


Incident Title		Ammonium Nitrate Storage Bin Explosion			
Incident Type		Explosion and Fire			
Date		17 th Apr 2013			
Country		USA			
Location		West, TX			
Fatalities		Injuries		Cost	
15		> 260		\$230 m (2016) – Ref. 1	
Incident Description		<p>A fire broke out at an agricultural chemical and grain storage/distribution site and was reported to the local fire brigade. Around 20 minutes later, while first responders were attempting to extinguish the blaze, a massive explosion occurred, registering as a magnitude 2.1 earthquake on the Richter scale. Approximately 27 of the 36 - 54 tonnes of fertiliser grade ammonium nitrate (FGAN) stored there detonated. Twelve first responders and three members of the public were fatally injured. The blast completely destroyed the facility, levelled dozens of homes and damaged other buildings including 2 schools and a nursing home. The company subsequently filed for bankruptcy.</p>			
					
Incident Analysis		<p>Basic cause of the initiating fire was either an electrical fault or arson (exact cause was not determined).</p> <p>Critical factors included: 1) FGAN was stored in loose piles in plywood bins, 2) Absence of fire detection and mitigation systems, 3) Poor ventilation in the FGAN storage area (contributing to soot formation in the initial fire which caused contamination of the FGAN and increased its explosive sensitivity), 4) First responders were not aware of the potential for FGAN detonation on exposure to fire, 5) The city had expanded over several years and multiple occupied buildings had been erected close to the plant boundary.</p> <p>Root causes included: 1) Inappropriate plant layout (combustibles too close to FGAN storage), 2) Inappropriate materials of construction (plywood FGAN storage bins), 3) Inadequate emergency response planning (absence of pre-incident training), 4) Inadequate hazard awareness (training of volunteer firefighters), 5) Failure to learn (from previous incidents involving FGAN and other grades of AN), 6) Inadequate land use planning regulations (proximity of residential buildings and a school), 7) Inadequate regulatory oversight.</p>			
Lessons Learned		<p>1) Pure solid ammonium nitrate (AN) is normally a stable compound and is not sensitive to most methods for initiating detonation (including mild shock, friction or sparks), 2) However, AN is a powerful oxidising agent which can behave unpredictably when contaminated or exposed to fire (may liberate toxic gases, “burn” uncontrollably even if air is excluded and/or explode), 3) AN should be stored in single storey, well-ventilated buildings constructed from non-combustible materials (eg. concrete, bricks or steel) and located away from potential sources of heat, fire or explosion (eg. timber yards, gas pipelines, oil storage tanks, etc), 4) AN storage bins should be constructed from non-combustible materials and should be located in areas of the AN storage building where electrical services are not required, 5) Direct electrical heaters should not be used in AN storage buildings, 6) Arson and faulty or damaged electrical equipment are major risk factors for warehouse fires, so unauthorised access should be prevented and electrical equipment and fittings should be regularly inspected and maintained (where used), 7) Care is required to avoid contaminating AN with foreign matter of any kind (eg. grease, oil or fuel leaks from mechanical shovels used for un/loading).</p>			
More Information		<p>1) “West Fertilizer Company Fire and Explosion”, US Chemical Safety and Hazard Investigation Board, Report No. 2013-02-I-TX (2016), 2) INDG230: “Storing and Handling Ammonium Nitrate”, UK Health & Safety Executive (2004) https://www.hse.gov.uk/pubns/indg230.pdf, 3) SI 2003/1082: “Ammonium Nitrate Materials (High Nitrogen Content) Safety Regulations”, Her Majesty’s Government (2003).</p>			
Industry Sector		Process Type		Incident Type	
Agrochemicals (Distribution)		Fertiliser		Explosion & Fire	
Equipment Category		Equipment Class		Equipment Type	
Mechanical		Container		Storage Bin	