper floors, where the explosions occurred (see Section 2.1).

Also, as we established in Section 2.1, fires could not have been the ignition source for the explosions that occurred before the collapse at the northeast corner on Floors 3 through 6, because the fires were limited to Floors 9 through 15. This fact alone appears to rule out the hypothesis that the explosions were caused by fire.

Molten Metal

As discussed in Section 2.4, large amounts of molten metal were found in the debris. Fires in open air cannot achieve temperatures above 1,800°F (1,000°C). Iron and steel melt at approximately 2,750°F (1,510°C). The fires that occurred in the Plasco Building, therefore, cannot account for the observed molten metal.

At this time, there appears to be no plausible fire-related scenario where large amounts of molten metal found in the debris could have been created during or after the incident.

3.2 Fire-Induced Failure Improbable

As mentioned above, the maximum temperature that open air fires can reach is around 1,800°F (1,000°C). However, even reaching this temperature with a diffuse flame is very difficult.

Thomas Eagar and Christopher Musso note, "Typically, diffuse flames are fuel rich, meaning that the excess fuel molecules, which are unburned, must also be heated.... This fuel-rich diffuse flame can reduce the temperature by up to a factor of two again. This is why the temperatures in a residential fire are usually in the 500°C to 600°C range." Meanwhile, Eagar and Musso note, "It is known that structural steel begins to soften around 425°C and loses about half of its strength at 650°C.... Nearly every large building has a redundant design that allows for the loss of one primary structural member, such as a column. However, when multiple members fail, the shifting loads eventually overstress the adjacent members and the collapse occurs like a row of dominoes falling down."[1]

In the case of the Plasco Building, we do not know the factor of safety, i.e., how many times its load it was designed to withstand. However, under a conservative assumption of a 2-to-1 factor-of-safety ratio, virtually every column would need to be heated to 650°C at the same time, losing 50% of its strength, to present the risk of a building-wide failure. This would be difficult to accomplish even in a raging fire.

But the fire in the Plasco Building was not raging shortly before its collapse. The fire department believed that it had extinguished the fires. Although the fires appear to have reignited after the first large explosion, videos show they did not cover a large portion of the building.

Finally, supposing there was sufficient heat to weaken certain structural members by 50% and somehow induce a partial collapse, it is highly improbable that a partial collapse would lead to a total progressive collapse. As we know, there were no fires below Floor 9. Therefore, the structural members below Floor 8 would have maintained their full strength. It is virtually impossible that the first partial collapse observed—the caving in of the roof along the south face—would have triggered a progressive collapse of all the floors below. The bottom eight floors would be expected to withstand partial collapse of the floors above them.

3.3 Accidental Blast-Induced Failure Improbable

Whereas fires have limited ability to cause a heat-induced failure, an accidental blast can be more capable of causing structural members to fail. However, the hypothesis of an accidental blast-induced failure is unlikely due to some of the factors discussed above and in previous chapters.

1. So far, no plausible fuel source other than explosives has been identified.
2. There was no apparent ignition source for the explosions that occurred at the northeast corner on Floors 3 through 6 prior to the collapse. It is, therefore, quite implausible that these explosions were accidental.
3. A scenario involving accidental explosions does not account for the large amounts of molten metal found in the debris.
4. Absent a single accidental explosion that destroys the entirety of the building, which was not observed, an accidental blast-induced failure is no more likely to trigger a progressive collapse than a heat-induced failure.

In summary, the hypothesis that fire and/or accidental explosions were responsible for the destruction of the Plasco Building does not appear to pass the first test of being consistent with the data collected to date. Nonetheless, the fire/accidental explosion hypothesis should not be ruled out while investigators continue to collect and analyze data.

1 Eagar and Musso: "Why Did the World Trade Center Collapse? Science, Engineering, and Speculation," *JOM* (December 2001).

AFTERWORD

As of this report's publication, which is exactly one month and one day after the Plasco Building tragedy, a national commission has been appointed by President Hassan Rouhani for the purpose of investigating the causes that led to the fire and collapse and then issuing a report within two months of the incident (one month from now).

It is our sincere hope that the commission will read and take seriously our analysis and recommendations and that it will adhere firmly to the principles of science-based fire and explosion investigations, which, in the United States, are codified in NFPA 921.

We are encouraged by the makeup of the commission, which includes seven apparently-renowned engineers, a political scientist, a lawyer/political scientist, and an insurance expert.

Immediately following the tragedy, there was reportedly widespread suspicion in Iran that the destruction of the building was due to an intentional act of terrorism. In the hours and days that followed, a number of high-ranking officials made statements dismissing those suspicions and alleging that no evidence of a terrorism act had been discovered.[1] Based on the data collected so far, those suspicions may have in fact been well-founded.

As we noted in our January 20 statement, it is often much more difficult to ascertain the truth of an event after an explanation for that event has been prematurely formed. We therefore urge the commission and the people of Iran to be fearless and vigilant in their search for the truth about this national tragedy that took the lives of 26 individuals.

1 http://www.ae911truth.org/images/PDFs/Minister-of-Intelligence-Statement.pdf

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