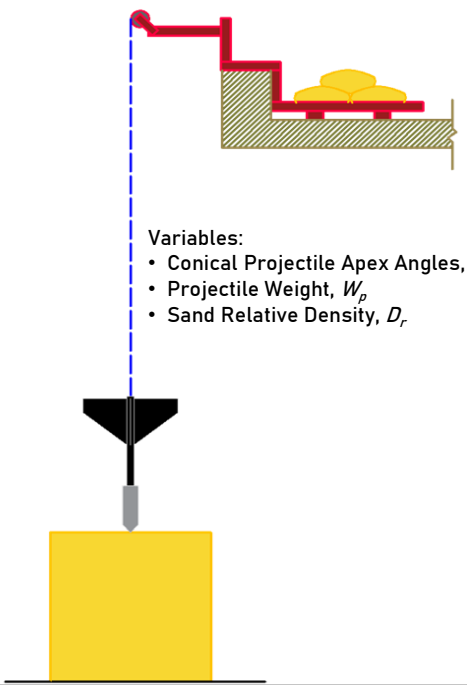
Coupled Experimental and Numerical Parametric Study of Projectile Penetration into Granular Sandy Soils under Low-Velocity Impact

Experimental

Free-Fall Drop Tests

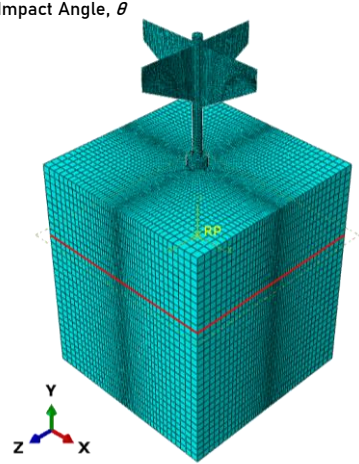


Variables:
- Conical Projectile Apex Angles, α
- Projectile Weight, W_p
- Sand Relative Density, D_r

Numerical

Abaqus 2024 CEL Framework

Variables:
- Conical Projectile Apex Angles, α
- Projectile Weight, W_p
- Sand Internal Friction Angle, ϕ
- Drop Height, H
- Projectile Nose Geometry
- Projectile Diameter, D
- Impact Angle, θ



Key Findings

Penetration Depth, d_p

- With Sand Relative Density, D_r: ▼ ▲
- With Conical Projectile Apex Angles, α: ▼ ▲
- With Projectile Weight, W_p: ▼ ▼
- With Sand Internal Friction Angle, ϕ: ▼ ▲
- With Drop Height, H: ▼ ▼
- With Projectile Diameter, D: ▼ ▲
- With Impact Angle, θ: ▼ ▼