



A Disaster in the Making at Rana Plaza

An Online Continuing Education Course for Engineers

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Introduction

On April 23, 2013 (one day before the factory collapsed) in Dhaka, Bangladesh, a television station visited the Rana Plaza building. Employees at BRAC Bank, on the first floor, had observed large cracks developing in the walls and requested that the news station document the development. The television crew recorded footage showing cracks in the building walls on multiple floors. A structural engineer was called to inspect the building and determined it was unsafe. Sohel Rana spoke publicly and deemed the building safe, and workers were pressured to return to work. The very next day, the building collapsed, killing 1,134 people and injuring over 2,500. Why was the structural engineer overruled?

Building collapses in Southeast Asia are not a new worry for workers. Wealthy business owners, both domestic and foreign, commonly skirt or completely bypass building design codes, pay off inspectors, and support local politicians that expedite building permits.

Although less common in the United States, these unethical behaviors can still occur. Structural collapses do occur in the United States, such as the Hyatt Regency Hotel in Kansas City walkway bridge in 1981. In August 2007, the I-35 bridge collapsed in Minneapolis, MN, due to undersized gusset plates. However, most *building* collapses in the United States tend not to be this nefarious, with the notable exception being the Champions Tower South condo building collapse in Surfside, FL on June 24, 2021. Building collapses in the U.S. are usually accompanied by natural disasters, gas leak explosions, acts of terrorism, or occur during construction-demolition. The circumstances that led to Rana were many; recent building collapses in Bangladesh number a half-dozen in the last twenty-five years.

This course will concentrate on building collapses and ethical dilemmas for Professional Engineers in the United States. Can we, as a developed country with our wealth of Professional Engineers, learn from an incident in South East Asia? The answer is yes.

What if your firm is designing a building for someone like Sohel Rana? What if you design the perfect building, but outside of your control, substandard contractors are hired, substandard materials are built, inspectors are paid off, and politicians' hands are greased for favored treatment? This behavior was guided by the belief that money would be saved on construction costs.

Due to the bad press in the immediate aftermath of the collapse, unfavorable news coverage, and an engineer's recommendation to evacuate, the building was emptied on April 23. Later in the day, Sohel Rana commented to the media that the building was safe and workers should return to work the next day. This decision would turn out to be a fatal mistake, taking the lives of over 1,100 people. Managers at one company threatened to withhold a month's pay from workers who refused to return to work.

The building's owner, Sohel Rana, bypassed building codes, forced contractors to use cheaper materials and received favorable inspections performed on critical phases of the construction. Murder charges were brought against Rana and nearly 40 others in an attempt to hold people responsible for the disaster. Three other people were charged with helping Rana flee after the

collapse and his inditement. The big questions are, how did we get to this point, and could a tragedy like this affect an engineering firm in the United States?

This course will focus on the ethics of managing a design or design-build project in a foreign country. Ask yourself this as you remember codes of ethics you have sworn to uphold: is it ethical for my firm to design something to meet current standards and walk away? After all, we were only asked to design the building. We did our job; we didn't have control over the construction or materials of construction. We were not contracted to do inspections. Can my firm's name still be dragged through the mud?

The Rana disaster involves ethical, political, design, construction, inspection, and foreign influence leading to a building being constructed that was never meant for housing a factory. Further, choosing to place emergency generators on the roof without proper design considerations inevitably caused harmonic vibrations that the structure was not designed for. This, combined with the soil conditions not suited for a building this size, meant that a disaster was waiting to happen.

Timeline of Rana Plaza from Inception to Destruction

The Rana Plaza was connected to the Savar bus station in Dhaka, Bangladesh, and was adjacent to the bus station. It was in America what would be called an “Intermodal development,” which ties a business hub to a transportation source like busses, trains, subways, and taxi services. Some facilities have all the above and more.

The buildings that adjoin them normally have banks, shopping malls, restaurants, businesses, and even factories. These types of developments can also have hotel and apartment living spaces within their walls. They are huge attractions for many in urban areas that are heavily populated and offer the public the convenience of living, working, shopping, and even medical services within a short walk.

How was the Rana family plaza venture envisioned? The image below shows the original approved construction along with unapproved additions.

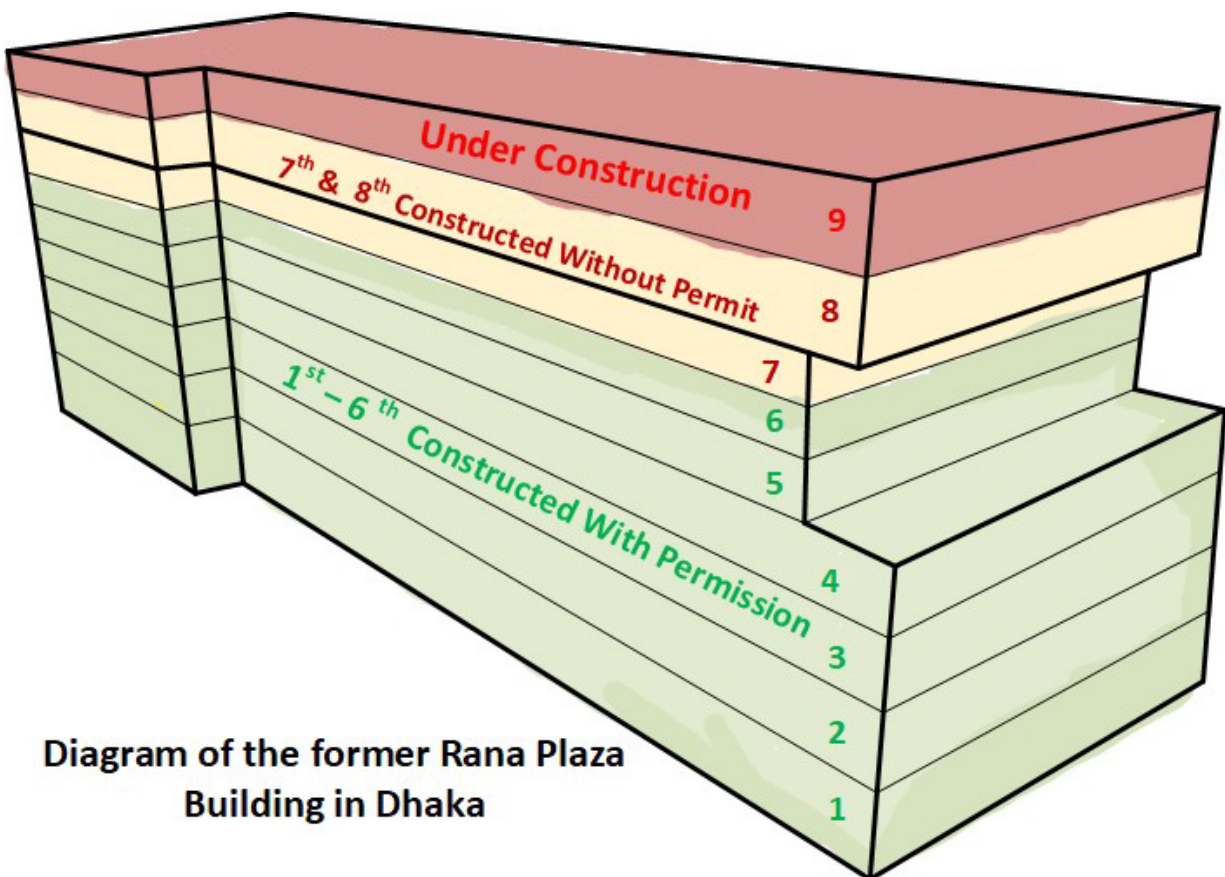


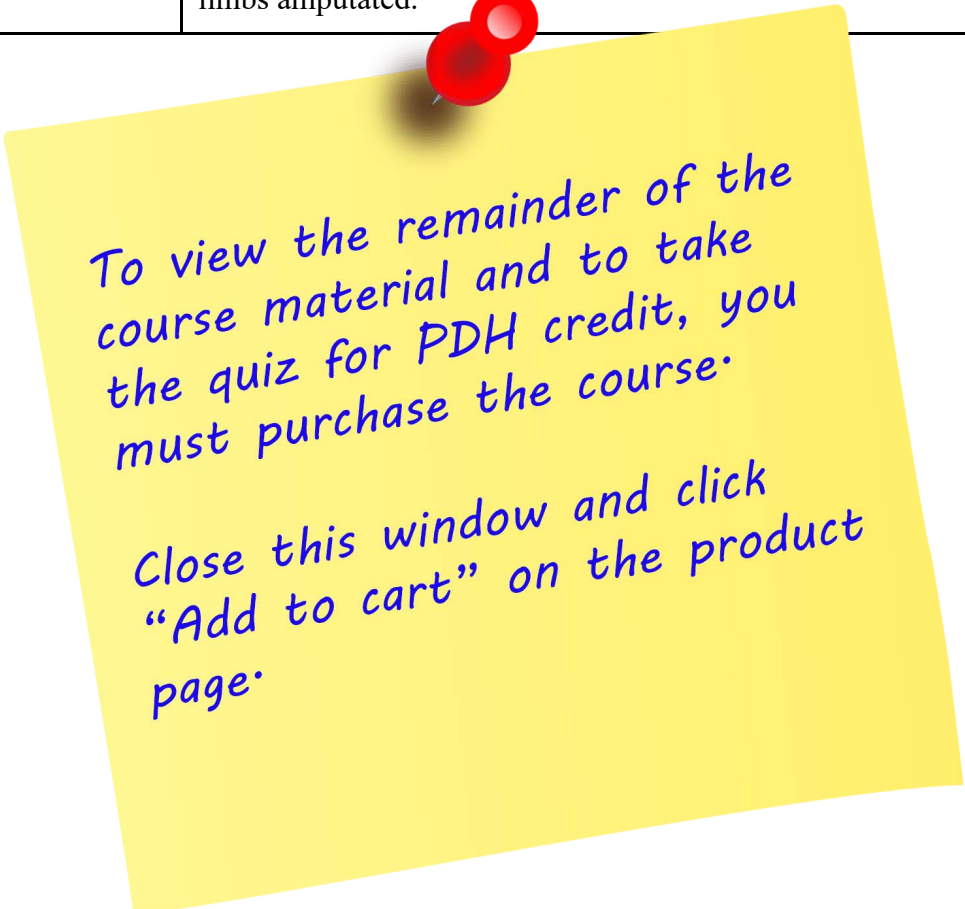
Diagram of the former Rana Plaza Building in Dhaka

It is important to run through a complete timeline to understand how we arrived at the collapse on April 24, 2013. Was this engineered poorly from the beginning, or were shortcuts and liberties taken during construction?

Approximate Date	Action Taken or Decisions Made
September 2003	Sohel Rana (Owner-Developer), along with his father Abdul Khaleq and mother Morjina Begum, signed a 29-clause contract with Kazi Saiful Islam, the director of a real estate company named Tonmoy Housing Limited, for the sole purpose of constructing a ten -storied building on land

	at the east side of the Savar bus-stand.
June 2005	Tonmoy Housing Limited sent a proposal to Savar Municipality in order to construct a six -storied building instead. Their application was numbered 557. Ten stories were not disclosed to the permitting and building inspection agency in Savar-Dhaka, Bangladesh.
April 2006	Savar Municipality gave permission to Sohel Rana to construct the building without being responsible for the structural design, meaning it was granted based on conceptual drawings.
After April 2006	After the construction of the first floor, Sohel Rana breached the contract and compelled Tonmoy Housing Limited to leave. Sohel Rana made his own arrangements for designing and constructing more floors, i.e., till the eighth floor.
2006 and 2008	Mayor Refat Ullah and related officials gave permission to build additional floors to Rana Plaza without considering its structural design.
March 2008	On the basis of a separate application, the Mayor and related authorities gave permission to Rana Plaza to increase its structure from 5 floors to 9 floors. These approvals contained no structural review by a licensed engineer or any official in the government with structural or geotechnical engineering qualifications.
Note	RAJUK: Rajdhani Unnoyan Kortipokkho (Capital Development Authority) should have reviewed these applications, but due to political corruption, these government oversight organizations were bypassed by Rana.
September 2009	A Member of Parliament, Murad Jong, inaugurated Rana Plaza in an opening ceremony. The building at this juncture had five completed floors of the eventual nine planned for construction prior to the collapse.
2013	By 2013, the first eight floors were completed. Construction materials for the ninth floor were stored on the roof. These materials included structural steel, rebar, brick, and mortar.
March 2013	About six weeks prior to any major cracks, hairline cracks at the foundation level up through the BRAC Bank began to appear. At first, these were not cause for alarm as concrete develops hairline cracks from settlement over time.
April 2013	The hairline cracks became more pronounced on the lower floors and traveled through the building to the upper floors.
April 23, 2013 Morning	The cracks grew so severe that the BRAC Bank personnel evacuated the building, awaiting a structural engineering inspection. The local news media were also called by an unknown employee of BRAC Bank who documented the cracks in the building.
April 23 and April 24- 2013	Power outages occurred, and the building's emergency generators located on the roof came on. This was common and was known to occur up to fifty times a day.
April 23, 2013	Sohel Rana speaks publicly about cracks and declares the building safe.

Afternoon	The engineer and inspector were overruled. It is speculated that threats by Rana were made, and political pressure from above was exerted on the inspector. Workers were ordered back to work the next day. Some were threatened with loss of a month's income or loss of job if they did not return.
April 24, 2013, 8:45 AM	Surviving workers describe a loud noise like an earthquake as the building began to collapse around them.
April 24, 2013	Rescue began without the aid of heavy equipment. Over the next month, of the four thousand people inside the Rana Plaza and Savar bus station, 1,134 died, and over 2,500 were injured. Many women that survived had to have limbs amputated.



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