


<b>Incident Title</b>		<b>Water Pumping Station Explosion</b>	
<b>Incident Type</b>		Explosion	
<b>Date</b>		23 <sup>rd</sup> May 1984	
<b>Country</b>		UK	
<b>Location</b>		Abbeystead (Lancashire)	
<b>Fatalities</b>		<b>Injuries</b>	<b>Cost</b>
16		28	Unknown
<b>Incident Description</b>		<p>On the evening of the incident, a group of 44 visitors were attending a public consultation meeting which had been set up to allay local residents' concerns that water pumped into the River Wyre via the Lune/Wyre River Transfer Link Scheme may have aggravated winter flooding in the lower Wyre Valley. (The scheme was built to meet anticipated future increases in water demand in the region through the 1980s). The meeting was held in a Valve House set into a hillside at the Abbeystead Outfall Station located at the outfall end of the link. The meeting included a demonstration of the station's operation with water being pumped over the weir regulating the flow of water into the River Wyre. Shortly after pumping commenced, with the visitors congregated in the Valve House, there was an intense flash, followed immediately by an explosion which caused severe damage to the Valve House and fatally injured 16 people. Some were killed by the explosion, some by roof collapse and some by drowning (the steel mesh floor collapsed, throwing victims into the water chambers below which rapidly flooded with river water).</p>	
			
<b>Incident Analysis</b>		<p><b>Basic cause</b> was a confined space explosion caused by accidental ignition of methane gas from a coal seam 1200 m below which had been displaced from the Wyresdale Tunnel into the Valve House at the Abbeystead Outfall Station as the water level in the tunnel rose after pumps were started at the upstream Lune Pumping Station.</p> <p><b>Critical factors</b> included: 1) The Lune/Wyre transfer system had not been operational for 17 days before the explosion, 2) A washout valve had been left permanently open at a low point in the Abbeystead Outfall end of the Wyresdale Tunnel to avoid silt accumulation beyond the Valve House (the resulting water loss led to a void forming in the normally water-filled tunnel), 3) The Wyresdale Tunnel had been cut through a complex network of geological faults and had a concrete (porous) lining, 4) The tunnel high point vents were ducted to the underground Valve House at the Abbeystead Outfall Station, 5) Smoking was not prohibited in the Valve House.</p> <p><b>Root causes</b> included: 1) Inadequate hazard identification (methane presence in Valve House not anticipated), 2) Inadequate design (water discharge system vented to underground room with limited natural ventilation), 3) Absence of gas detection equipment (due to inadequate hazard identification), 4) Violation of operating procedures (washout valve left open), 5) Inadequate management of change (flush procedure using washout valves)</p>	
<b>Lessons Learned</b>		<p>1) Methane solubility in water increases with pressure, 2) Methane gas can be evolved from groundwater and in water boreholes, 3) Systems conveying water should be designed such that any gas evolved is vented to a safe location in the open air.</p>	
<b>More Information</b>		<p>1) "The Abbeystead Explosion: a report of the investigation by the Health and Safety Executive into the explosion on 23 May 1984 at the valve house of the Lune/Wyre Water Transfer Scheme at Abbeystead", Her Majesty's Stationery Office, ISBN 0-11-883795-8,                  2) "What Went Wrong? Case Histories of Process Plant Disasters and How They Could Have Been Avoided", 4th Edition (1999), Trevor Kletz, Elsevier, ISBN-10: 0 88415-920-5, ISBN-13: 978-0-88415-920-9,                  3) Incident Overview: <a href="https://en.wikipedia.org/wiki/Abbeystead_disaster">https://en.wikipedia.org/wiki/Abbeystead_disaster</a></p>	
<b>Industry Sector</b>		<b>Process Type</b>	<b>Incident Type</b>
Water		Water Distribution	Explosion
<b>Equipment Category</b>		<b>Equipment Class</b>	<b>Equipment Type</b>
Not equipment-related		Not applicable	Not applicable