EXPLOSION MODEL

Tank Cleaning / Hot work in Tanker

Type of risks will be:

- Personal injury
- Operational Injury

Identification of hazards:
Let us consider a hazard of fire and explosion

Consequences Analysis:

Structural Damage Levels Due to Blast Wave Overpressures

Overpressure (N/m2)	***Damage Type***
1000–1500	Window breakage
4000–5000	Minor structural damage
10,000	Serious structural damage
40,000	Collapse of wood-framed building
70,000	Probable destruction of all buildings

Personal Injury Levels Due to Blast Wave Overpressures

Overpressure (N/m2)	***Injury Type***
7000–14,000	Knocks a person over
35,000	Ruptured eardrums
100,000	Damaged lungs
240,000	Possibly fatal
340,000	50% fatalities
450,000	99% fatalities

To calculate overpressure:

The overpressure for a given scaled distance, Z, can be estimated from Equation given below. The quantity p0 is the overpressure value and pa is the atmospheric pressure, which has a sea-level value of 101,325 N/m2

(P0/pa) = (808* (1+(z/4.5)^2) / ((1+(z/0.048)^2)^0.5 * (1+(z/0.32)^2)^0.5 * (1+(z/1.35)^2)^0.5)

"z" is a function of explosive-index of material in TNT scale.

- *It can be seen above that human can take more blast wave pressure than material.*

Eliminate or Minimize (As Low As Reasonably Practicable) Risk:

- Gas Free the area
- IG if in tank
- Avoid Spark
- So on

Reference:

- "A Comparison of Vapor Cloud Explosion Models," The Quest Quarterly
- G. F. Kinney and Graham, K. J., Explosive Shocks in Air
- Ribbands Explosives, www.ribbands.co.uk/prdpages/C4.htm