

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

**Presented by Ir. Joseph Mak**  
**CSE/DC&ICU**

Development & Construction Division  
Housing Department

31/3/2010

# Preface

- This section is to highlight some of those areas that have potential safety risks in structural construction, including demolition, foundation and building works.
- Emphasis will be placed on early planning, design and specification provisions.



*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

**Demolition**

*Management*

*Construction*

**Demolition Plan**

*Operation*

*Planning & Design for Safety*

*Use*

# Demolition Plan

- Demolition plan is prepared early by the Structural Engineer incorporating all critical safety provisions.
- These plans are to be incorporated into tender documents.
- When the contract is awarded, the Contractor is required to submit their proposed demolition plan which should be in line with the SE's demolition plan.



# Demolition Planning Features



**Double Deck Hoarding/Covered Walkway to Protect Pedestrians;  
Locations and Extent of Hoarding Should be Clearly Defined**



# Demolition Planning Features



**Scaffold, Nylon Mesh and Periphery Catch Platforms/Fans to Prevent Demolished Debris from Falling out of the Block**



# Demolition Planning Features



**The Route for Movement of Mechanical Breaker Must be Defined in Demolition Plan. Adequate Propping Should be Provided underneath**



# Demolition Planning Features



**Stacking of Demolished Debris Not to Exceed Allowable Height.  
Debris is to be Cleared from Time to Time**



# Demolition Planning Features



**Barrier Erected at the Opening of Refuse Chute.  
Scaffold and Nylon Mesh at the Building Perimeter  
Must be More Than 1 Meter Height**



# Demolition Planning Features



**Clamping Instead of Tack Welding to Bracing Should Be Specified In Demolition Plan;  
Tack Welding is Difficult to Assess for Adequacy**



*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

**Demolition**

*Management*

*Construction*

**Asbestos Handling**

*Operation*

*Planning & Design for Safety*

*Use*



# Asbestos Handling

- Asbestos removal should be well planned.
- These include:
  - Early identification of possible asbestos containing materials by asbestos consultant before tender.
  - Requirements for asbestos removal specialist contractor stipulated in Specification.



# Identification of Asbestos Containing Materials



## Early Identification of Asbestos Containing Materials by Asbestos Consultant

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

• Caring • Customer-focused • Committed • Creative



# Asbestos Removal Works

*Project Life Cycle*  
*From cradle to cradle*

*Maintenance*

*ement*

*n*

*ety*



**Asbestos Removal  
Works for Fuse Box**



**Asbestos Removal Works for  
Grille Panel**



# Asbestos Removal Works



**Vacuum Cleaner  
with HEPA Filter**



**Chalk Board  
Covered by  
Polythene  
Sheet**





# Asbestos Removal Works



Sealed Drum



# Asbestos Removal Works



**Respiratory Protective Equipment and Protective Clothing Used for Asbestos Abatement Work**



# Asbestos Removal Works



**Spray of Water**



**Asbestos Particles  
Removing**



# Compartment for Asbestos Removal Works





# Passage for Asbestos Removal Works

*From cradle to cradle*



**Transferring Sealed Drum to the Ground**



# Passage for Asbestos Removal Works



## Designated Asbestos Sorting Area



# Passage for Asbestos Removal Works



**Transportation of Sealed Container to  
Designated Chemical Dumping Site**



*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

# **Foundation**

*Management*

*Construction*

## **Excavation and Lateral Support (ELS) Works**

*Operation*

*Planning & Design for Safety*

*Use*



# Excavation and Lateral Support (ELS) Works

- For large scale excavation and lateral support (ELS) works, it is important that Structural Engineer should early design a pretender scheme.
- The scheme would be used as a base for comparing with Contractor's proposed scheme at tender return.
- This allows the SE to better assess the structural adequacy of Contractor's proposed scheme, as well as the correct order of the ELS cost.



## Under Stage



IAN



## PLAN



# ELS Works



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

• Caring • Customer-focused • Committed • Creative



# ELS Works



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

• Caring • Customer-focused • Committed • Creative



*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

# **Foundation**

*Management*

*Construction*

**Materials and Plant Handling**

*Operation*

*Planning & Design for Safety*

*Use*



# Materials and Plant Handling

- Safety in material and plant handling is often critical in foundation contracts.
- Early planning by contractor and checked by SE in materials storage, maneuvering of plants, transporting of heavy and large volume of materials are essential.



# Materials Storage



**Proper Storage of  
H-pile Material**



**Proper Storage of  
Steel Casing**



**Store Rack for  
RCD Drill Rod**



**Proper Storage of  
Steel Liner**



# Equipment Disposition and Transportation



**CCTV In Operator Cabin**



**Warning Bar & Rear Camera**



# Equipment Disposition and Transportation



**Overload Alarm**



**Overload Alarm of Excavator**



# Equipment Disposition and Transportation



**Lifting Casing (Horizontal)**



**Lifting Steel Cage by  
2 Cranes (Horizontal)**



# Equipment Disposition and Transportation



**Lifting Steel Cage  
(Vertical)**



**Lifting Steel Casing  
(Vertical)**



# Loading Test

*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

*nt*



**Final Set up of  
Mass Steel Kentledge**



**Typical Conc. Block Kentledge**



*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

*Management*

*Construction*

*Operation*

*Planning & Design for Safety*

*Use*

# **Building**

## **Large Steel Cage Erection in Pile Cap and Transfer Structures**



## Project Life Cycle





# Large Steel Cage Erection in Raft Footing for Domestic Blocks (Shear Links not Required)





# Large Steel Cage Erection in Transfer Structures for Domestic Blocks (Shear Links Required)



**Less Congested Shear Links**



**Congested Shear Links**

**Congestion of Shear Links Can be Mitigated by Enlargement of Member Size**



# Large Steel Cage Erection in Transfer Structures for Domestic Blocks (Shear Links Required)



**The Upward Projections of Congested Shear Links Pose Safety  
Concerns during Fixing of the Upper Layers of the Reinforcement  
Bars**





*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

**Building**

*Management*

*Construction*

**Falsework**

*Operation*

*Planning & Design for Safety*

*Use*



# Substantial Falsework

*Project Life Cycle*

*From cradle to cradle*



**Substantial Falsework with Ground Supports**  
**Good Practice Vs Bad Practice**

*Planning & Design for Safety*

*Use*



# Substantial Falsework

*Project Life Cycle*

*From cradle to cradle*



**Horizontal Loads –  
Bracing**



**Overturning –  
Height to Width Ratio**



# Passage through Falsework



**Adequate Lighting and Fencing off Hazardous Area**



*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

**Building**

*Management*

*Construction*

**Steel Fixing**

*Operation*

**and**

*Planning & Design for Safety*

**Concrete at Heights**

*Use*



# Steel Fixing and Concrete at Heights

*From cradle to cradle*



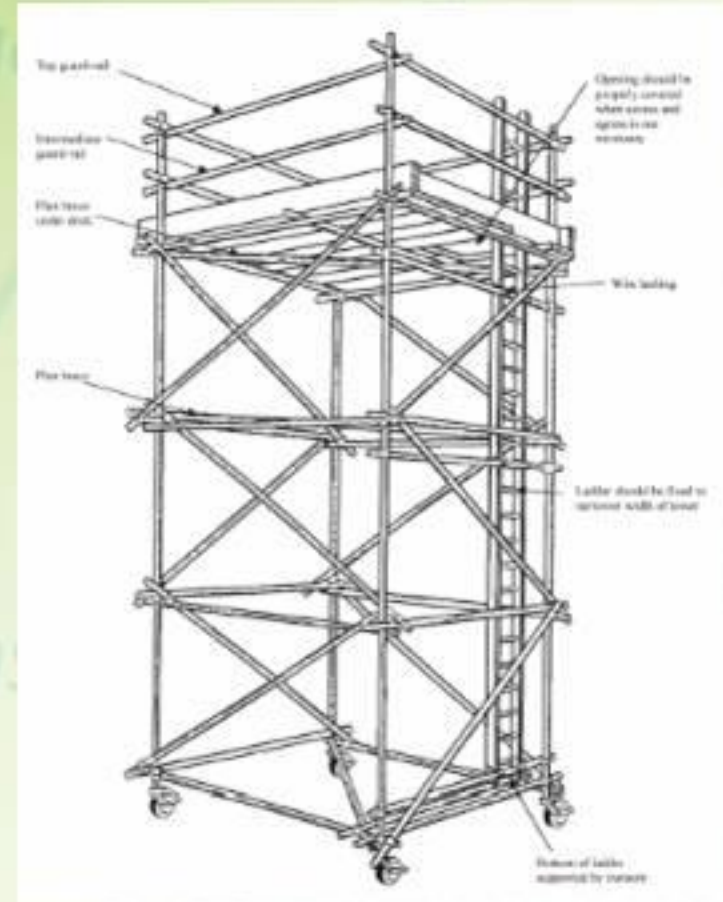
## Bad Examples



# Steel Fixing and Concrete at Heights



**Working Platforms Suggested  
in COP**



**Mobile Working Platforms  
for Steel Fixing or  
Concrete Pouring  
Suggested in COP**



# Steel Fixing and Concrete at Heights

*From cradle to cradle*



**Working Platform with Adequate Railings and Toe Boards was Provided during Working at Heights**



# Steel Fixing and Concrete at Heights



**Good Housekeeping in Working Area**



**Working Platform Provided for Steel Fixing Works at Heights (above 2m)**

**Working Chair Provided for Steel Fixing Works at Heights (Below 2m)**





# Steel Fixing and Concrete at Heights

*From cradle to cradle*

*Maintenance*

*ment*



**Temporary Working Platform  
Provided for Concrete Pouring at  
Heights  
(below 2m)**



**Mobile Working Platform  
(above 2m)**

*Planning & Design for Safety*

*Use*



# Steel Fixing and Concrete at Heights

## – by Use of Fabric Reinforcement at Walls



**Traditional Rebar Fixing**



**Fixing of Fabric Reinforcement**



*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

**Building**

*Management*

*Construction*

**Mechanized and Precast Construction**

**for**

**Elevated Structures**

*Planning & Design for Safety*

*Use*



# Benefit of Rotary Symmetry

*From cradle to cradle*



**Ideally Design Block with Rotary Symmetry to Avoid Moving Formwork to Ground Level**



# Large Panel Formwork



**If Rotary Symmetry Cannot be Fully Achieved, Designated Site Crews Should be Assigned to Look after Every Movement of Formwork to Ground Level.**



# Precast Facade



Allow Enclosed Working Floor for  
Other Construction



# Precast Staircase



**Precast Staircase is Supported on Concrete Landing Cast Earlier so that Temporary Props are Not Required. Temporary Props May be Easily Disturbed due to Frequent Passage of Workers.**



# Semi-precast Slab



**Avoid Slab Formwork Construction and Minimize Nos. of Proppings**



# Precast Beam



**Avoid Insitu Construction of Tie Beams at Elevated Positions**



*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

**Building**

*Management*

*Construction*

**Crane Handling**

*Operation*

*Planning & Design for Safety*

*Use*



# Tower Crane, Material Hoist CCTV and Double Chain Sling



**Tower Crane CCTV, Monitor and Control Panel**



**Material Hoist CCTV and Recording**

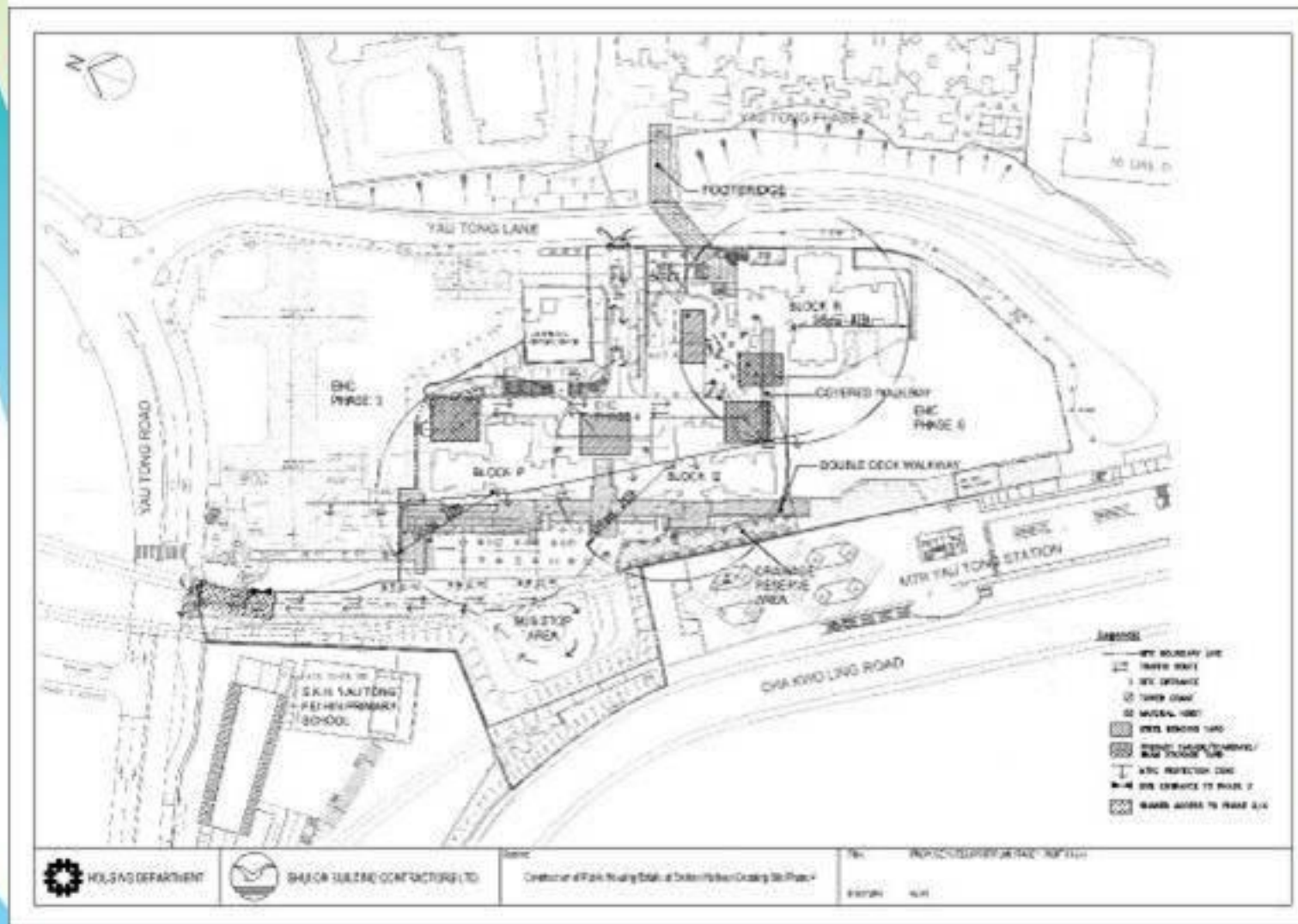


**New Design Double Chain Sling for Lifting of Hopper**

**Traditional Single Chain Sling**



# Crane Handling

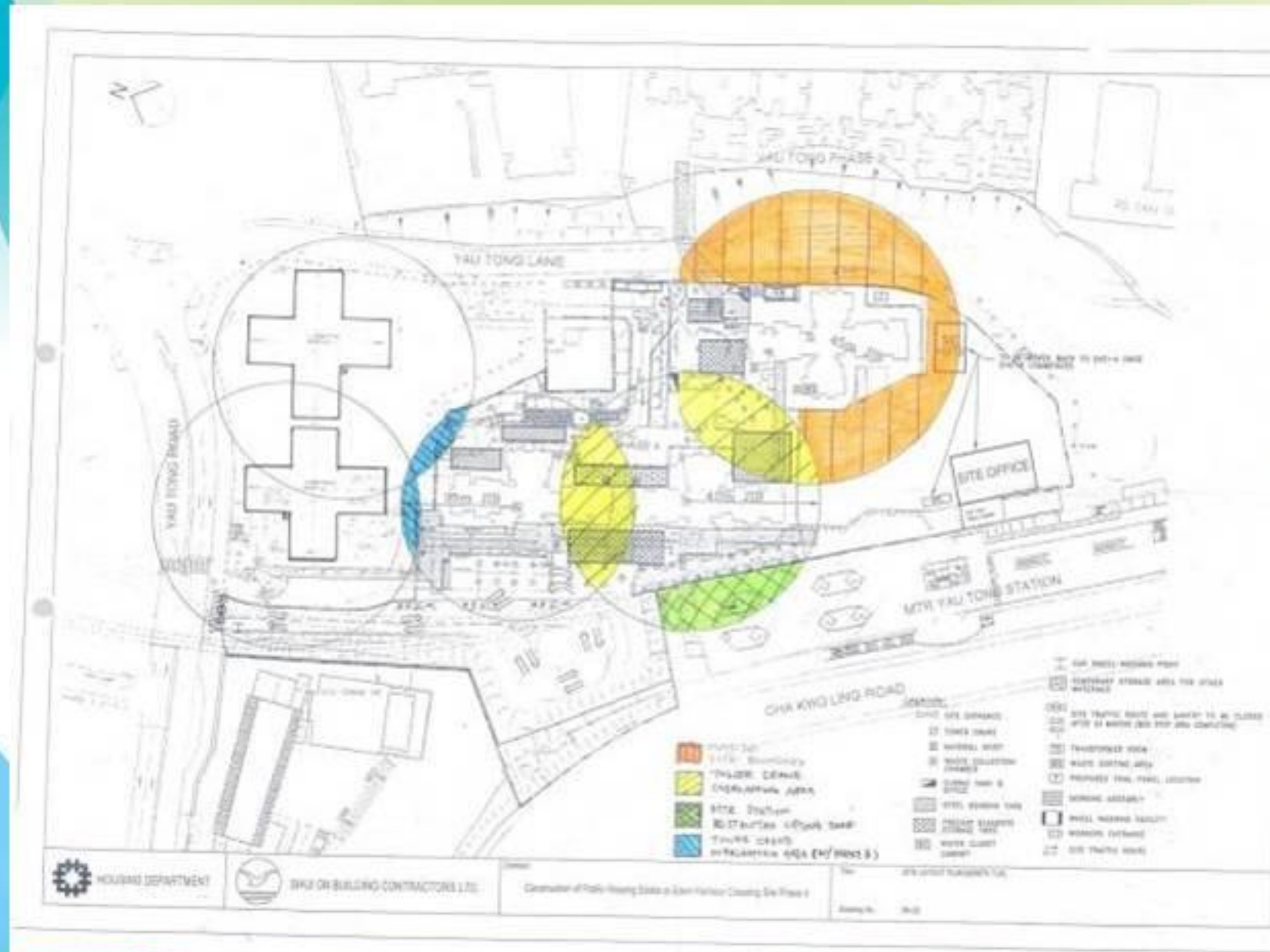


**Lifting Zones are Identified during Site Planning Stage**  
**Max. Required Lifting Weight for the Precast Elements Has Been**  
**Considered in the Selection of Crane System & Jib Length**  
**as Well as in the Location of Tower Cranes**



# Crane Handling

Project Life Cycle



**Overlapping Areas and Sensitive Areas were Identified during Site Planning Stage**

**Anti-collision System were Installed to All Cranes**

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

• Caring • Customer-focused • Committed • Creative



# Crane Handling



**Walkie-talkie is Provided for Signaler**





*Project Life Cycle*

*From cradle to cradle*

*Maintenance*

**Building**

*Management*

*Construction*

**Gondolas**

*Operation*

*Planning & Design for Safety*

*Use*



# Gondola

Project Life Cycle

From cradle to cradle



**Previous Arrangement –  
Two Supports for One Gondola Holding  
down/Fixing to Roof Floor**

Maintenance

Management

Construction



**Current Proposed Design –  
Two Supports for One Gondola Tying to  
Roof Parapet**

Planning & Design for Safety

Use



# Gondola



**A Close-Up View of the Hole for Tying Wire**



# Conclusion

- Safety responsibility does not rest with the workers and site supervisors alone. It would be more effective if the safety DNA be early built in the design and management levels.
- At design levels, if structural components including both permanent and temporary designs are well considered and adequately allowed, it would remove significant safety risks for workers carrying out the construction.



## Conclusion (Cont'd)

- At management levels, if construction methodology and plant and equipment control and housekeeping are well planned and properly managed, the high safety risks to workers operating these systems could be much reduced.





**Thank you**