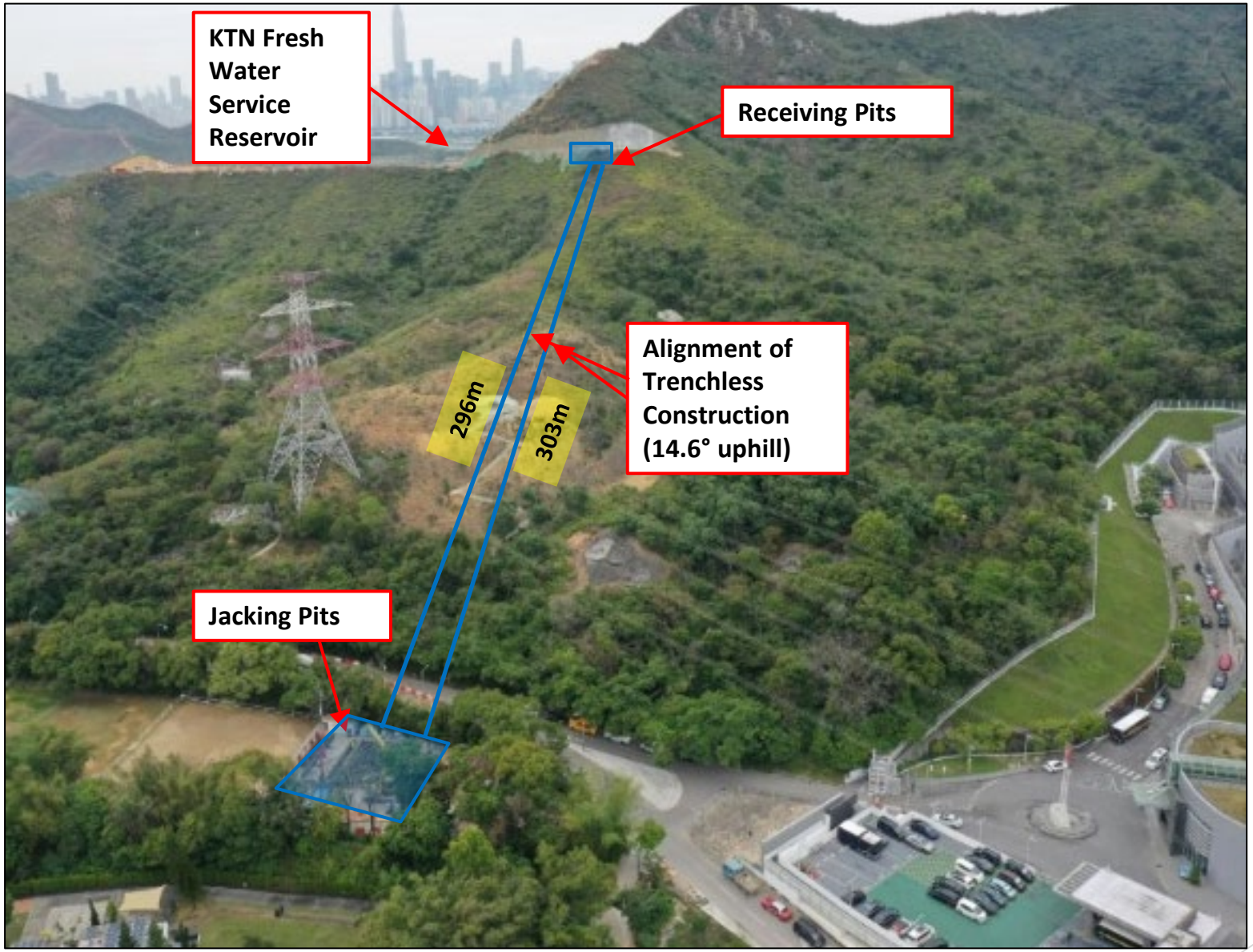
Adoption of Design for Safety in Kwu Tung North New Development Area, Phase 1 — Construction of Underground Pipes in Slope using Trenchless Method

Design for Safety in Kwu Tung North New Development Area

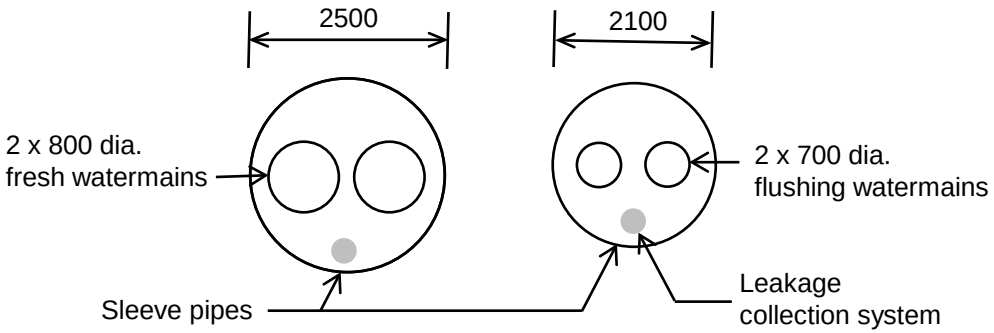


Dynamic construction planning

- Eliminate hazards at source
- Engineering controls
- Administrative controls
- PPE

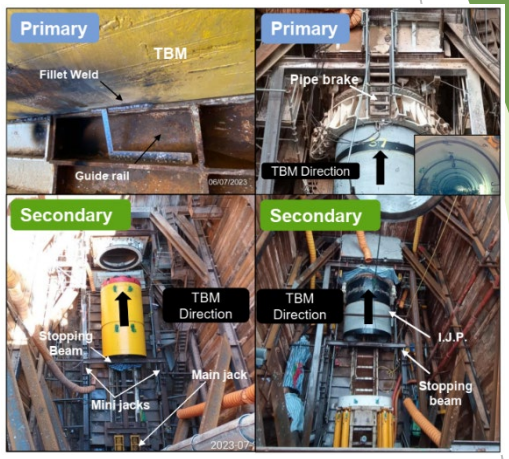
Design for Safety in Kwu Tung North New Development Area

Larger sleeve pipes for water mains installation

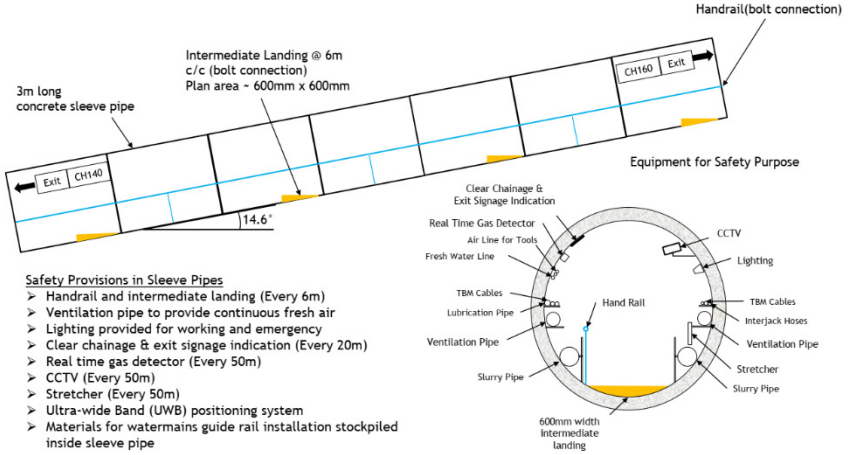


Typical Section of Pipe Jacking Works

Double safety measures for pipe jacking



Safety enhancement measures



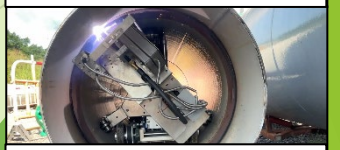
Safety Provisions in Sleeve Pipes

- Handrail and intermediate landing (Every 6m)
- Ventilation pipe to provide continuous fresh air
- Lighting provided for working and emergency
- Clear chainage & exit signage indication (Every 20m)
- Real time gas detector (Every 50m)
- CCTV (Every 50m)
- Stretcher (Every 50m)
- Ultra-wide Band (UWB) positioning system
- Materials for watermains guide rail installation stockpiled inside sleeve pipe

Smart safety devices

AI cameras

Entry control



Robotic welding

Installation of Concrete Sleeve Pipes

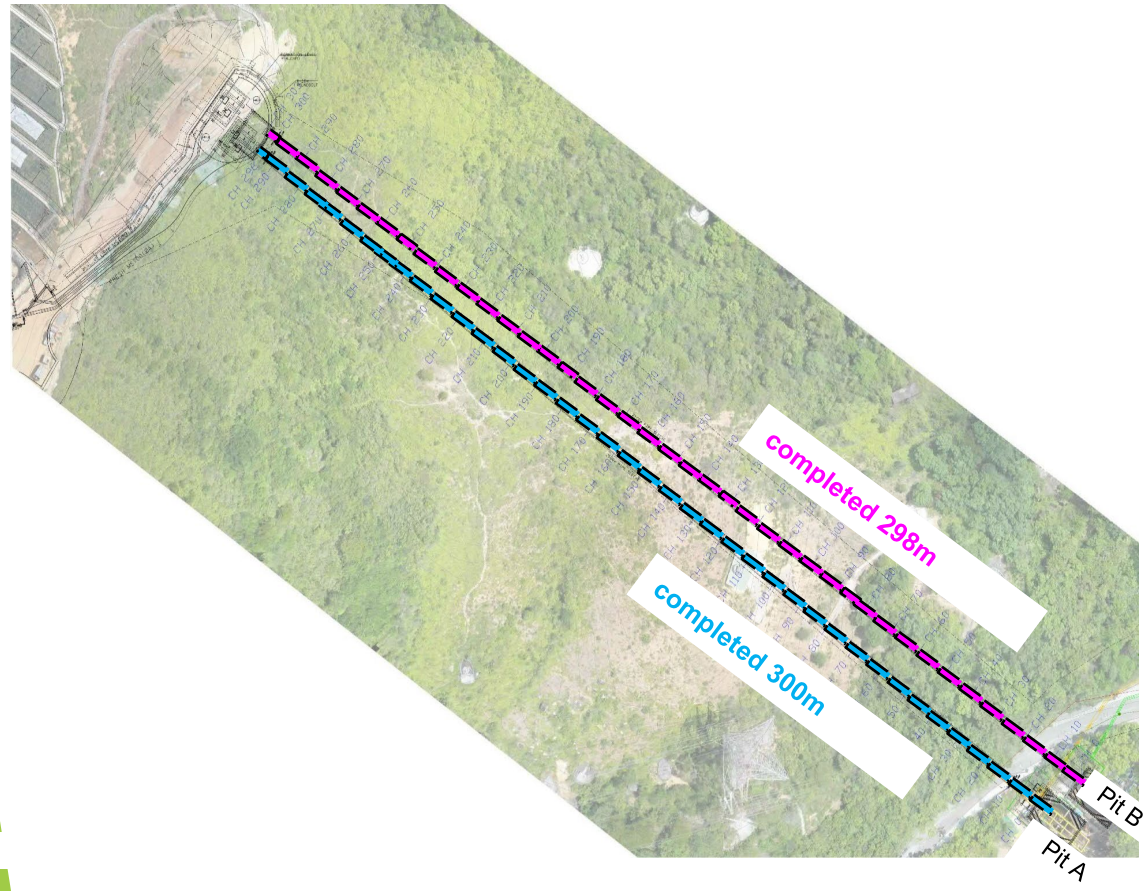
- DN 2500 Sleeve Pipes for housing two 800mm dia. watermains (296m in total)
- DN 2100 Sleeve Pipes for housing two 700mm dia. watermains (303m in total)

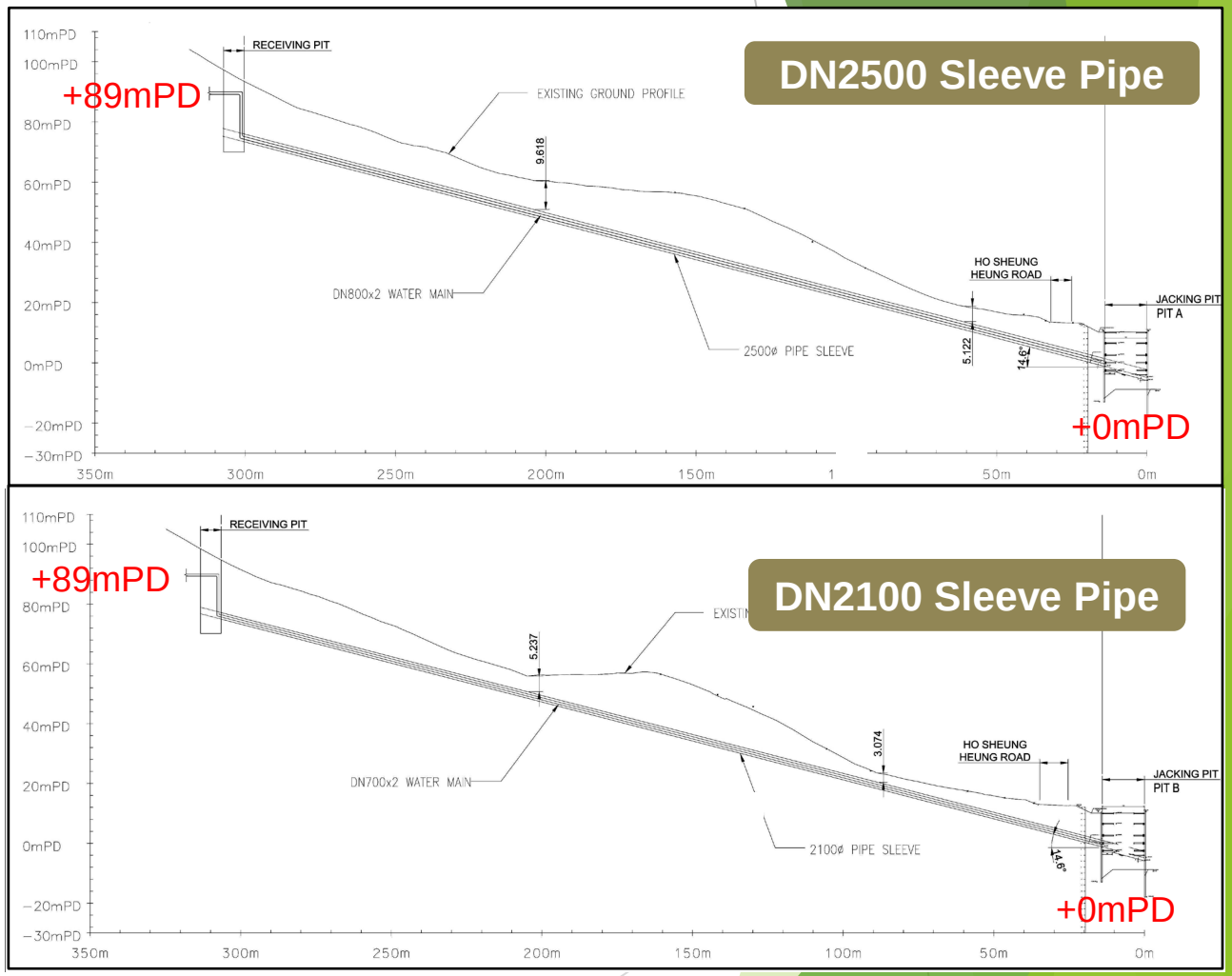
Installation of Mild Steel Pipelines

- DN 800 Fresh Watermains (Dual Pipes)
- DN 700 Flushing Watermains (Dual Pipes)

Pipe Jacking Longitudinal Profile

- **Uphill Watermain Installation**

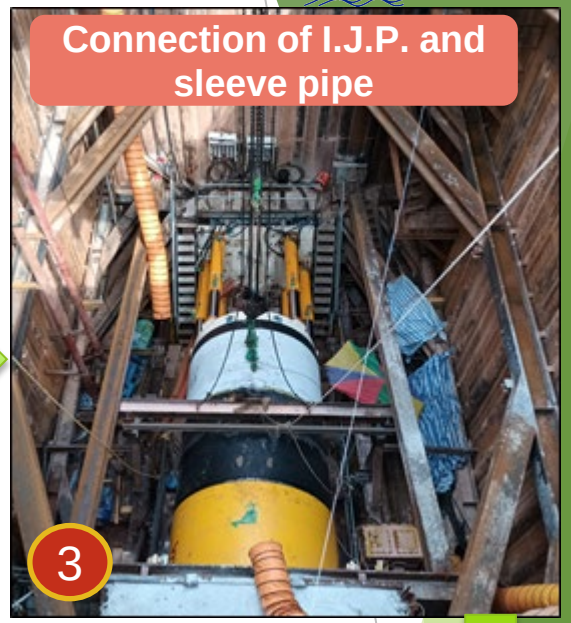


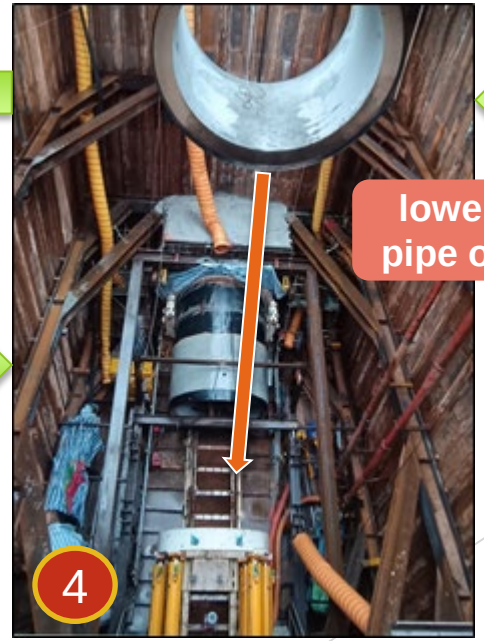


Sequence of TBM Operation

Trenchless Method Video Demonstration

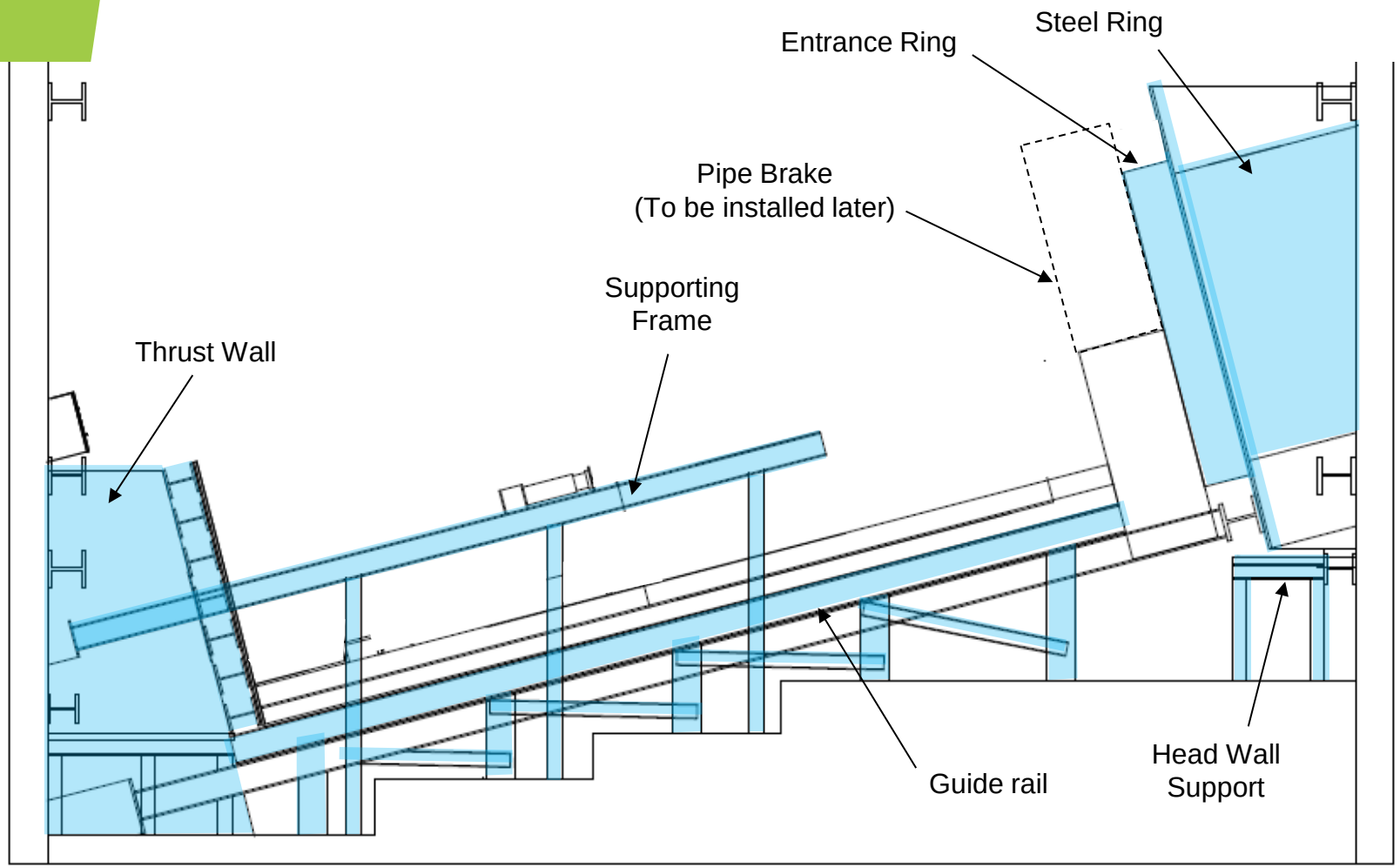
Overall Sequence

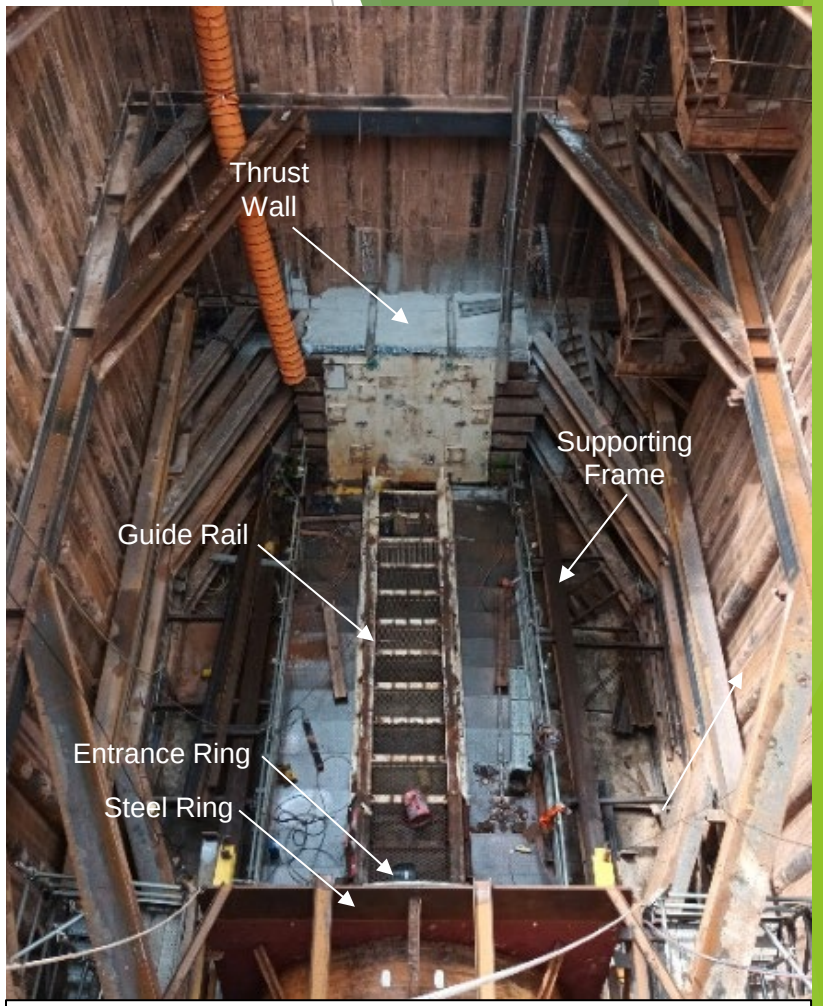




Repeat step 4 & 5

Safe Construction of Concrete Sleeve Pipes (Sequence)



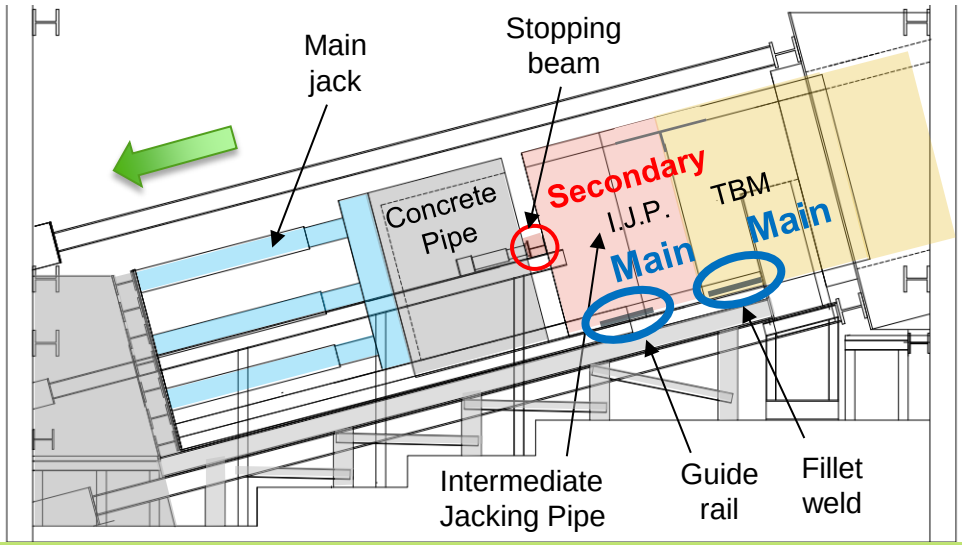


Step (0) Site Photo Montage

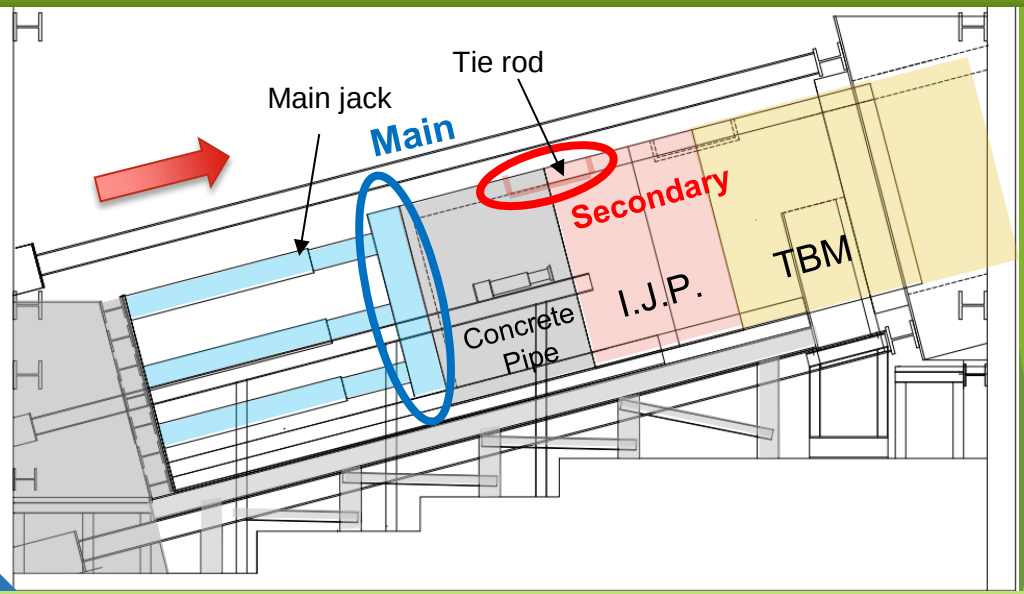
0 **Set Up of Equipment inside Jacking Pit**

Safe Construction of Concrete Sleeve Pipes (Sequence)

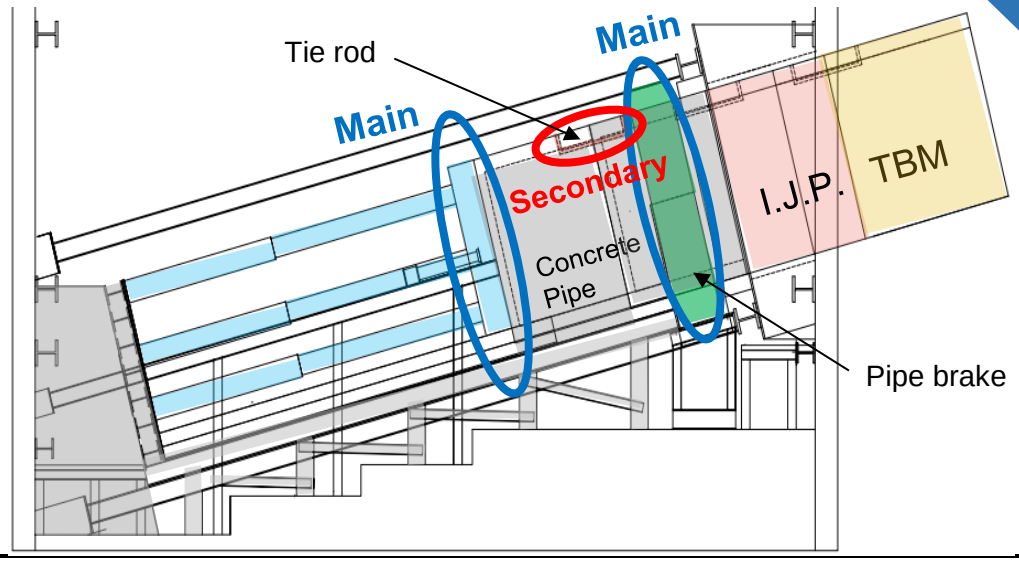
1 **Retract** the main jack and lower the concrete pipe onto the guide rail



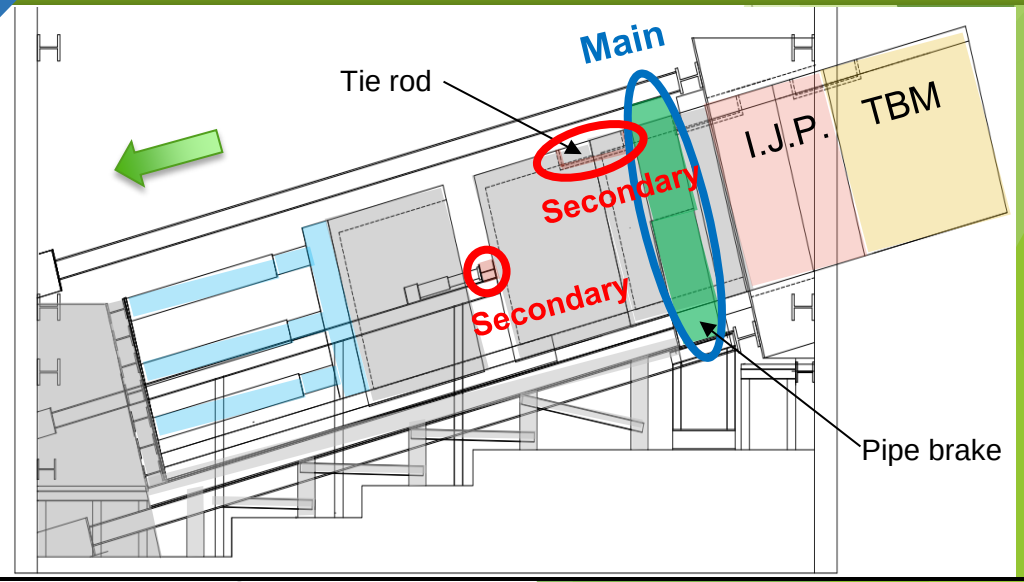
2 **Push** the concrete pipe by main jack



3 Installation of **pipe brake** onto concrete pipe

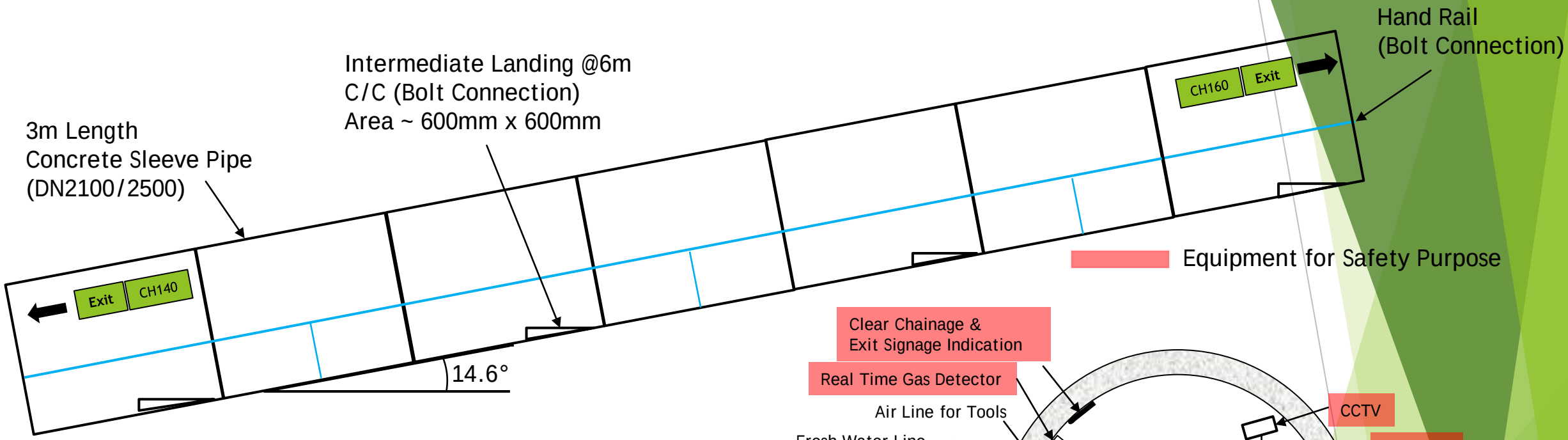


4 **Retract** the main jack and lower the concrete pipe onto the guide rail

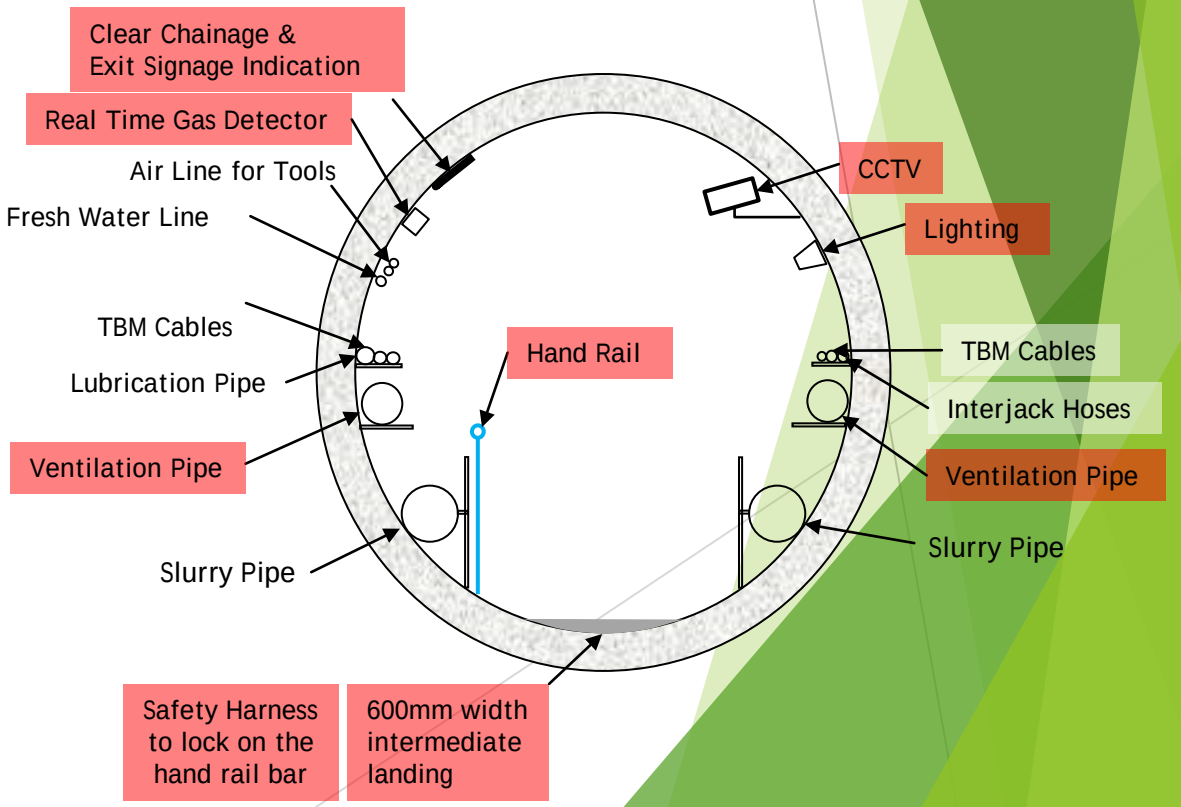


Safety Enhancement Measures of Underground Pipes

Safety Enhancement Measures Inside Sleeve Pipe



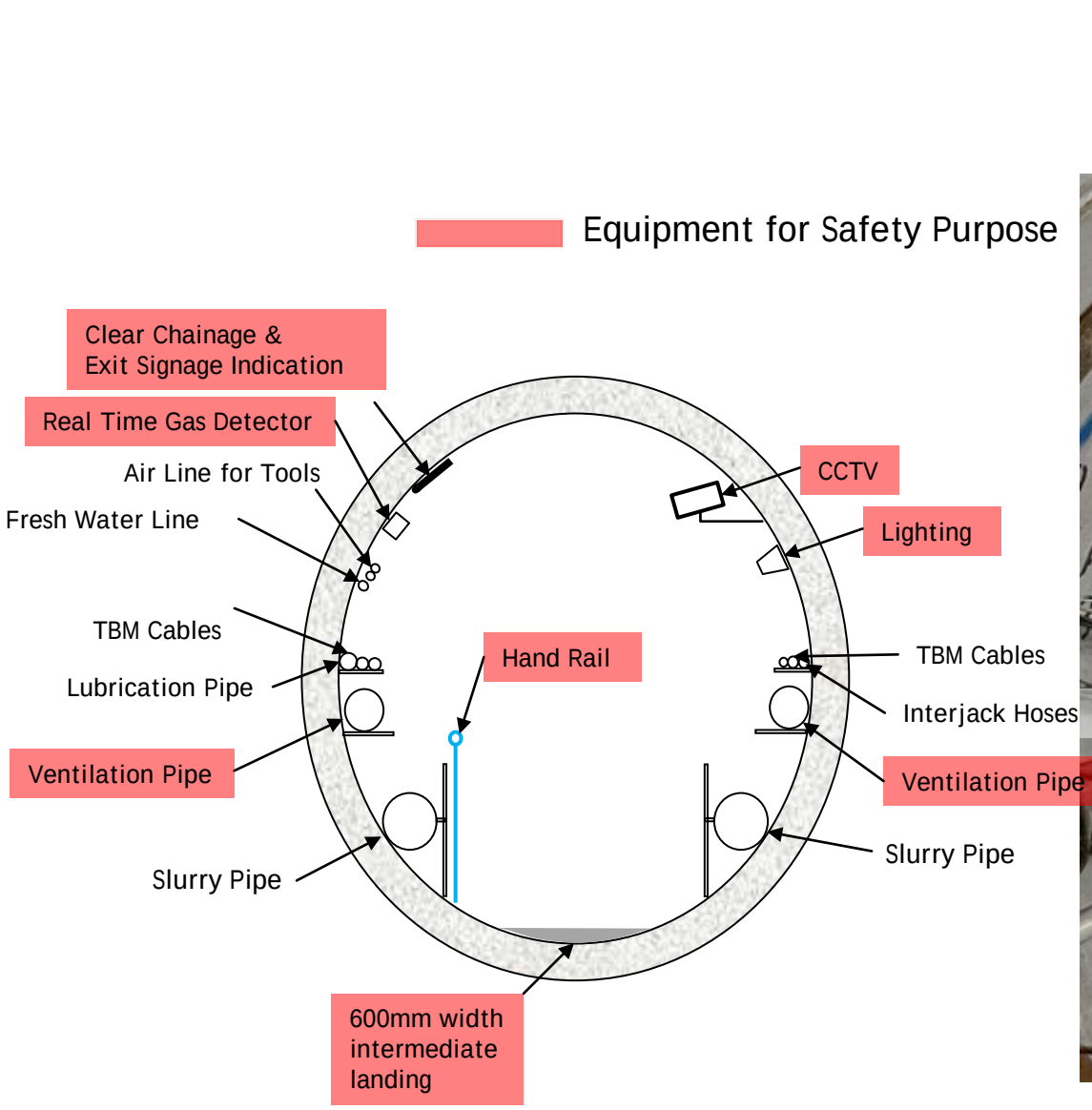
Equipment for Safety Purpose

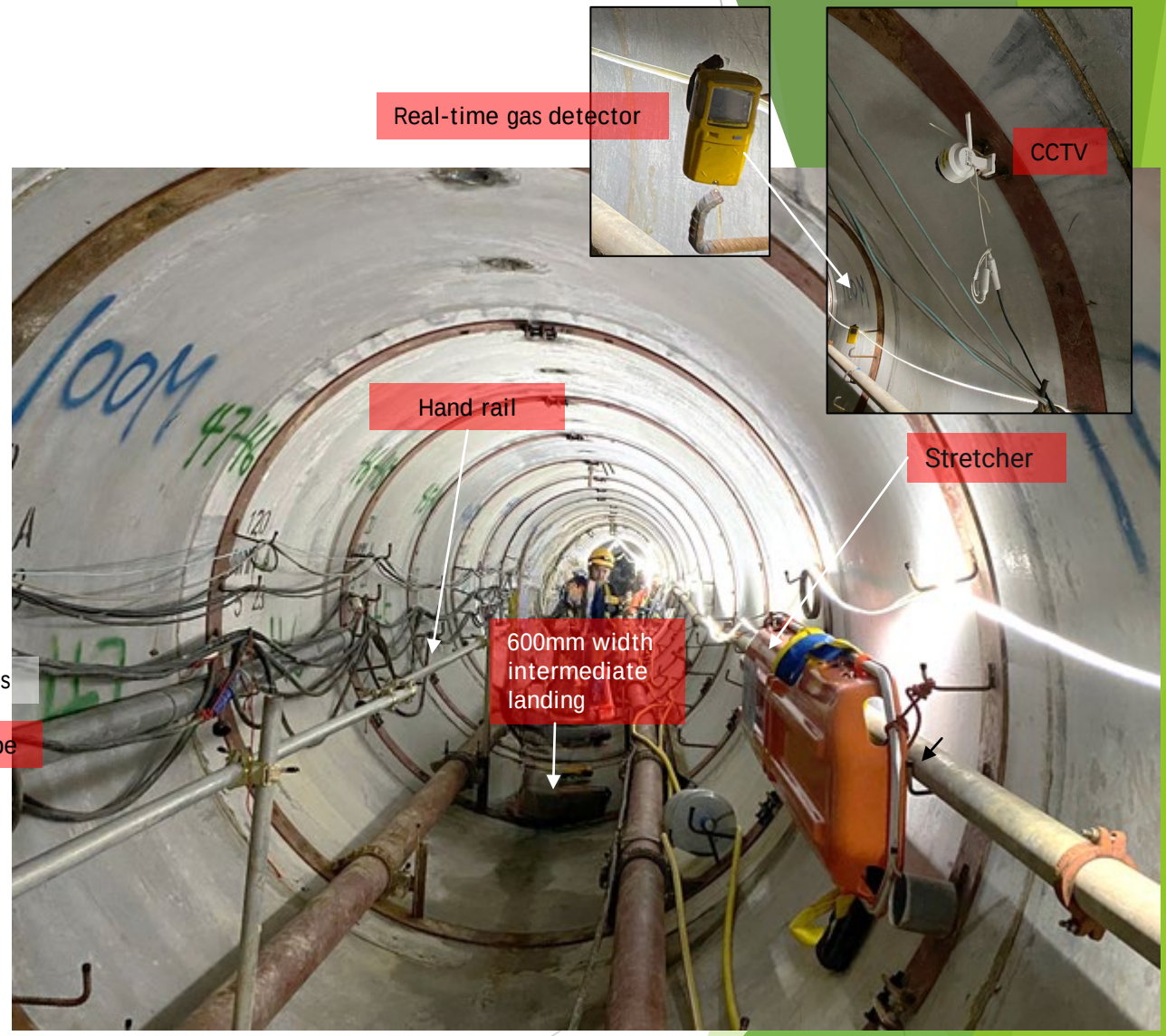


Safety Provisions Pre-Installed in Sleeve Pipes;

- Handrail and intermediate landing provided
- Material for guide rail stockpiled inside sleeve pipe
- Ventilation pipe provided to provide continuous fresh air inside sleeve pipe
- Lighting provided for working, emergency lighting as well
- Clear Chainage & Exit Signage Indication (Every 20m)
- Real Time Gas Detector (Every 50m)
- CCTV (Every 50m)

Safety Enhancement Measures Inside Sleeve Pipe





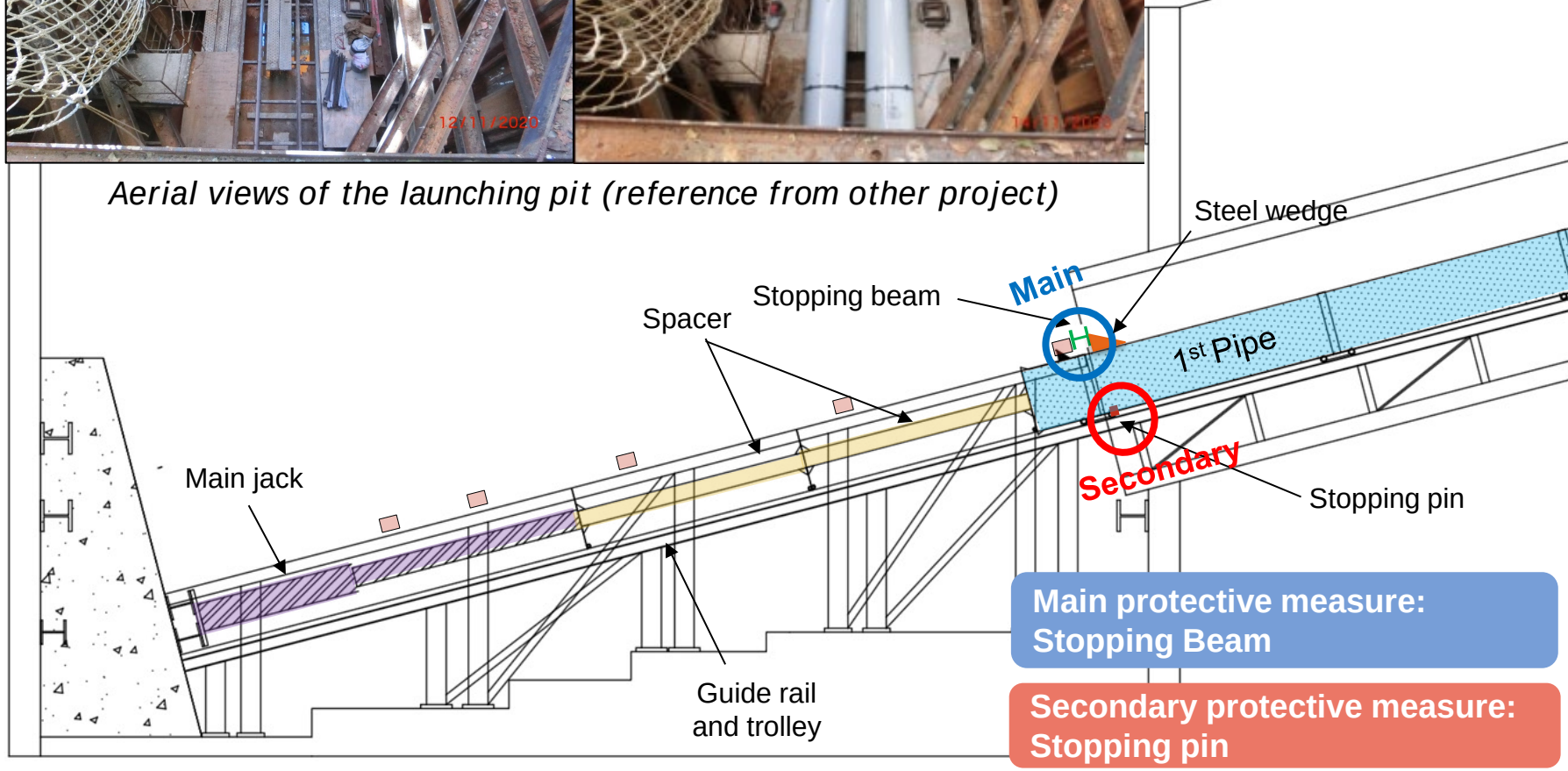
Site Trial with Simulation of Jacking Watermain Pipes on Ground

Safe Construction of Inclined Watermains

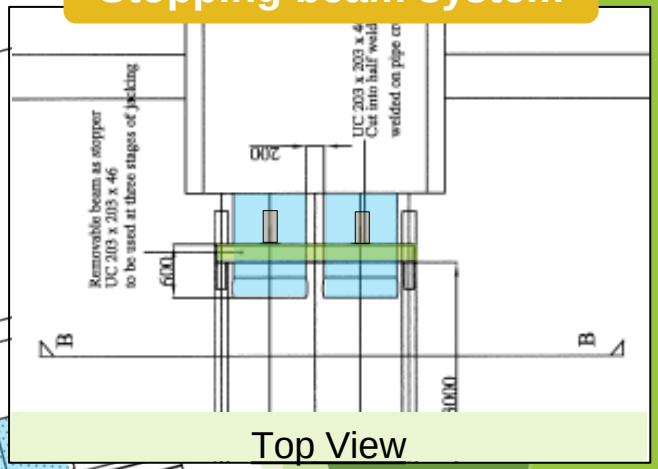
Site Trial of Jacking Watermain Pipes inside Jacking Pit

Safe Construction of Water Main Pipes (Sequence)

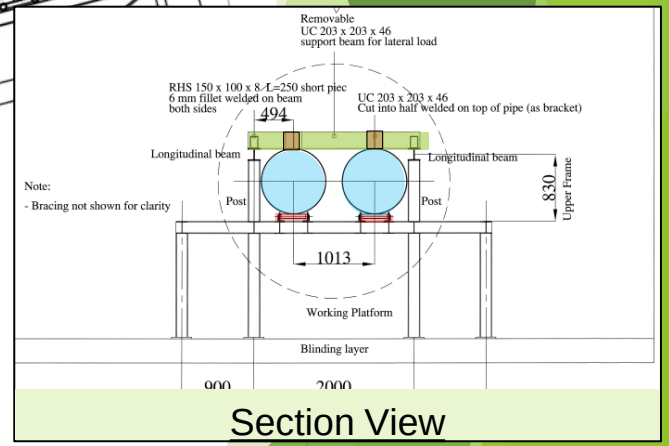
Aerial views of the launching pit (reference from other project)



Stopping beam system



Top View



Section View

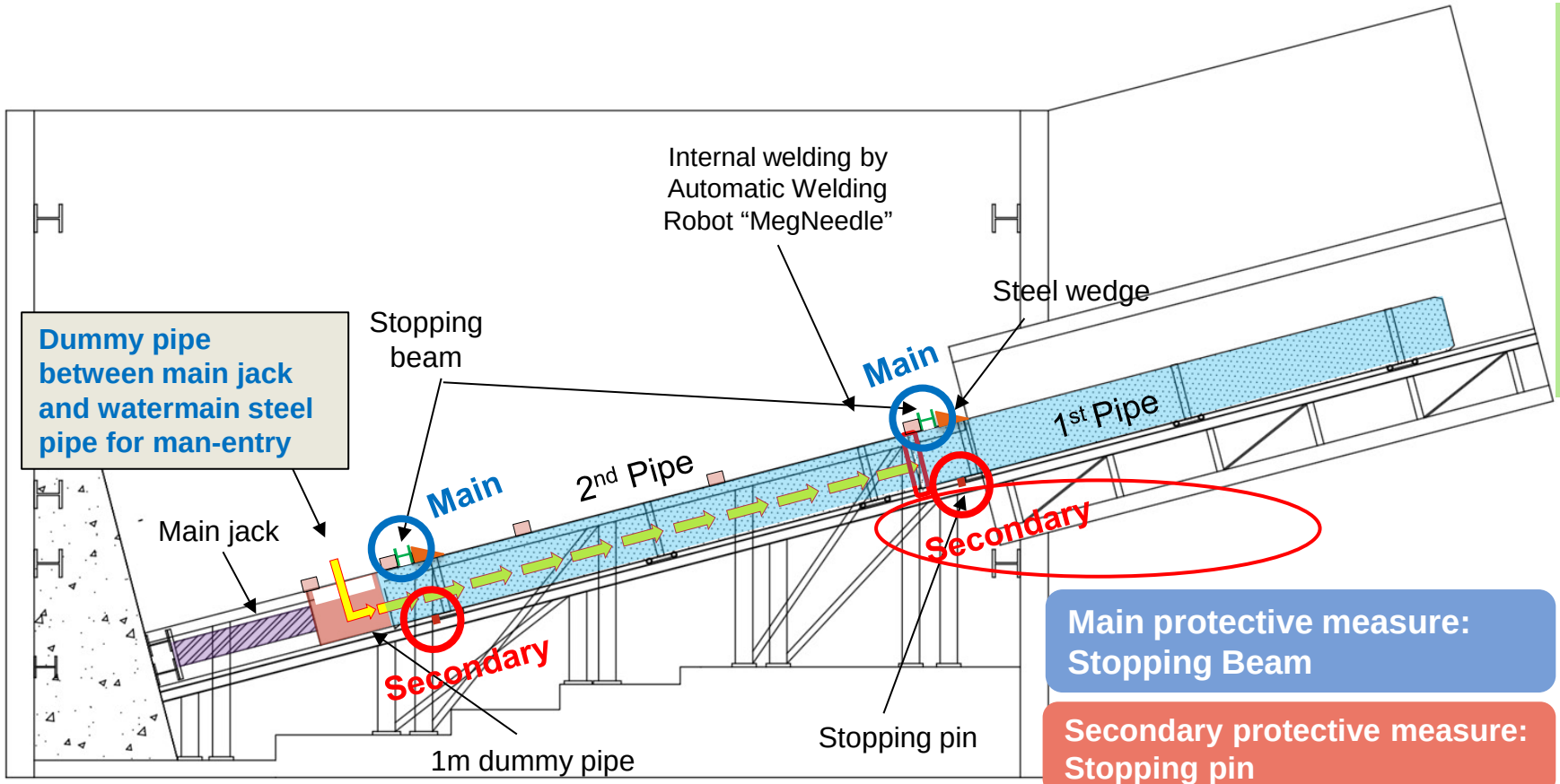
Main protective measure: Stopping Beam

Secondary protective measure: Stopping pin

1

Setup of 1st pair of water main pipes and push with spacers for next pipe

Safe Construction of Water Main Pipes (Sequence)



Main protective measure: Stopping Beam

Secondary protective measure: Stopping pin

Safety

- Automatic welding robot – "MegNeedle" will be used for welding connection of watermains;
- For Internal welding;
  - Minimized the hot work inside the steel pipe;
  - Man entry is required for alignment set up and welding touch up (if necessary) only

"MegNeedle" for Internal Welding

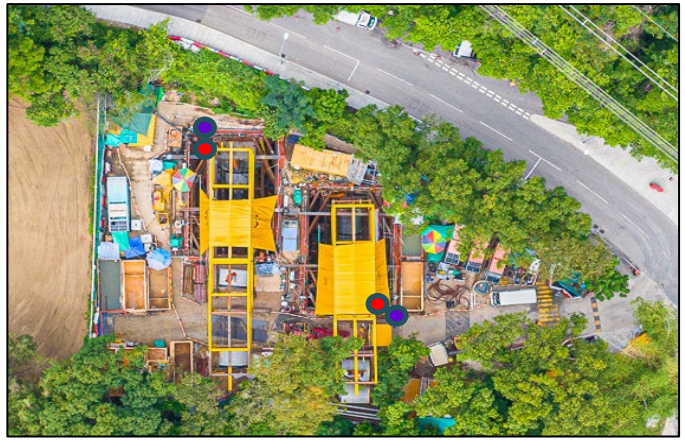
2

Setup of robotic welding at inner side of pipe joints, then weld the outer pipe

Smart Safety Measures of Underground Pipes

Smart Safety

Real Time Gas Detector

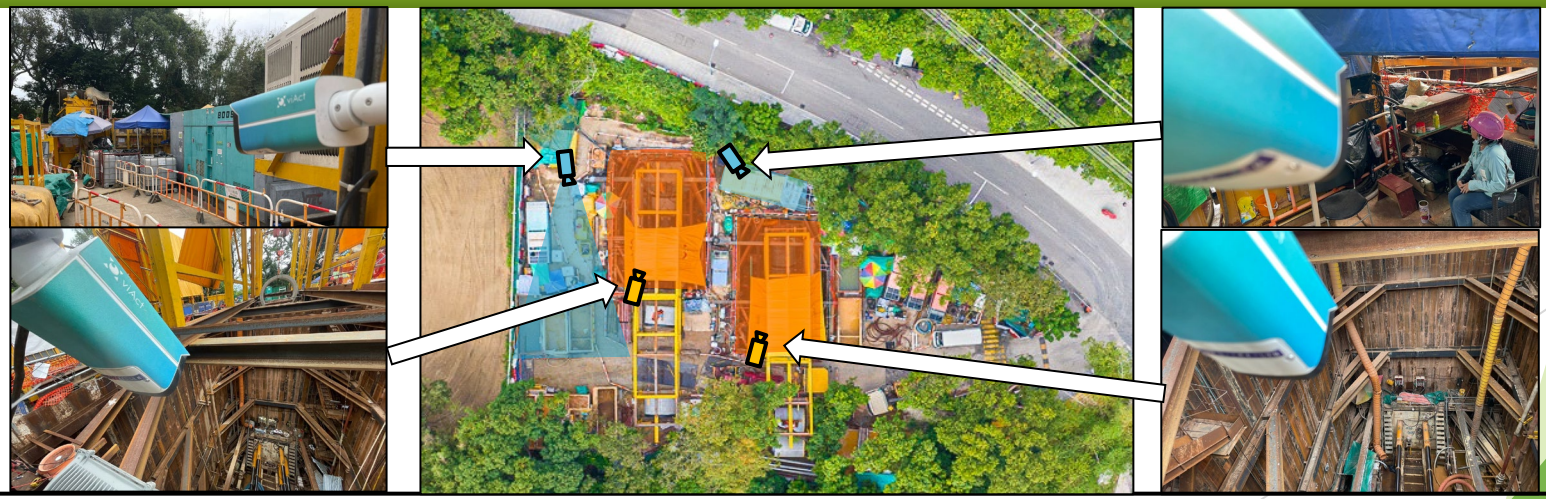


Display Board with Alert System

Gas Detector at the bottom of Shaft

Face Recognition/Card Access Point Control

AI Camera A/B and Lookout Man



Smart Safety

Gas Detector at 50m c/c inside the pipe gallery

CCTV Monitoring

Workers' equipment before entry of confined space:

1. Safety Belt
2. Gas Detector
3. Personal Alarm