

“From Cradle to Cradle” Workshop on Planning & Design for Safety in Project Life Cycle for Public Housing Developments

Safety Considerations in Civil Engineering Design and Management

Development & Construction Division
Housing Department

Safety Considerations in Civil Engineering Design and Management

- ***Excavation for Roads and Drainage Works***

- ***Land (Miscellaneous Provisions) Ordinance***
- ***Road Safety Checklist***

- ***Utilities Detection before Excavation***

- ***Good Practices in Civil Engineering Design***

- ***Manholes***
- ***Catchpits***
- ***Pedestrian Crossings***
- ***Road Gullies***

Project Life Cycle

From cradle to cradle

Maintenance

Excavation for Roads and Drainage Works

Management

Construction

Operation

Planning & Design for Safety

Use

Excavation for Roads and Drainage Works

Land (Miscellaneous Provisions) Ordinance

Section 10T - Provision of safety precautions and support

The permittee and nominated permittee of an excavation permit shall

- ❑ adopt all necessary safety precautions to protect the public or any person making or maintaining an excavation to which the permit relates from any danger or injury;
- ❑ provide adequate support for the structural stability of building, roads, slopes, structures, pipes, lighting posts, utility services or similar installations adjacent to the excavation so as to prevent the public or any person from being endangered by a fall or displacement of earth, rock or other material;

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Excavation for Roads and Drainage Works

Land (Miscellaneous Provisions) Ordinance

Section 10T - Provision of safety precautions and support

It is an offence if the above requirements are contravened. A court may, in making a decision on the defence, take into consideration that a person charged with an offence has

- ❑ hired a competent person to supervise the excavation
(competent person can be registered architect, registered professional engineer of relevant discipline, registered professional surveyor or registered safety officer);
- ❑ a documented system for supervising the excavation and ensuring the contractor complies with the above requirements;
- ❑ taken other reasonable steps.

Excavation for Roads and Drainage Works

Road Safety Checklist

- ❑ Provision of safety precautions and support
 - Install adequate support to trench excavation in a timely manner for trench with a depth greater than 1.2m to prevent collapse of the trench (as stipulated in Construction Sites (Safety) Regulations);
 - Provide and properly maintain adequate safe access to and egress from any trench deeper than 300mm;
 - Provide adequate drainage measures (e.g., pumps with sufficient capacity, upstands along sides of excavation) to minimize water runoff from the surface falling into the trench excavation.

Excavation for Roads and Drainage Works

Road Safety Checklist

- ❑ Provision of adequate proper lighting, signing and guarding to road opening works
 - Provide traffic signs, traffic cones/cylinders, temporary barriers, road hazard warning lanterns, traffic control equipment etc. as per **Code of Practice for Lighting, Signing and Guarding published by HyD;**
 - Traffic signs, cones/cylinders, barriers, lantern are to be in good condition and quality.
- ❑ Temporary road markings for temporary traffic arrangement
 - To be reflectorised and provided in accordance with the **Road Traffic (Traffic Control) Regulations;**
 - Existing road markings (if only required to be covered temporarily) to be covered temporarily with proprietary black tape.

Excavation for Roads and Drainage Works

Road Safety Checklist

- ❑ Name and contact telephone number of the responsible technician are to be displayed at the back of portable traffic light signal
- ❑ Monitor any apparent ground movement or damage of roads, buildings, slopes and any other structures, or services under or above ground adjacent to or within the site.

Excavation for Roads and Drainage Works

Road Safety Checklist

Section 10(T)(1)(a) – Shoring

Inadequate support



Excavation for Roads and Drainage Works

Road Safety Checklist

Section 10(T)(1)(a) – Safe Access

Inadequate safe access



Excavation for Roads and Drainage Works

Road Safety Checklist

Item 13 – Placing of Traffic Cone

Traffic cone max. spacing 3m



Excavation for Roads and Drainage Works

Road Safety Checklist

Item 13 – Advance Warning Signs (Road Narrows On The Right/Left)



Wrong sign



At least 300mm above carriageway



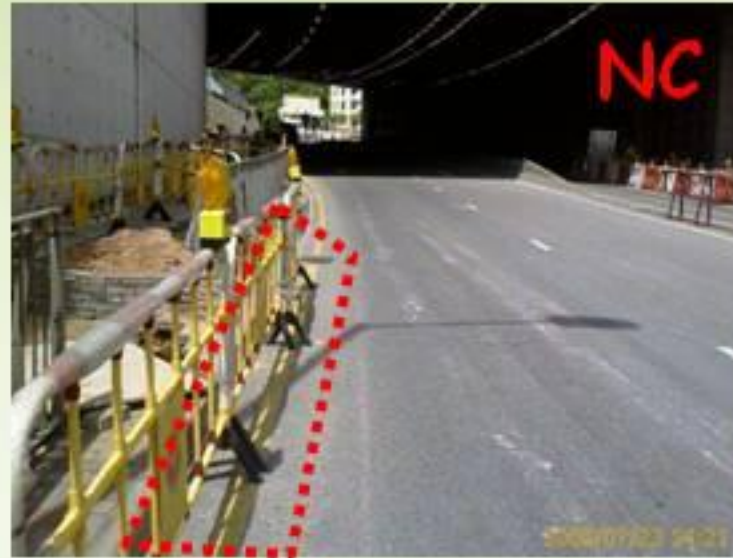
Excavation for Roads and Drainage Works

Road Safety Checklist

Item 13 – Continuous Pedestrian Barriers



No continuous pedestrian barriers



With continuous pedestrian barriers but without adequate traffic cone



No continuous pedestrian barriers



Excavation for Roads and Drainage Works

Road Safety Checklist

Item 14 – Condition/Quality of Traffic Cones



Should be free-standing (Bag filled with sand as ballast is not acceptable)



No white portion



Toppled



Excavation for Roads and Drainage Works

Road Safety Checklist

Item 14 – Condition/Quality of Barriers



Barriers should be painted so that they stand out conspicuously in contrast



Barriers should be hooked/fastened to form continuous barriers



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Planning & Design for Safety

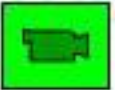
Use

Utilities Detection before Excavation

To reduce risk of damaging existing underground utility services, especially high voltage cables and gas mains which might lead to fatal site accidents.

- ❑ **Electrical Supply Lines (Protection) Regulation and Gas Safety (Gas Supply) Regulations** stipulate that all reasonable steps shall be taken to ascertain the locations and positions of electrical cables and gas pipes respectively before commencing of any works in the vicinity of these underground services.
- ❑ Obtain utilities records from utility undertakers before commencing excavation.
- ❑ Verify locations of utilities on site. Follow Code of Practices published by EMSD for practical guidance on locating underground cables and gas pipes.

Utilities Detection before Excavation

- ❑ Common non-destructive utilities detection methods include use of “Pipe and Cable Locator” and “Ground Penetrating Radar”.
 - Pipe and Cable Locator locates buried pipes/cables by detecting magnetic field around the lines, e.g., electric cables, metallic pipes.
 - For non-metallic pipes, Ground Penetrating Radar can be employed to map the buried features using radio waves; 
 - Survey interval - not exceeding 2m in discrete areas and 10m along alignments of services;
 - Survey depth - up to 4m below ground or predicted depth of known deepest utilities, whichever is greater.

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Utilities Detection before Excavation

- Accuracy of location and level
 - for depth up to 1.5m below ground, 90% of a representative sample of points on locatable services shall be within $\pm 165\text{mm}$;
 - for depth more than 1.5m below ground, shall be to better than 10% of depth below ground.
- Survey by non-destructive method should be carried out under supervision of competent engineer or senior technician experienced in relevant surveying procedure.
- If necessary, dig trial pits to further confirm utilities locations.

Project Life Cycle

From cradle to cradle

Maintenance

Good Practices in Civil Engineering Design

Management

Construction

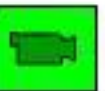
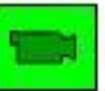
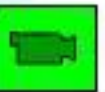
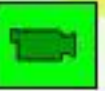
Operation

Planning & Design for Safety

Use

Good Practices - Manholes

- ❑ **Avoid locating manholes at centre of road and run-in / out as far as possible**
 - **To avoid hazardous working conditions to workers / road users and interruption to EVA during repair / maintenance works**
- ❑ **Avoid locating manhole access opening above drainage channels**
 - **To ensure safe landing on benching of manhole for repair / maintenance**
- ❑ **Provide intermediate platform for deep manhole**
 - **To provide safe working intermediate platform for repair / maintenance**
- ❑ **Provide restraint to covers of manholes with inadequate ventilation (being considered for adoption in housing sites)**
 - **To prevent gas explosion hazard in the manhole**



Good Practices - Catchpits

- ❑ **For catchpits easily accessible to general public, install with grating or cover**
 - **To safeguard pedestrians from falling into the pits**

Catchpit with gratings



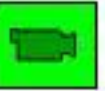
Catchpit covered up with concrete strips



Good Practices – Pedestrian Crossings

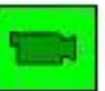
- **Ensure sight line unobstructed**

- **To avoid hazardous traffic conditions to pedestrians**



- **Construct with gradient not exceeding 1 in 12**

- **To avoid slippery surface (especially with tactile) and meet barrier free standard**



Good Practices – Road Gullies

- ❑ **Avoid locating gullies on pedestrian pathways (e.g. crossings, stairways)**

➤ **To avoid pedestrians from being tripped by the gully gratings**



Gullies in front of crossing



Gullies in front of stairway

Conclusion

- ❑ ***Take safety considerations from operational and maintenance points of view.***
- ❑ ***Implement safety audit on design.***
- ❑ ***Maintain well documented system on site Safety supervision.***



Thank you

Good Practices - Manholes

- ❑ **Avoid locating manholes at centre of road and run-in / out**



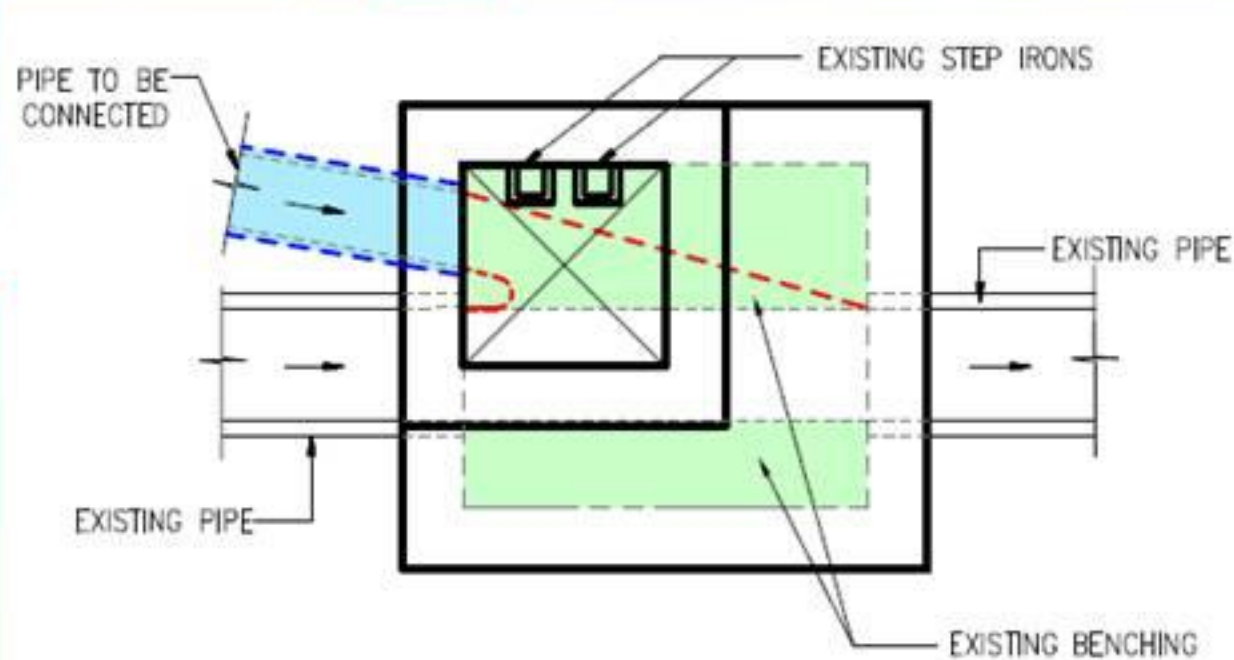
Manhole at centre of run-in / out

Manhole at centre of carriageway

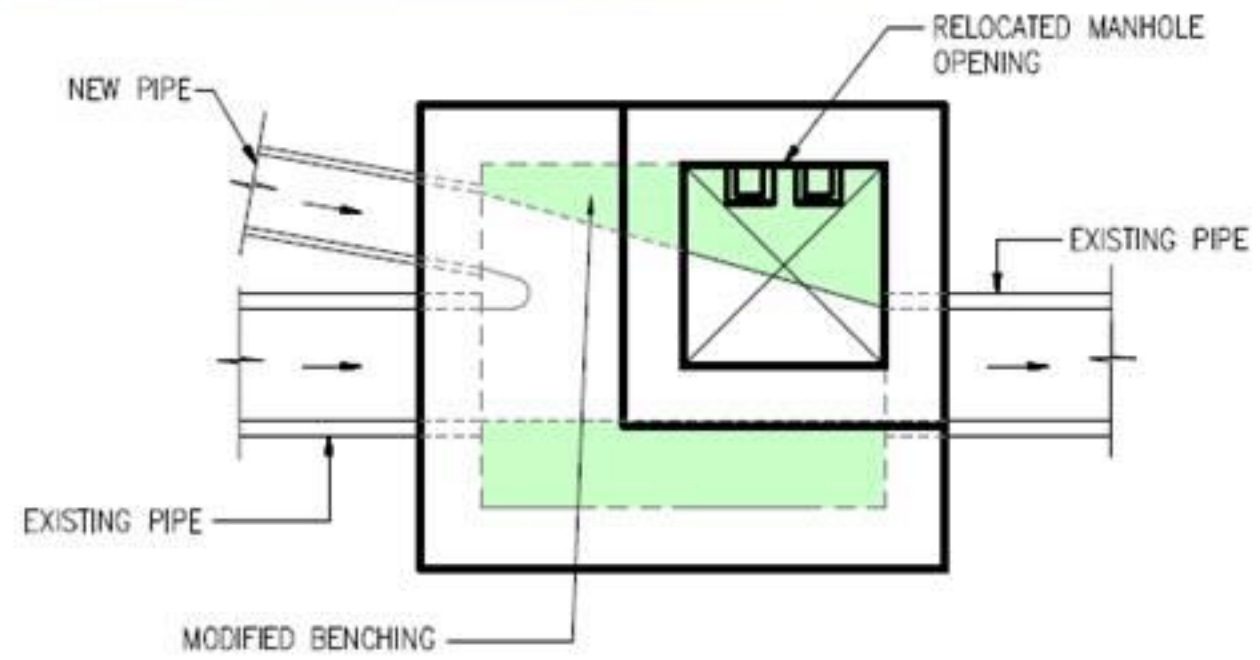


Good Practices - Manholes

- ❑ **Avoid locating manhole access opening above drainage channels**



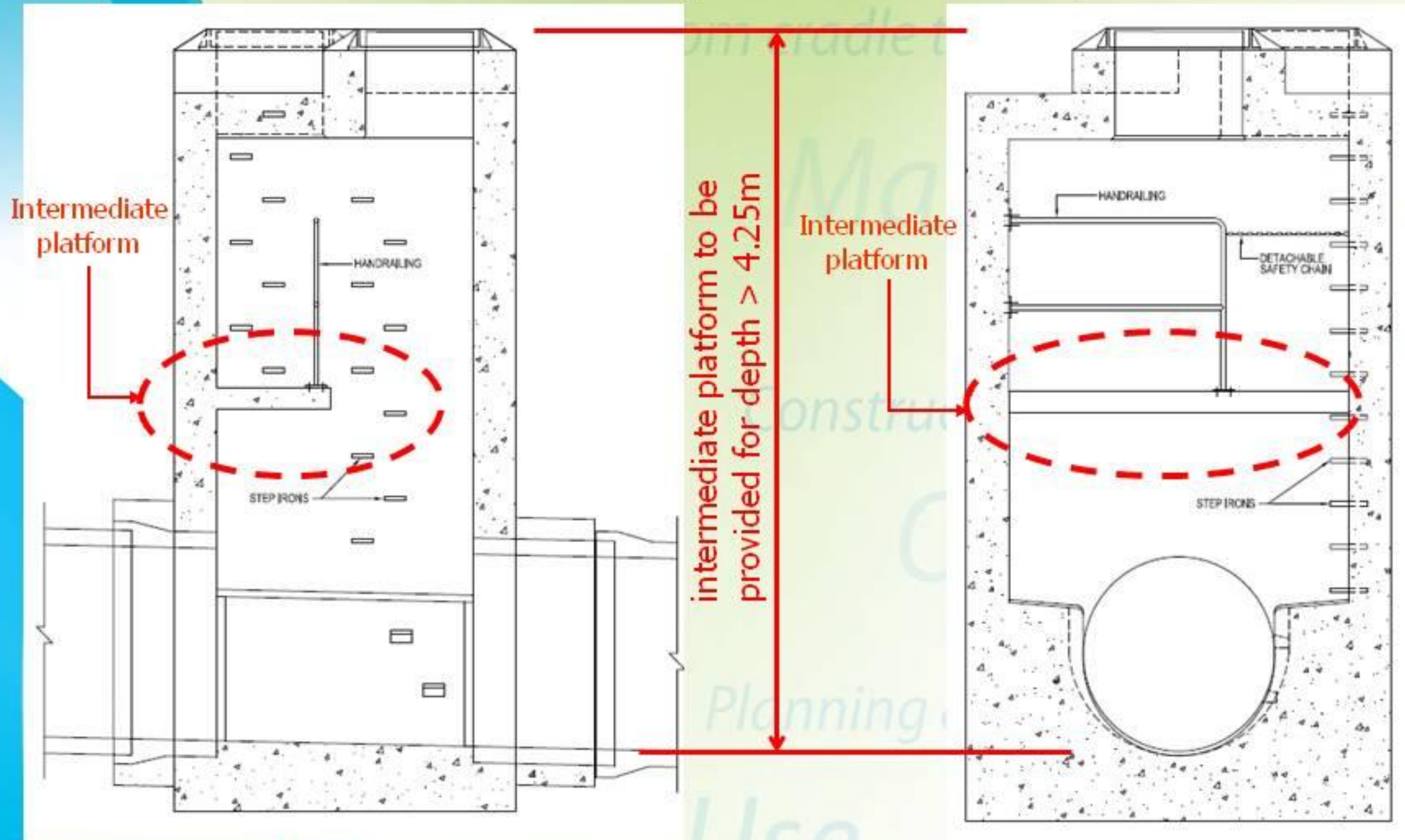
EXISTING MANHOLE



MODIFICATION WORKS TO EXISTING MANHOLE

Good Practices - Manholes

- Provide intermediate platform for deep manhole



Good Practices - Manholes

Project Life Cycle

From cradle to cradle

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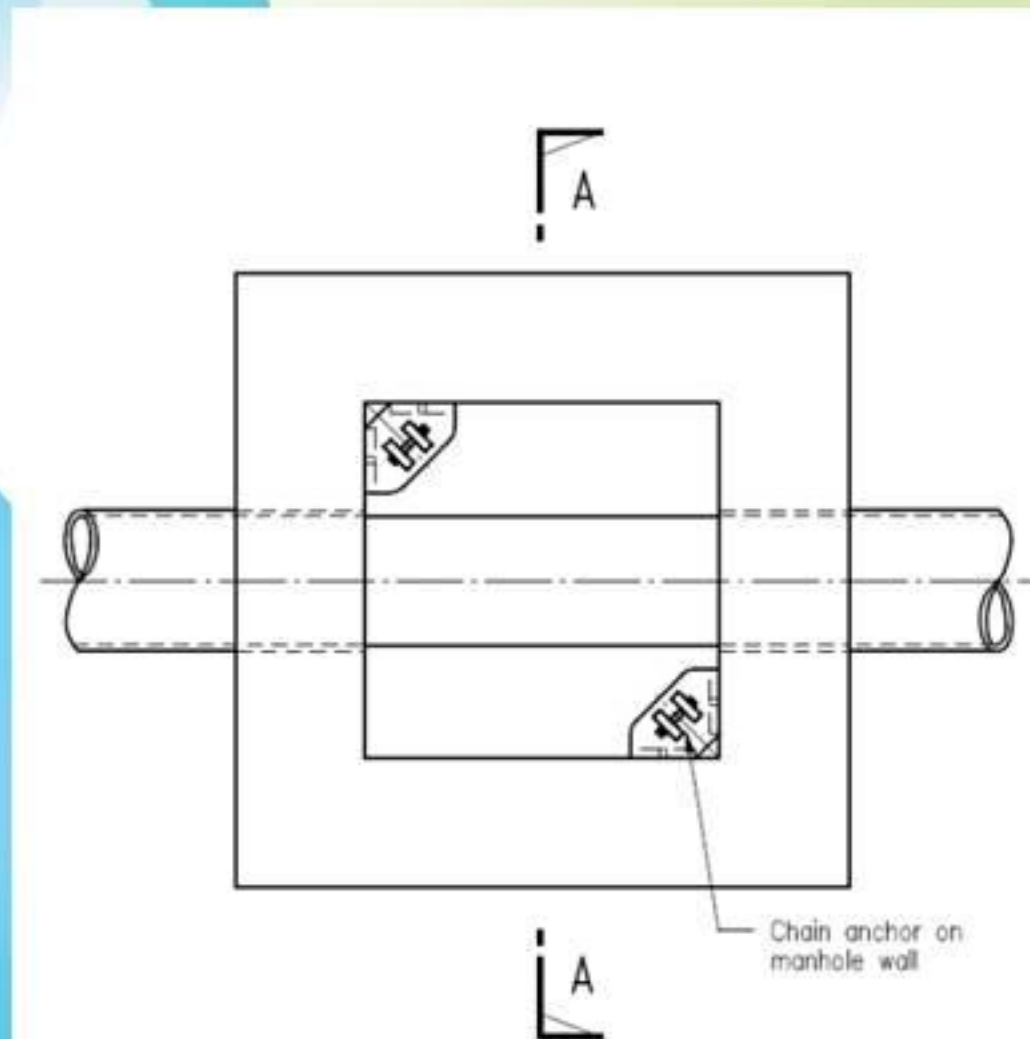
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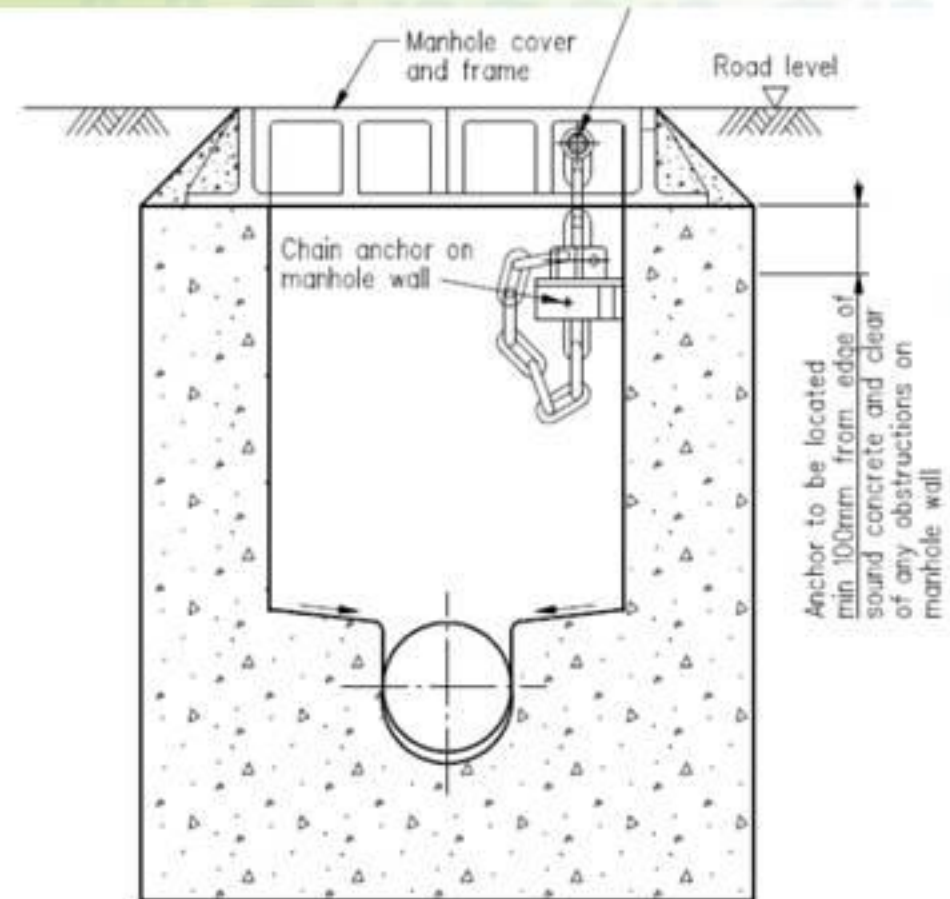
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Use

- ❑ **Provide restraint to covers of manholes with inadequate ventilation e.g. - upstream manholes more than 10m from connecting gullies**



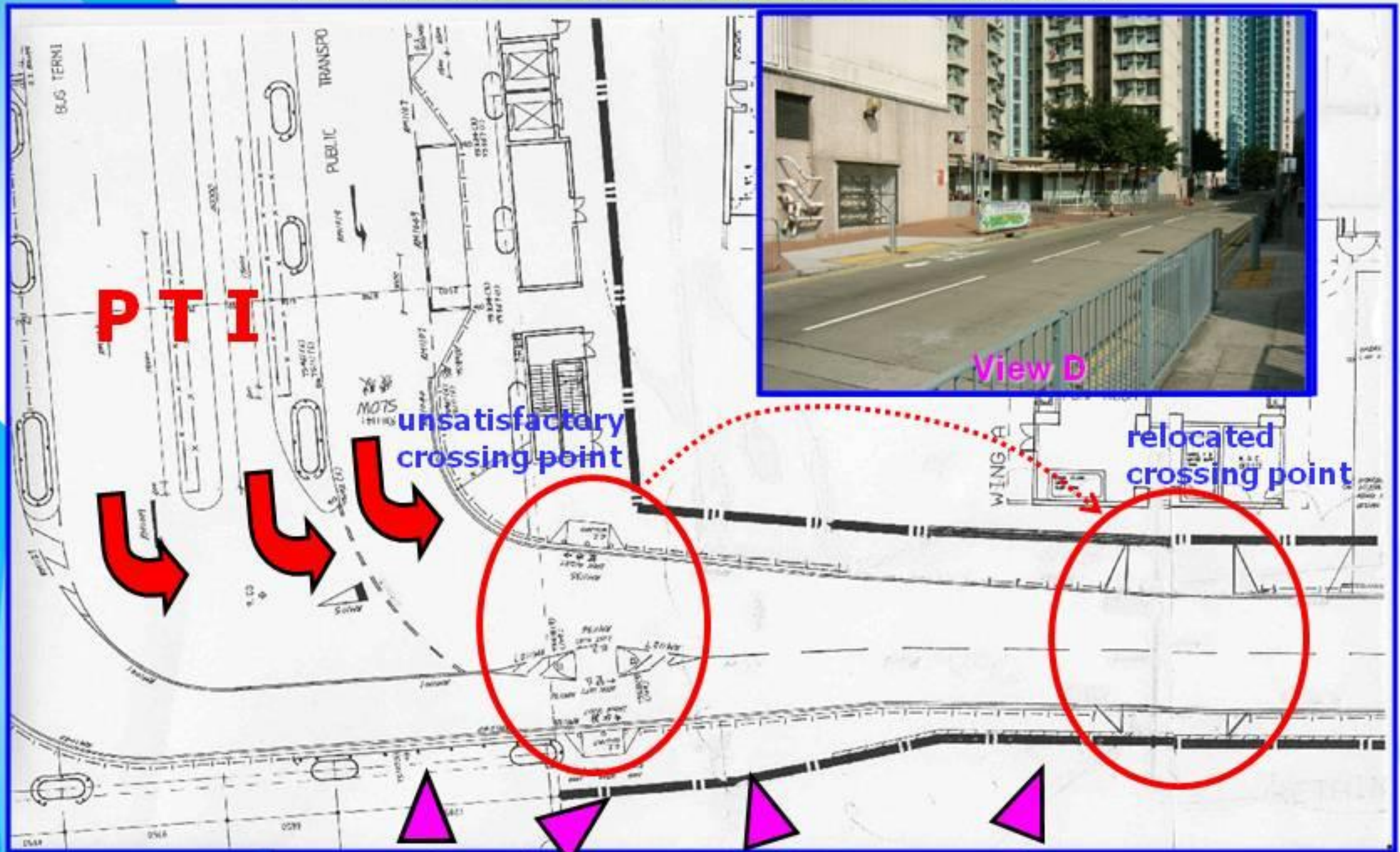
PLAN



Section A-A

Good Practices – Pedestrian Crossings

- Ensure sight line unobstructed



Good Practices – Pedestrian Crossings

- ❑ **Construct with gradients not exceeding 1 in 12**



Crossings constructed with too steep gradient may cause slippery surface (especially with tactile)

Utilities Detection before Excavation



Pipe and Cable Locator

Ground Penetrating Radar

