



CONSMA 2016

CMAK

March 14, 2016 , Seoul, Korea

Disaster Recovery after Hurricane Sandy in New York



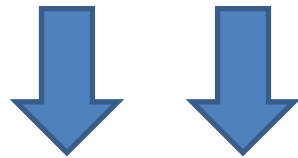
Presentation by Robert Bennett, PE

RABCO ENGINEERING PC

Freeport, New York



Possible Disasters in Korea due to the Climate Change



In the recent years in Korea, there have been increased incidences of weather disasters (hurricanes, floods, heavy snow, high winds, drought, etc) due to the climate change and this is affecting the environment, the economy, the society and various fields.

1. Four Major Rivers Project

- The original purpose of the project was to prevent floods and droughts caused by the climate change and provide water quality improvement and ecological restoration and also secure hydrophilic space that can meet cultural and recreational needs, create jobs and stimulate the economy. The project provided 450 million m³ of dredging, 16 multi-functional dammed pools for irrigation, 130 km² of water front ecological space, 784 km of aging levee reinforcement, 5 dams and regulating reservoirs and 93 agricultural reservoirs. However, due to the climate change, there is a chance that super typhoons like that of Hurricane Katrina and Hurricane Sandy could also occur in Korea and as such there is a possibility of major disasters if heavy rain or droughts occur that surpass the flood control forecast of the Four Major Rivers Project.
- In addition, disasters could occur due to issues such as problems with durability of installations for the Four Major Rivers Project, water quality, damage to aquatic ecosystems, river bed fluctuations and water pollutions. Consequently, it is necessary to be prepared for disasters that may occur after the Four Major River Project.

2. Skyscrapers

- Some examples of skyscrapers in Korea include Korea Hyundai Motor Global Business Center (571m, 115 floors, expected), Lotte World Tower (555m, 123 floors), Haeundae L City (411m, 101 floors), Northeast Asia Trade Centre (305m, 68 floors) and Haeundae Doosan . We've the Zenith (300m, 80 floors). Risks involved in skyscrapers include natural disasters, fire, changes in the use of the building, problems involved with the lifespan of the building materials, geotechnical problems and inherent defects but in addition to this, if strong winds caused by the climate change hit the skyscrapers, the skyscrapers which are vulnerable to shaking (vibration) can become structurally unstable and may eventually result in a collapse.
- There is also a possibility of many accidents occurring if the lower part of skyscrapers get flooded due to heavy rain and the energy (power) supply to the building is cut.
- In addition, if the lightening strikes the skyscrapers, it could lead to fires. For skyscrapers, fires are major disasters.
- Skyscrapers are like small cities where many people reside and work in and therefore when there are disasters, loss of life, casualties and damage to properties are inevitable.
- Accordingly, it is necessary to be prepared for climate disasters in skyscrapers.

3. Bridges

- On 11th February 2015, there was a 106 car collision accident on one of the major bridges in Korea, the Youngjong Bridge and on 3rd December 2015, on Seohae Bridge, a fire accident happened. The accident on the Youngjong Bridge was caused by dense sea fog and the accident on Seohae Bridge was caused by a lightning strike. These two incidents could be seen as climatic disasters caused by the climate change.
- Thus if strong winds, snow, fog and lightning happen due to the climate change, situations could arise where the bridges become structurally unstable leading to bridge collapses which could cause catastrophes resulting in casualties.
- Accordingly, for bridges also, it is necessary to be prepared for disasters due to the climate change.

4 Major Rivers Project



Lotte World Tower (555m, 123 floors)



Youngjong Bridge



Seohae Bridge



**11th February 2015
106 Cars Collision Accident**



**3rd December 2015
Seohae Bridge Fire Accident**



The beginning of Hurricane Sandy



Sandy north of Cuba and predicted path on October 25, 2012



Hurricane Sandy 1,850 km wide



Hurricane Sandy from space



Map of Mid- Atlantic States



Map of Long Island and NYC



Aerial view of NYC looking south



Aerial view of south Manhattan looking north



New York Preparation



The Brooklyn–Battery Tunnel remained flooded after the storm



Submerged NYC taxi cabs



Beachfront homes destroyed



Floating cars from underground parking garage



Destroyed amusement park ride at Coney Island Brooklyn, NY



Incoming high tide on New Jersey shoreline



Post fire damage at Breezy Point, Queens, NY



Post fire damage at Breezy Point, Queens, NY



Post fire damage at Breezy Point, Queens, NY



One State Street; Downtown Manhattan



sub-basement; 1 State Street, NYC



Downtown Manhattan cleanup



Downtown Manhattan



Downtown Manhattan



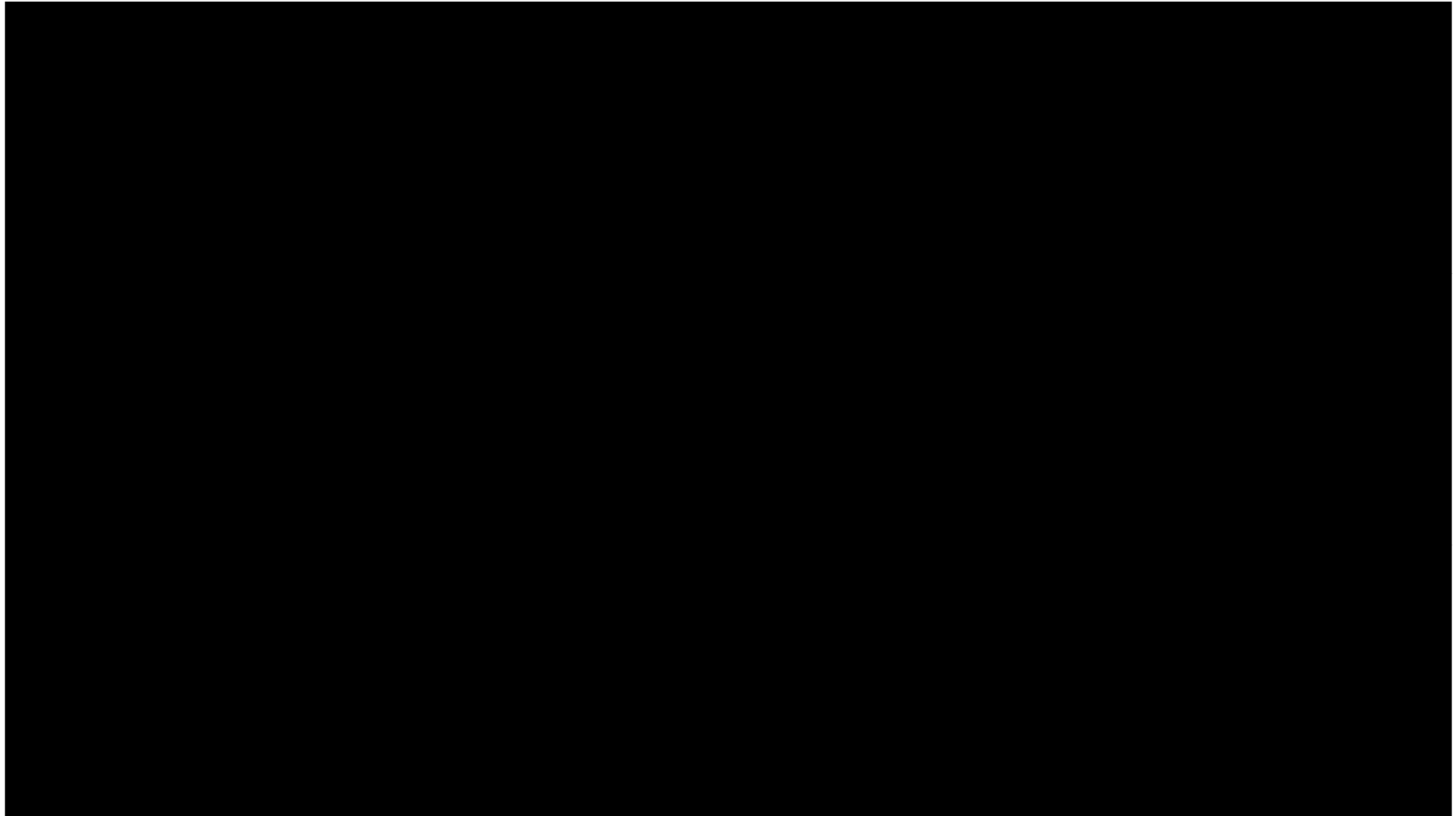
Downtown Manhattan

- On November 26, Governor Cuomo called Sandy "more impactful" than Hurricane Katrina, and estimated costs to New York at \$42 billion.
- The storm severely damaged or destroyed around 100,000 homes on Long Island with more than 2,000 homes deemed uninhabitable there.
- There were 71 Hurricane Sandy-related deaths in the state of New York.

Downtown Manhattan



Video Village of Freeport 1 year later



Elevated wood frame residence



Elevated wood frame residence



Elevated wood frame residence



Elevated wood frame residence



100 year old residence at grade



Elevated wood frame residence



Elevated wood frame residence



Existing damaged home on grade



Elevated home on open pier system





Elevated home on open pier system



Elevated home on open pier system



Collapsed home during construction



Collapsed home during construction



Collapsed home during construction



1920 home at grade level



1920 home under construction



1920 home under construction



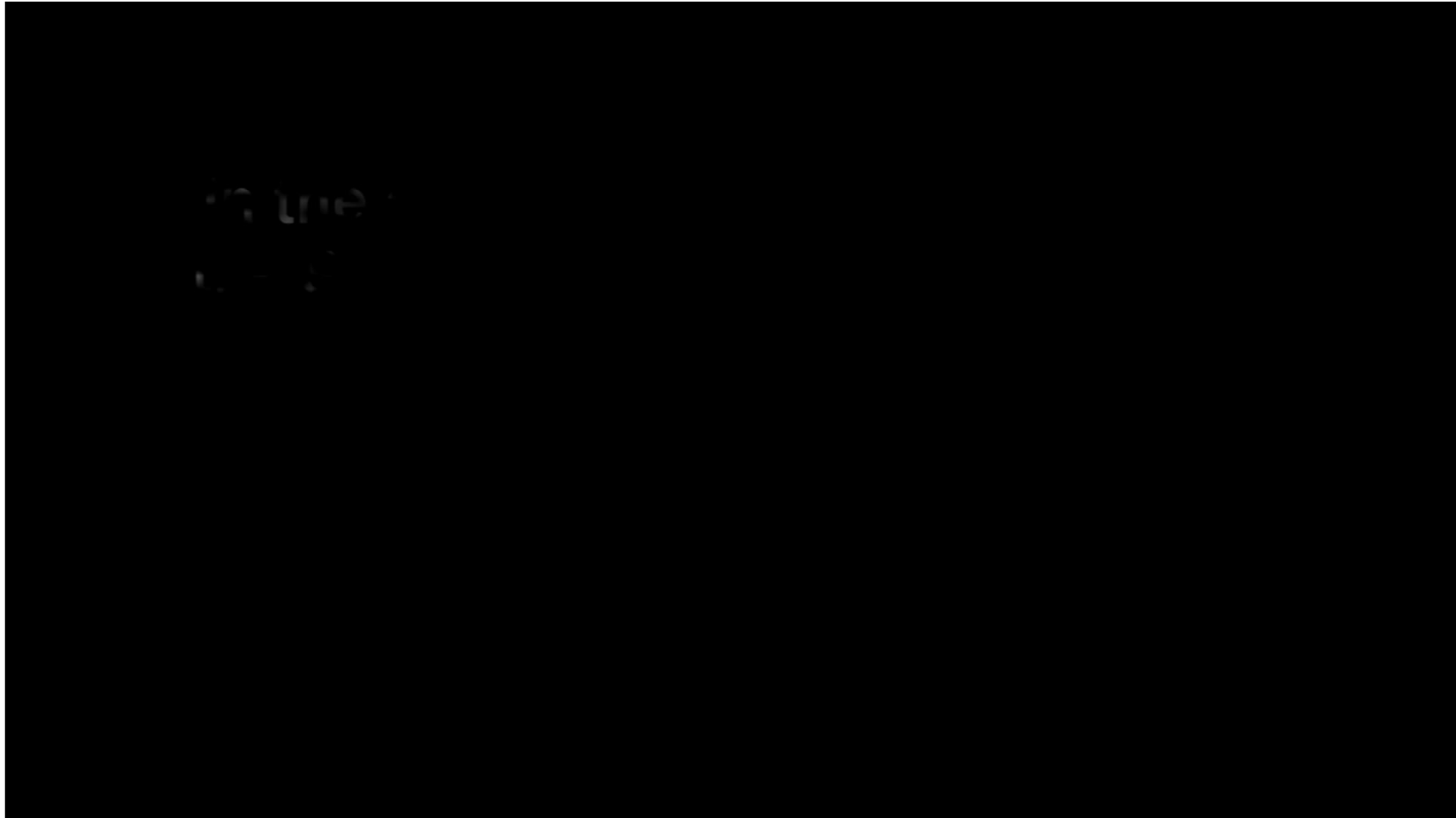
1920 home under construction



1920 home elevation complete



1920 home elevation video



CM is not an option, it's a necessity



고맙습니다

Thank you

Danke schön

merci beaucoup

muchas gracias

Большое спасибо

ขอบคุณมากครับ

RABCO
ENGINEERING P. C.