# HDB CONSTRUCTION AWARD 2012
# HOUSING DEVELOPMENT AT QUEENSTOWN RC 25



集永成建築工程(1988)私人有限公司
CHIP ENG SENG CONTRACTORS (1988) PTE LTD
*(A member of the Chip Eng Seng Group)*

# Presentation Outline
# Sharing Session on the Successful Completion of Queenstown RC25

1. Project Detail
2. Project Considerations
3. Formation of Project Management Team & Structure
4. Environmental Health & Safety Management
5. Technical Contribution / Innovation
6. Project Photographs
7. Q&A

# 1. Project Detail

| | |
|---|---|
| Client | • Housing & Development Board |
| Principal Consultants | • Surbana International Consultants |
| Builder | • Chip Eng Seng Contractors (1988) Pte Ltd |
| Contract Sum | • $187 Million |
| Construction Period | • 16 Feb 2008 to 31 Oct 2011 (45 Months) |

# 1. Project Detail



1. 5 Blocks of 30 / 35 / 40 Storey High Residential Building - Total 1,394 nos. of Dwelling Units
2. 1 Block of 1 storey high Commercial Shop Houses
3. 1 Block of 2- 4 Sty High MSCP with Link bridges / Roof Garden / Fitness Corners / Playground / Hard-court / Education

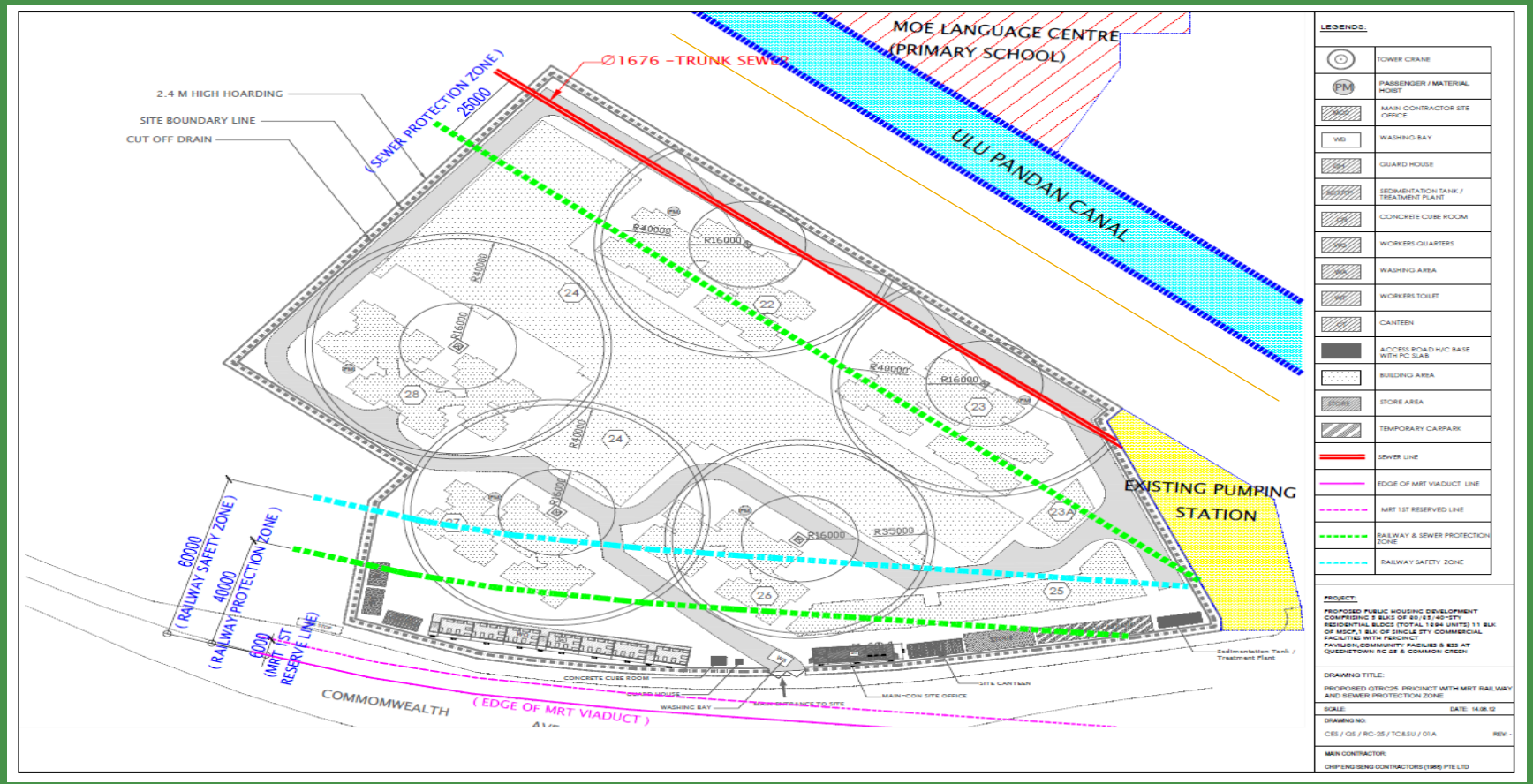
4. Pedestrian Bridge spanning from Ghim Moh Valley to Ghim Moh Link



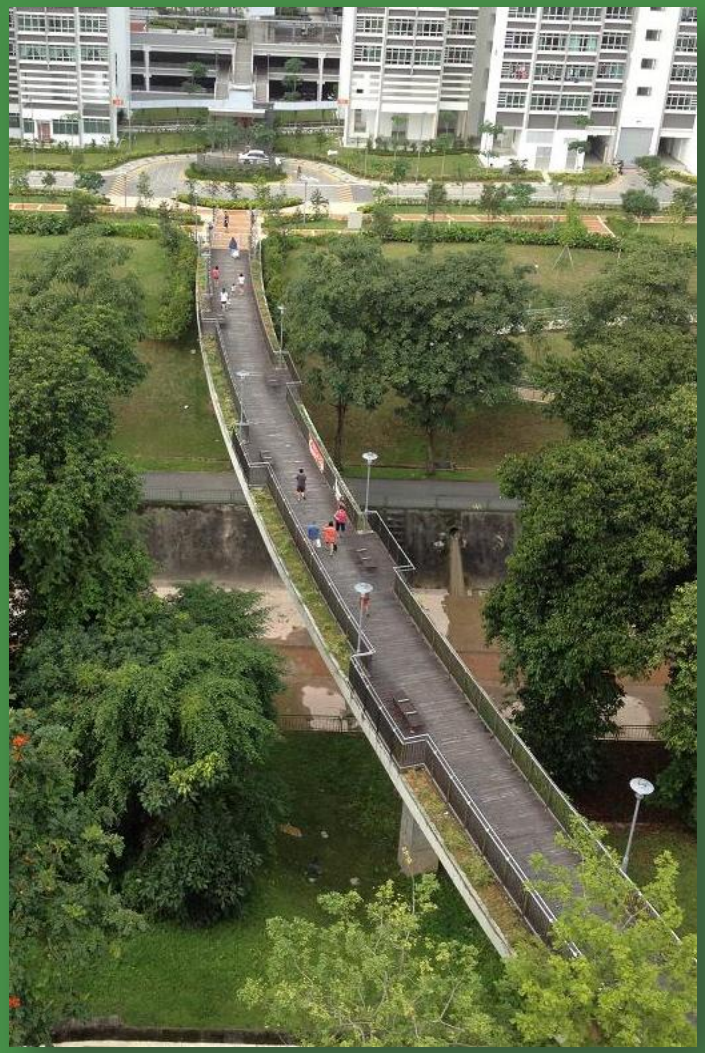
# 2. Project Considerations

5 blocks of building within

1. MRT 2nd & 3rd Railway Protection Zone
2. 1.65m dia PUB Trunk Sewer (Nearby Pumping Station)



# 2. Project Considerations

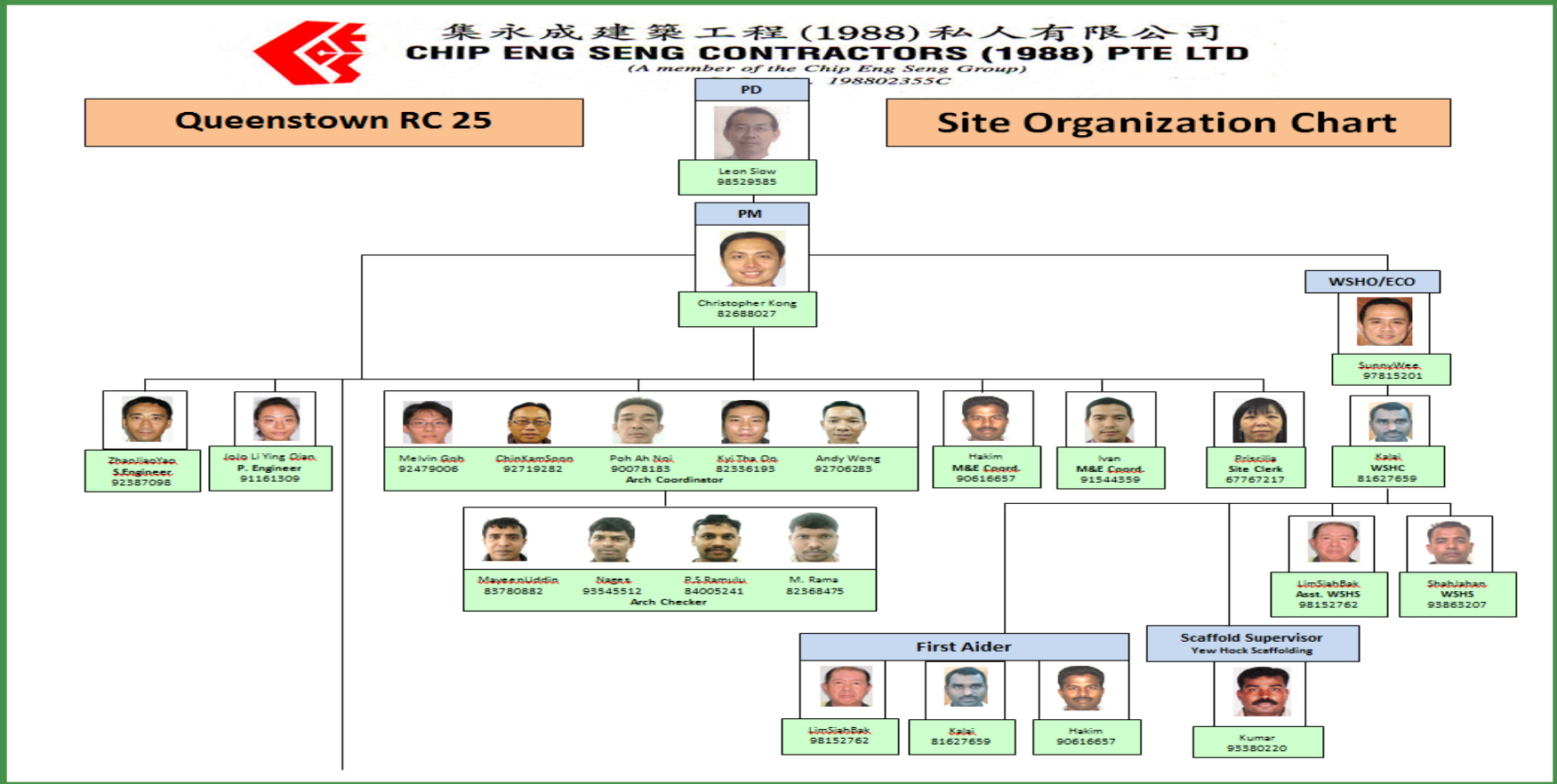


3. Construction of 103m Pedestrian Bridge span across
a. Ulu Pandan Canal
b. Park Connector
c. ϕ 500 Gas Pipe
4. Virgin Forest – Unforeseen underground conditions
5. School & Dover Crescent Neighbourhood



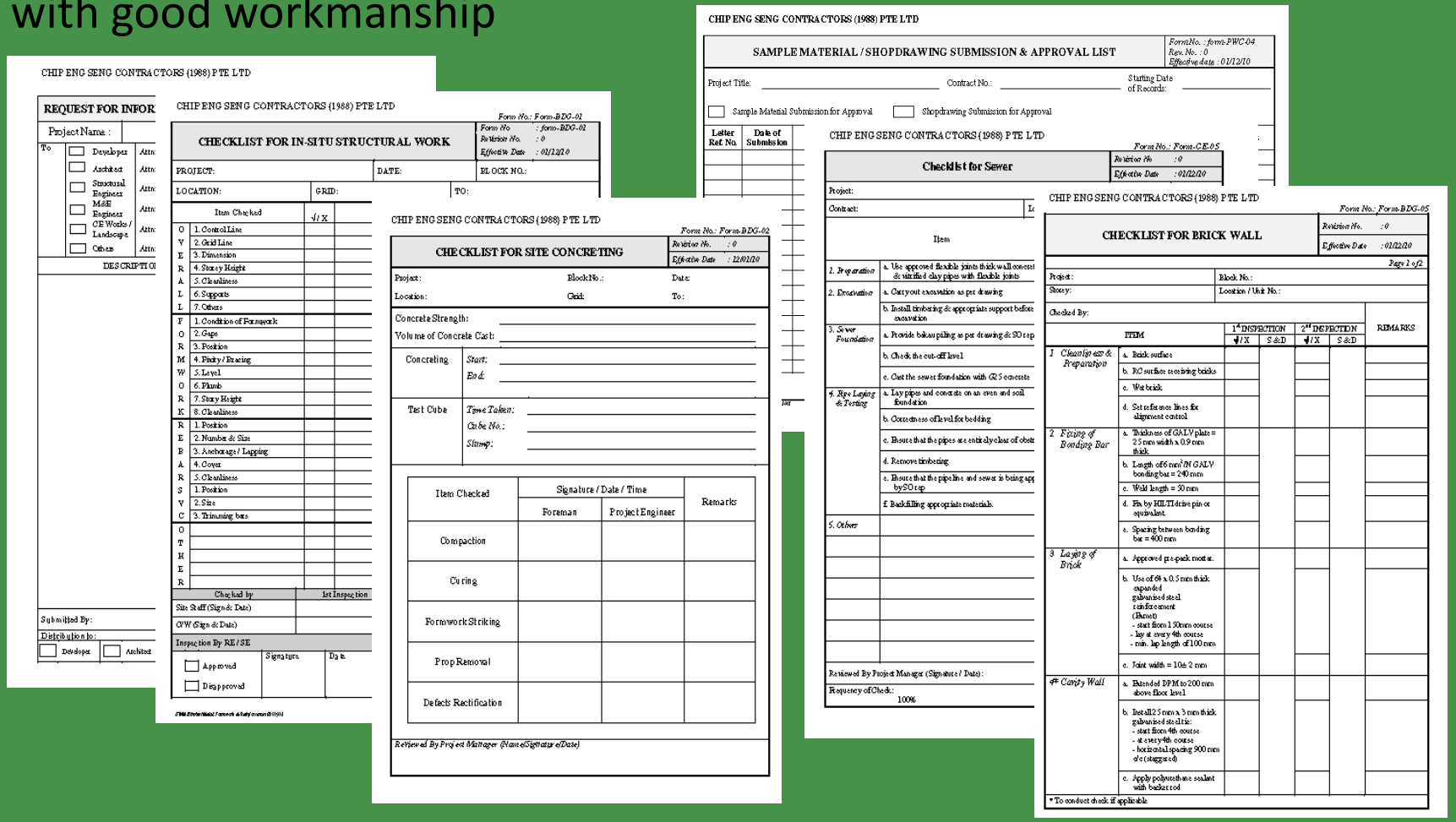
# 3. Formation of Project Management Team & Structure Organization Chart

From start Top Management setup a comprehensive Site Organization Structure headed by five departments mainly Structure / Architectural / M&E and EHS lead by a Project Manager oversee by a Project Director supported by a Corporate EHSQ Team



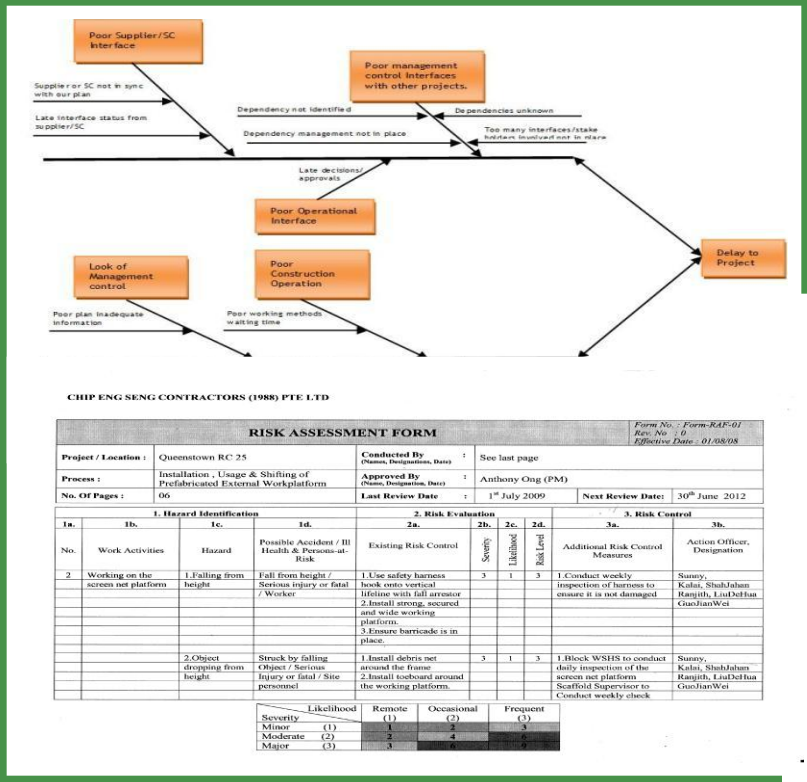
# 3. Formation of Project Management Team & Structure
# Implementation of Corporate ISO System

Strict Implementation of Corporate ISO Standard Procedure in all stages of work with In-Process-Control to ensure correct work sequencing comply to approved work method statement and material to deliver quality products with good workmanship



# 3. Formation of Project Management Team & Structure
# Use of Proven Project Management Tools

Proactively forward planning using extensive proven project management tools/model with regular reviewing of project objectives and goals at each critical stage of work to assess the project team position to refine command and control on all site activities




CHIP ENG SENG CONTRACTORS (1988) PTE LTD

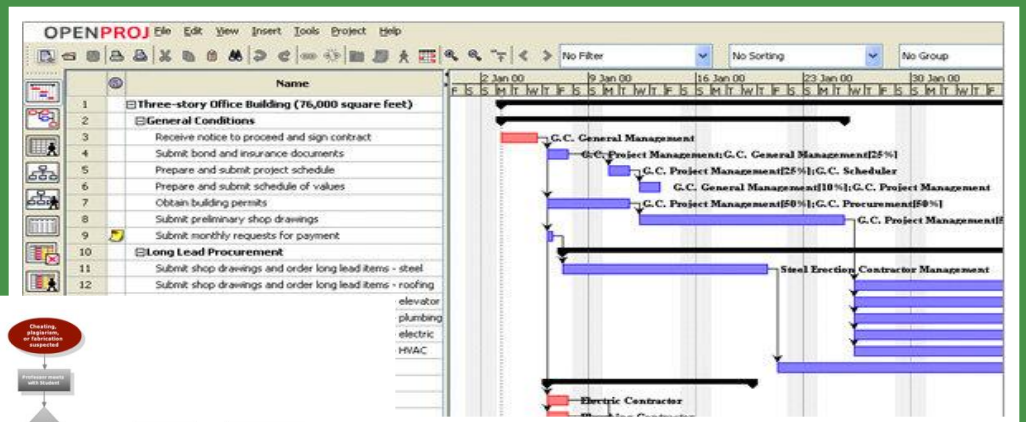
**RISK ASSESSMENT FORM**

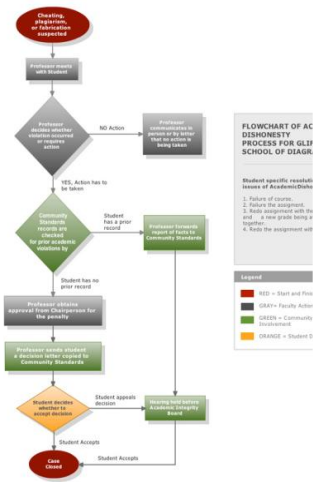
Form No. : Form-RAF-01
Rev. No : 0
Effective Date : 01/08/08

| | | | |
|---|---|---|---|
| **Project / Location :** | Queenstown RC 25 | **Conducted By** (Names, Designations, Date) : | See last page |
| **Process :** | Installation , Usage & Shifting of Prefabricated External Workplatform | **Approved By** (Name, Designation, Date) : | Anthony Ong (PM) |
| **No. Of Pages :** | 06 | **Last Review Date** : 1st July 2009 | **Next Review Date:** 30th June 2012 |

| 1. Hazard Identification | | | | 2. Risk Evaluation | | | | 3. Risk Control | |
|---|---|---|---|---|---|---|---|---|---|
| 1a. No. | 1b. Work Activities | 1c. Hazard | 1d. Possible Accident / Ill Health & Persons-at-Risk | 2a. Existing Risk Control | 2b. Severity | 2c. Likelihood | 2d. Risk Level | 3a. Additional Risk Control Measures | 3b. Action Officer, Designation |
| 2 | Working on the screen net platform | 1.Falling from height | Fall from height / Serious injury or fatal / Worker | 1.Use safety harness hook onto vertical lifeline with fall arrestor 2.Install strong, secured and wide working platform. 3.Ensure barricade is in place. | 3 | 1 | 3 | 1.Conduct weekly inspection of harness to ensure it is not damaged | Sunny, Kalai, ShahJahan Ranjith, LiuDeHua GuoJianWei |
| | | 2.Object dropping from height | Struck by falling Object / Serious Injury or fatal / Site personnel | 1.Install debris net around the frame 2.Install toeboard around the working platform. | 3 | 1 | 3 | 1.Block WSHS to conduct daily inspection of the screen net platform Scaffold Supervisor to Conduct weekly check | Sunny, Kalai, ShahJahan GuoJianWei |

| Severity \ Likelihood | Remote (1) | Occasional (2) | Frequent (3) |
|---|---|---|---|
| Minor (1) | 1 | 2 | 3 |
| Moderate (2) | 2 | 4 | 6 |
| Major (3) | 3 | 6 | 9 |





# 3. Formation of Project Management Team & Structure Close Collaboration with all Stakeholders

Good collaboration with Client's Rep, Consultant Teams and various inter-disciplines sub-contractors and supplier enabled early confirmation of technical issue bring forth smooth work progress minimizes works disruption/reworking










# 3. Formation of Project Management Team & Structure
# Close Collaboration with all Stakeholders

Regular Top Management and Consultant Field Inspection



# 3. Formation of Project Management Team & Structure Close Collaboration with all Stakeholders

Site deployed 95% of Biz-Safe Sub-contractors / Suppliers with competent workers have help to cut down EHS learning curve, reduce down times and aid productivity



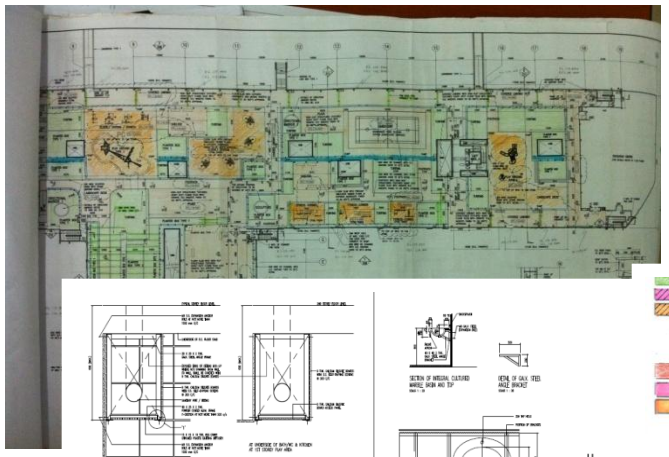


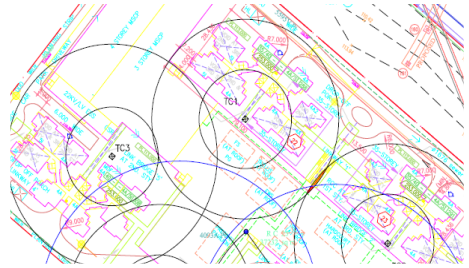


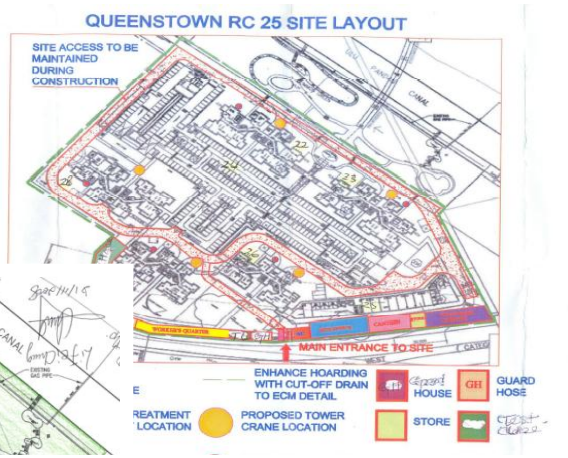


# 3. Formation of Project Management Team & Structure Close Collaboration with all Stakeholders

Early study of layout plans and technical drawings enable forward planning and lead time for technical clarifications

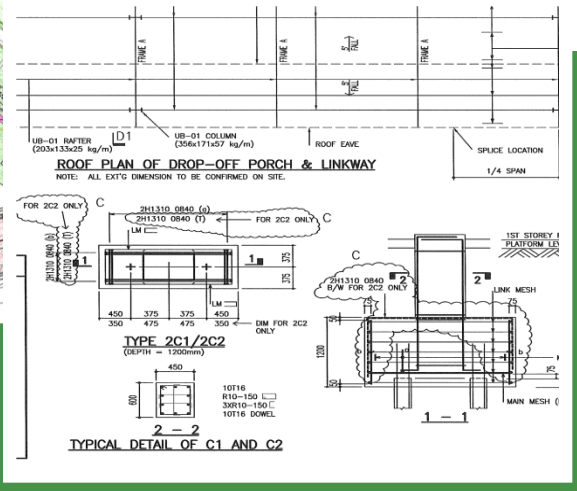


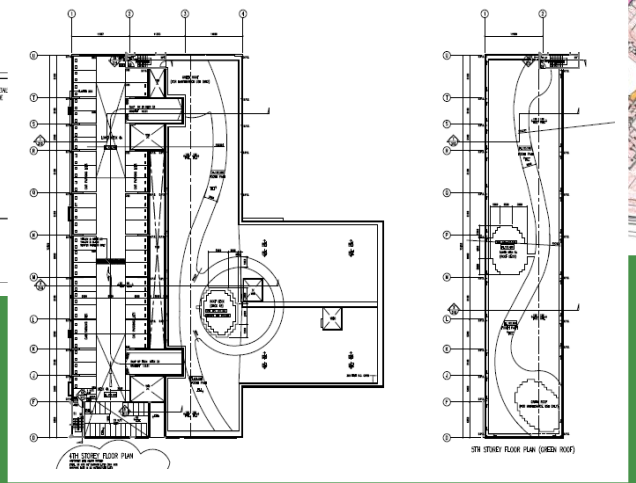






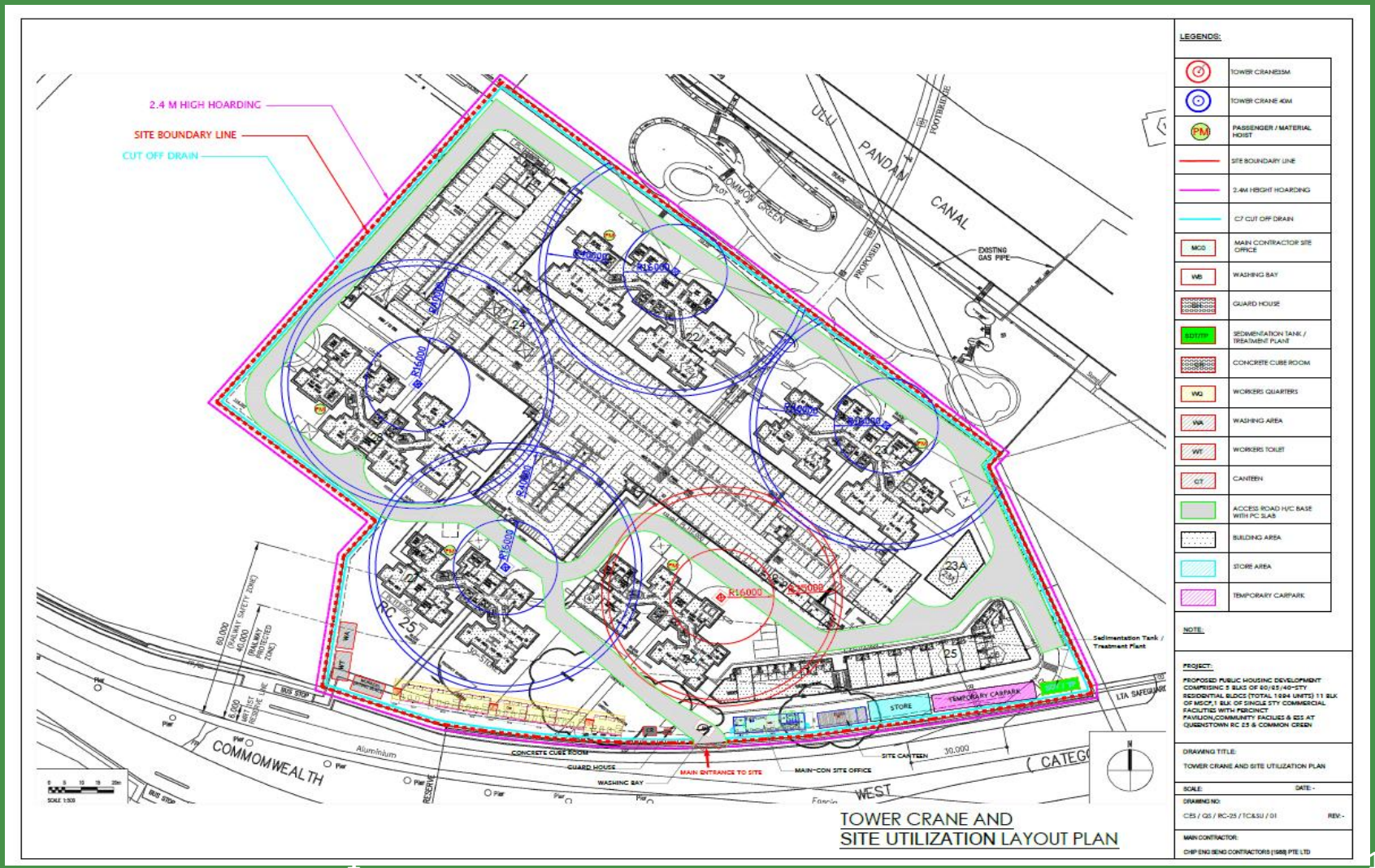


# 3. Formation Project Management Team & Structure
# Close Collaboration with all Stakeholders

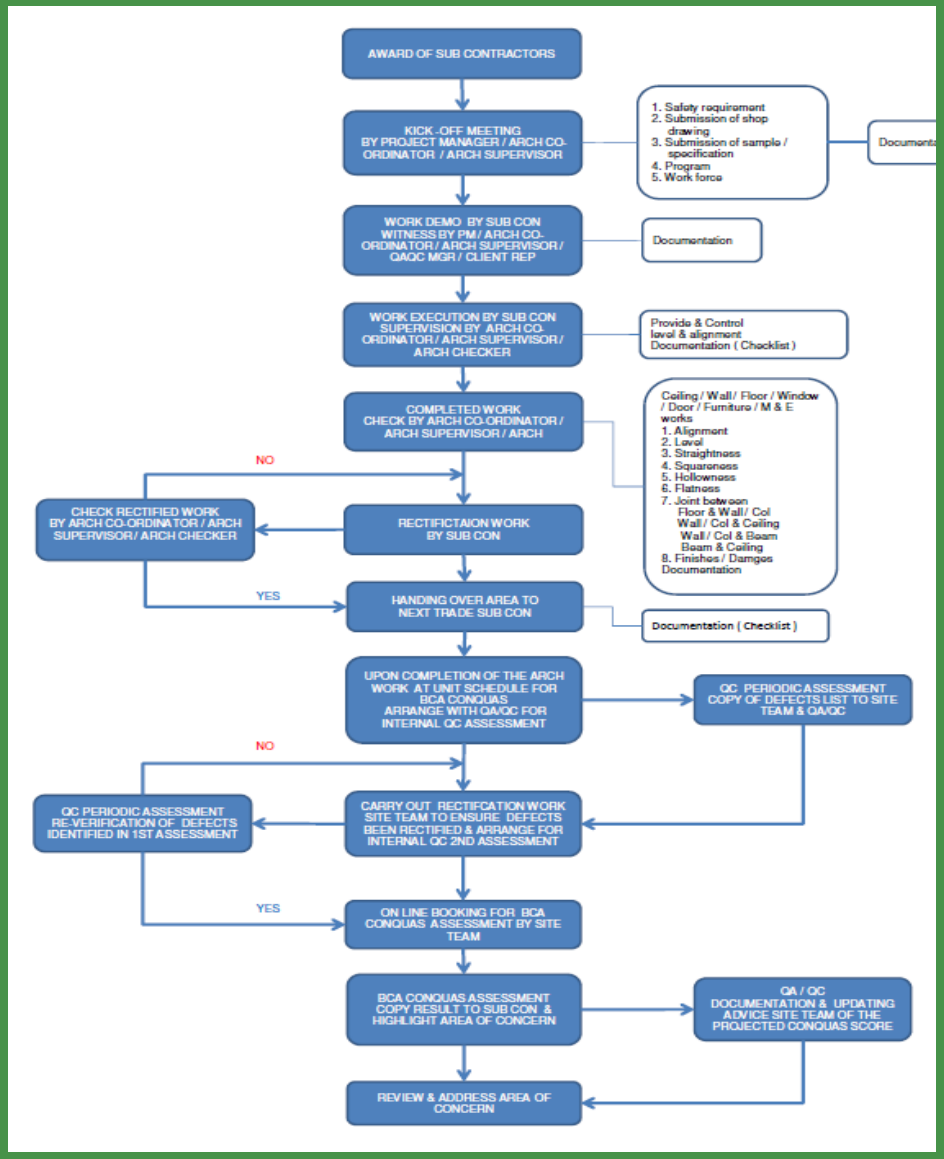
Optimized site utilization to maximize resource management



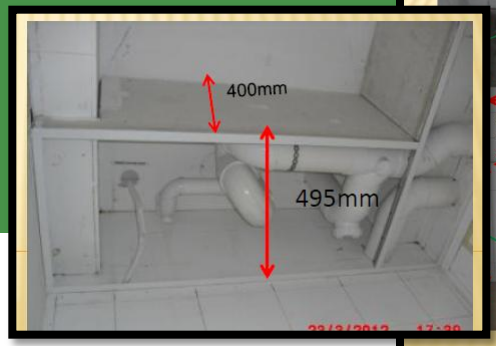
# 3. Formation Project Management Team & Structure Productivity & Quality Control

## QUALITY CONTROL

- Deployment of trained and competent site staff to lead and coordinate every stages of work complying to approved Work Method Statement and
- Use of Approved Material tally with technical spec and data evaluate by competent staff
- Strictly follow the consultant's specification, approved method statements & in-house SWM
- In Process Performance tests / mockups were conducted prior to the architectural works
- Done data analysis to achieve CONQUAS score
- Set KPI for Conquas and BIT inspections by HDB

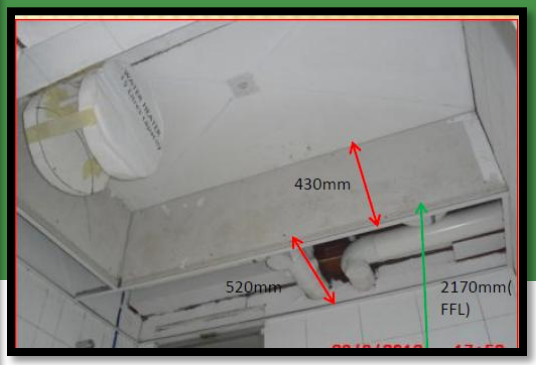


# 3. Formation Project Management Team & Structure
# Productivity & Quality Control – Erections of Mock Ups



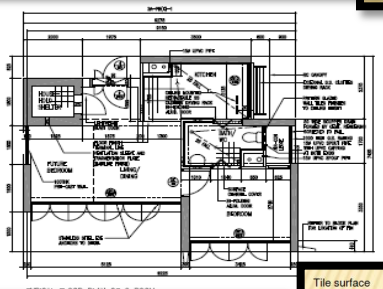


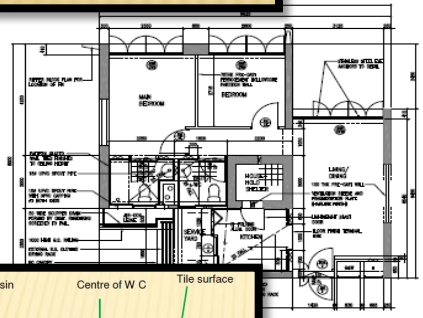


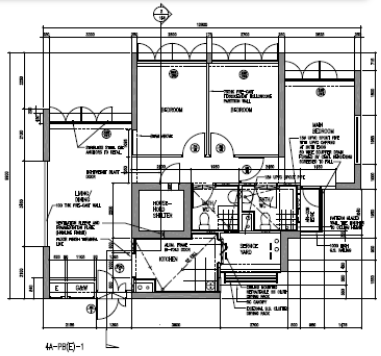


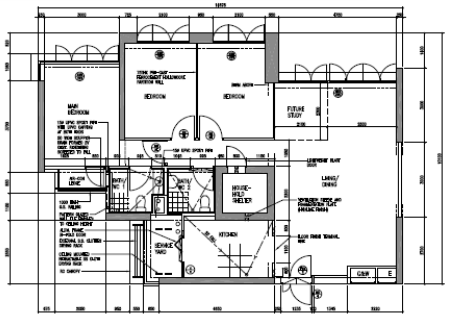










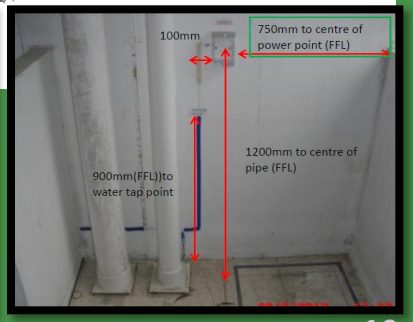










# 3. Formation Project Management Team & Structure Productivity & Quality Control – Trade Demos

Step by step trade demo to ensure workers understand the sequence and process are in line with approved method statement and technical spec



# 3. Formation Project Management Team & Structure
# Productivity & Quality Control – Trade Demos






# 3. Formation Project Management Team & Structure Productivity & Quality Control – Mechanization

Enhanced Productivity Through Mechanization :

a. Heavy Duty Tower Crane
b. Scissor lifts & Boom lifts
c. Mechanized Platforms
d. Movable Gantry Crane
e. Bobcat Sweepers
f. Heavy Duty forklifts
g. Mini forklifts
h. Concrete Pumps
i. HD Twin Cage Material Hoist
j. Solar Panel use in Real time noise and ECM monitoring
















# 3. Formation Project Management Team & Structure Productivity & Quality Control – Methodology

Methodology / Work Process

1. Use of Integrated Safety Screen c/w Safety Working Platforms.
2. Dove-tailing Pre-Cast Component and use of latest survey equipment such as Laser guided survey equipment for better constructively in alignment and level control to deliver quality work










# 3. Formation Project Management Team & Structure Productivity & Quality Control – Resource Maximization

1. MATERIALS

a. Use of 100% Pre-packed Materials for screeding, plastering, rendering etc

b. Use of Timber Look-liked concrete products

c. Use of Lightweight Wall Panels for internal partition wall

2. MANPOWER

Continuing training to improve employees and workers to enhance their work competency, job motivation, work skills and job knowledge





# 3. Formation Project Management Team & Structure Productivity & Quality Control – Performance Test

In-house performance test for:

1. Water-Ponding Test
2. Pull-out Test
3. Window Water-Tightness Test







# 3. Formation Project Management Team & Structure
# Productivity & Quality Control – Performance Test





Ultra Pulse Velocity(UPV) Test

This is a self-test to ensure the consistency of the concrete quality and compliance to concrete specification



# 3. Formation Project Management Team & Structure
## Productivity & Quality Control
## - Use of Survey Equipment





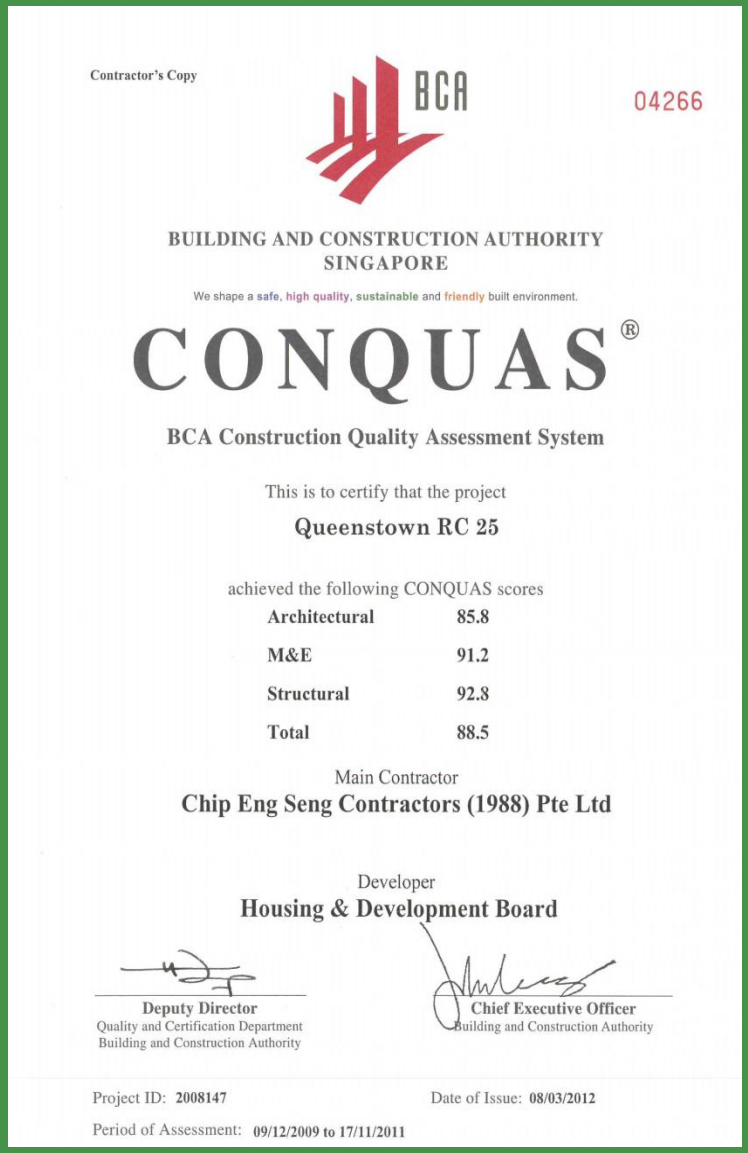


Extensive use of various of survey equipment for accuracy in setting out and levels to minimize reworking and double handling

# 3. Formation Project Management Team & Structure Productivity & Quality Control – Achievement

CONQUAS Score

Overall CONQUAS Score :88.5



Contractor's Copy

04266

BUILDING AND CONSTRUCTION AUTHORITY
SINGAPORE

We shape a safe, high quality, sustainable and friendly built environment.

CONQUAS®

BCA Construction Quality Assessment System

This is to certify that the project

Queenstown RC 25

achieved the following CONQUAS scores

| | |
|---|---|
| Architectural | 85.8 |
| M&E | 91.2 |
| Structural | 92.8 |
| Total | 88.5 |

Main Contractor

Chip Eng Seng Contractors (1988) Pte Ltd

Developer

Housing & Development Board

Deputy Director
Quality and Certification Department
Building and Construction Authority

Chief Executive Officer
Building and Construction Authority

Project ID: 2008147

Date of Issue: 08/03/2012

Period of Assessment: 09/12/2009 to 17/11/2011

# 4. Environmental Health & Safety Management
## Top Management Participation

Top Management Participation and Involvement in all WSH Promotional Activities to recognize and spur the site team motivation to continue to upkeep the site environmental, health and safety KPIs and awareness at all times









# 4. Environmental Health & Safety Management
## Top Management Participation

On top of the site daily and weekly EHS regime & inspection. Top management have implemented a independent fortnight Corporate EHS Inspections and quarterly Consass Audit to ensure all current work activities meet the authorities requirement and corporate EHS standard and procedure





# 4. Environmental Health & Safety Management
## Cohesive Teamwork

Monitor through Operational Control Procedures, EHS Management Programme and Safety Management System





# 4. Environmental Health & Safety Management
## Cohesive Teamwork

Conduct of regular mass housekeeping involving all stakeholders to harness site EHS awareness and promote teamwork








# 4. Environmental Health & Safety Management
## KPI on Waste Control & Management

KPIs are developed to monitor Waste Controls, Water Consumption, Energy Cost, Noise Complaints and Compliance Regulations.








# 4. Environmental Health & Safety Management
## KPI on Waste Control & Management

Different types of waste segregated by categories such as General, Soil, Hardcore, Steel Scrap & Organic to enable recycling of resources





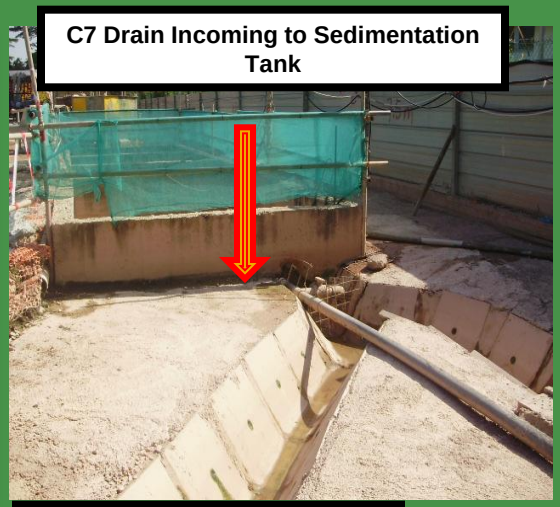

# 4. Environmental Health & Safety Management
# KPI on Waste Control & Management

## ECM / Treatment Plant and Recycled of treated water


















# 4. Environmental Health & Safety Management
## KPI on Waste Control & Management

**Use Soil Erosion Mat for slope protection to prevent soil erosions**




**Regular spraying of recycled water to control/minimize environmental dust pollution**



# 4. Environmental Health & Safety Management
## Public Relation

Additional shelter built to protect the public from dust pollution while waiting at the bus stop. (*Contractor's initiative*)





# 4. Environmental Health & Safety Management
## Public Relation

Extensive use of warning signs to warn motorists and pedestrians at Main Site Entrance and works along the perimeter hoarding



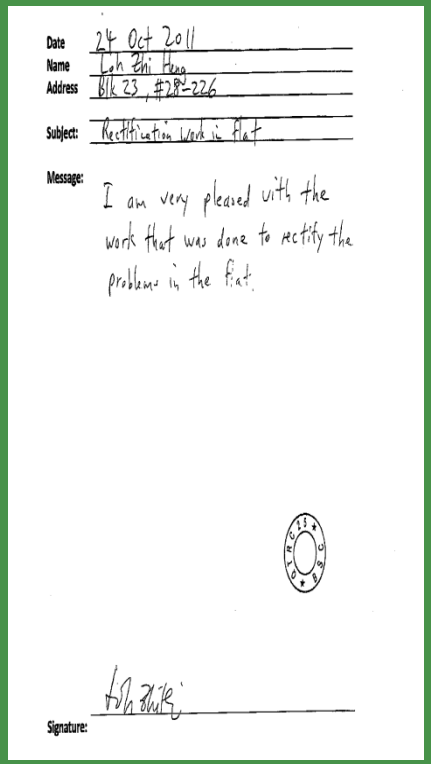




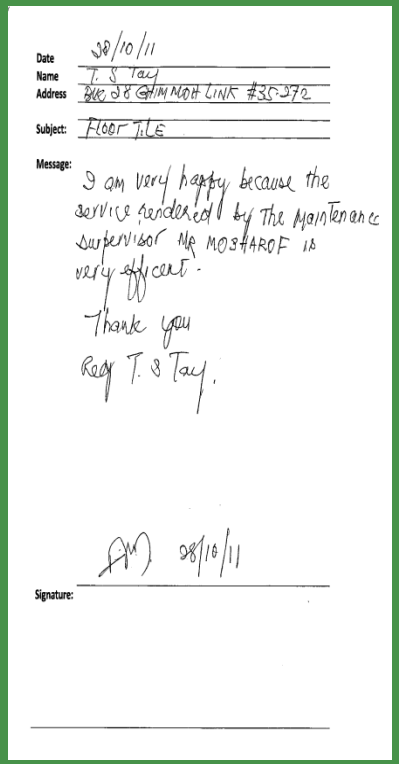

# 4. Environmental Health & Safety Management
## Public Relation

Maintain constant communication and updates to neighboring school and residents of construction activities as well as to gather feedbacks from them for continual improvement.

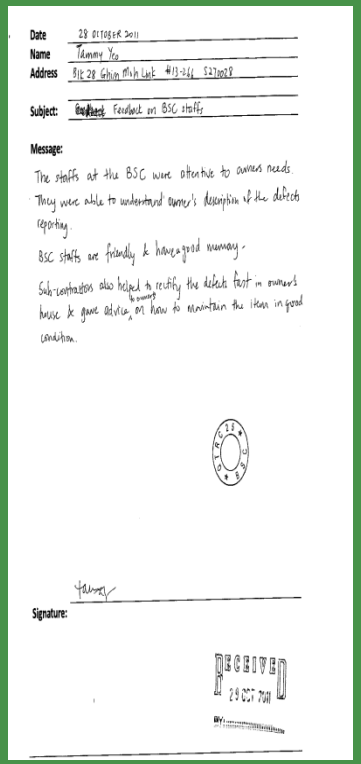




Date 24 Oct 2011
Name Loh Zhi Heng
Address Blk 23, #28-226
Subject: Rectification Work in Flat
Message: I am very pleased with the work that was done to rectify the problems in the flat.
Signature:



Date 28/10/11
Name T. S Tay
Address Blk 28 GHIM MOH LINK #35-272
Subject: FLOOR TILE
Message: I am very happy because the service rendered by the Maintenance supervisor Mr MOSHAROF is very efficent.
Thank you
Reg T. S Tay.
Signature: 28/10/11



Date 28 OCTOBER 2011
Name Tammy Yeo
Address Blk 28 Ghim Moh Link #13-266 S270028
Subject: Feedback on BSC staffs
Message: The staffs at the BSC were attentive to owners needs. They were able to understand owner's description of the defects reporting.
BSC staffs are friendly & have a good memory.
Sub-contractors also helped to rectify the defects fast in owner's house & gave advice to owners on how to maintain the item in good condition.
Signature:
RECEIVED 29 OCT 2011

Regular neighborhood visit to gather feedback for continual improvement

Appreciation letters

# 4. Environmental Health & Safety Management
## Public Relation

Feedback from Occupants on Standard of Workmanship & Response to Complaints

Most occupants defect rectifications attended by Contractor's Public Relation Officers were completed within 3 to 7 days on lodgement to Building Services Centre. This effective and direct mode of personal communication between occupant and Contractor's PRO have therefore received many positive feedbacks. (*See below Table*)

**Building Service Centre**

Survey forms responded till end Apr 2012

Nos. of service survey forms responded / No. of service survey forms handed to lessees after the repair work completed = 254/372

| Queenstown RC25 | Very Satisfied | Satisfied | Not Satisfied | Very Dissatisfied |
|---|---|---|---|---|
| Efficient (Response) | 80.3% | 19.7% | 0% | 0% |
| Knowledge | 79.5% | 20.5% | 0% | 0% |
| Helpfulness | 76.8% | 23.2% | 0% | 0% |
| Efficient (Repair) | 78.8% | 21.2% | 0% | 0% |
| Quality (Repair) | 78.7% | 21.3% | 0% | 0% |

Report last amended on 30th Apr 2012 at 7.00PM

# 4. Environmental Health & Safety Management Achievement

Cohesive EHS teamwork and culture enable Contractor to conferred with the following achievements:

1. Winner of MOM WSH Sharp Award 2011
2. Nominated 2X for MOM WSH Sharp Award for 2010 & 2011
3. Runner up in the company organize competition in Best EHS managed site.
4. Achieved 2 million accident free man-hour.










# 5. Technical Contribution and Innovation

Use of spiral connectors



# 5. Technical Contribution and Innovation

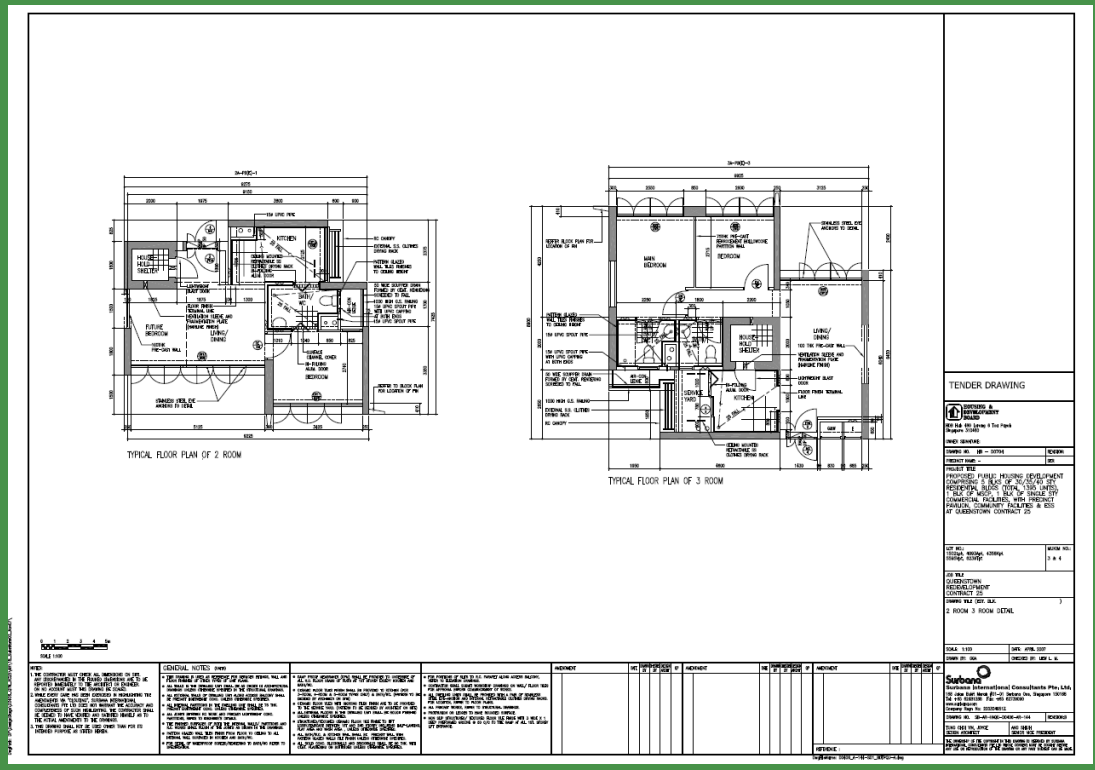
1. Implement Barrier Free Accessibility to DUs Toilet
2. Use of non Cementitious Waterproof Membrane

19,3 WATERPROOFING MEMBRANE AT BATHROOM/TOILET, KITCHEN AND SERVICE YARD (CONT'D)

19,3,2 Specification Of The Waterproofing Membrane

The flexible non-cementitious (water-based) waterproof membrane or other approved water-based waterproofing membrane shall comply with the following performance/product specifications when subjected to the specified laboratory testing:

| Characteristics/Properties | Testing Method | Specifications |
|---|---|---|
| 1) Verification of base polymer | FTIR, DTA and TGA | Polymer which undergoes hydrolysis should not be used |
| 2) Volatile content | TGA | < 50% |
| 3) Resistance to water penetration 0.2 Kg/cm² for 12 hrs (3 specimens are to be cured for 3 days) Observe : Depth of penetration (mm) | DIN 1048, Pt 5: 1991 (HDB METHOD) | Depth of penetration should be 0 |
| 4) Adhesion to substrate (after 3-day cure) ($N/mm^2$) condition as at cast water immersion | ASTM D4541:93 | ≥ 0.2 $N/mm^2$ |
| 5) Tensile strength ($N/mm^2$) after 3-day cure - Before aging | ASTM D412 : 98a | ≥ 1.2 $N/mm^2$ |
| - After aging at 50°C, 14 days - Change in tensile strength (%) After immersion in the following chemicals for 72 hrs. at room temp: a) 0.5% (v/v) NaOCl Change in tensile strength (%) b) 1.25% (v/v) NH4OH Change in tensile strength (%) c) 3.70% (v/v) HCl Change in tensile strength (%) | | Value ≥ 1.0 N/mm2 & -ve change ≤ 20% no limit for +ve change |
| 6) Elongation at Break (%) after 3-day cure - Before Aging | ASTM D412 : 98a | ≥ 150% |
| - After Aging at 50°C, 14 days Change in Tensile Strength (%) - After immersion in the following chemicals for 72hrs at room temp: a) 0.5% (v/v) NaOCl Change in Elongation at break (%) b) 1.25%(v/v) $NH_4OH$ Change in Elongation at break (%) c) 3.7% (v/v) HCl Change in Elongation at break (%) | | Value ≥120 % and -ve change ≤ 20% no limit for +ve change |



# 5. Technical Contribution and Innovation
## Alternative Designs & Products

Pilot Project using concrete look-alike timber strip achieving equivalent if not better sustainability material over timber in long term.

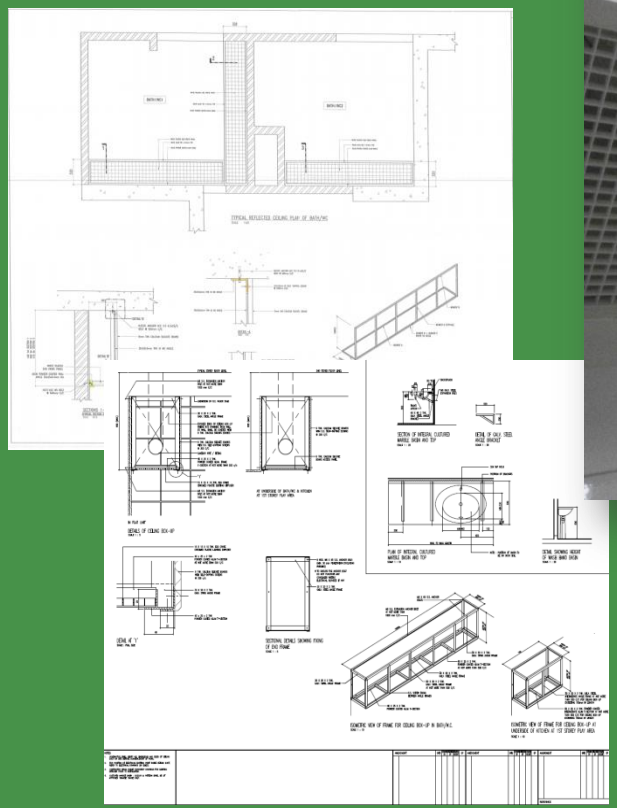


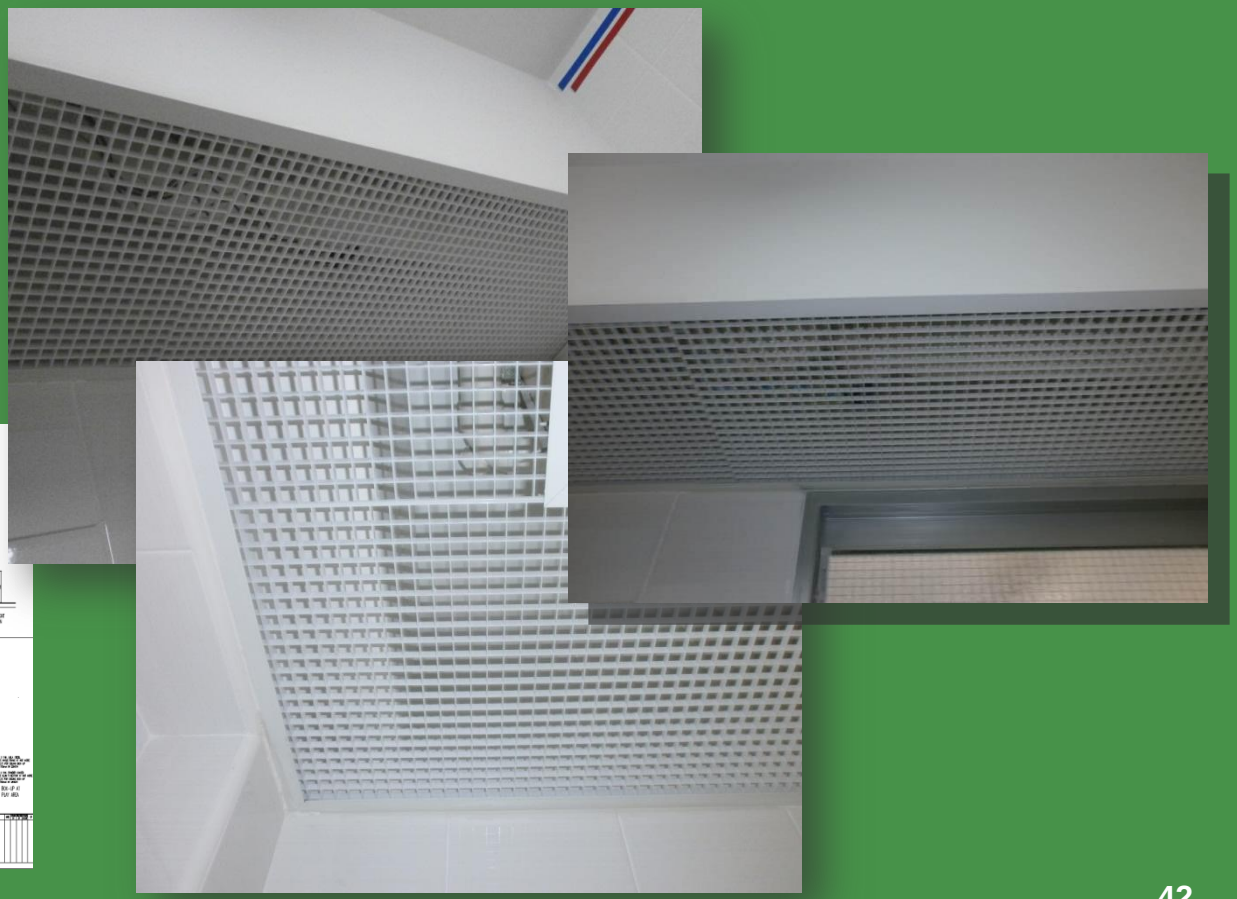


# 5. Technical Contribution and Innovation
## Alternative Designs & Products

Pilot Project using Simplified Ceiling Boxed-up

1. Simplified boxing up details
2. Cheaper and equally robust, saves time and cost
3. Easier installation

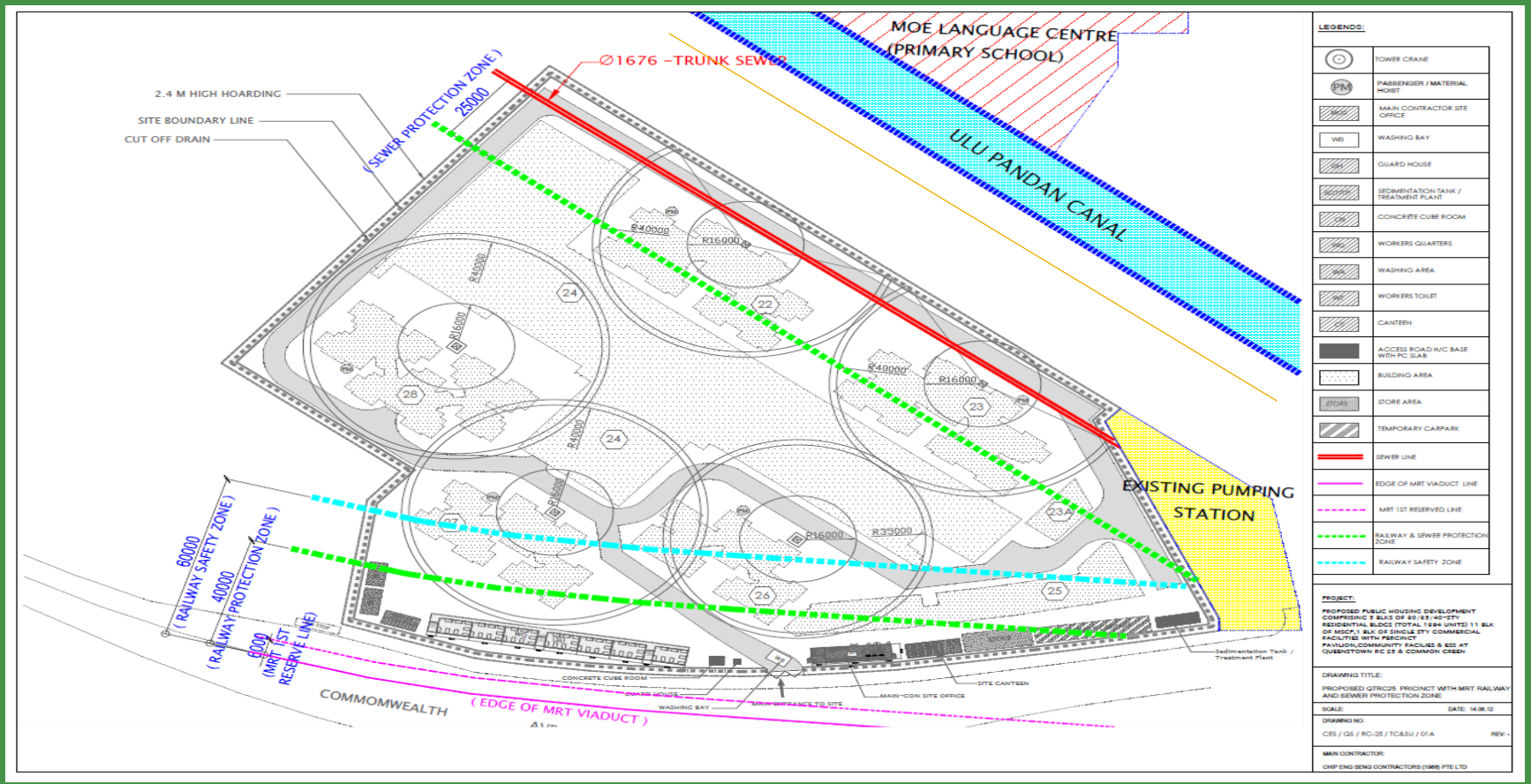




# 5. Technical Contribution and Innovation
## Constraints & Complexity

a. MRT 2nd & 3rd Railway Protection Zone

b. 1.65m dia PUB Trunk Sewer (Nearby Pumping Station)



# 5. Technical Contribution and Innovation Constraints & Complexity

1. Pre condition survey of the existing deep sewer and MRT structure to established the baseline condition of the structure and utilize the data for detail planning.
2. Advance planning design consideration in all foundation works, excavation works, sub-structure works with close monitoring through intense tracking. Daily feedback and interpretation analysis of instruments results.
3. Effective measure enable to eliminate work hiccups and communication with all stakeholders for the project methods and interpretations.

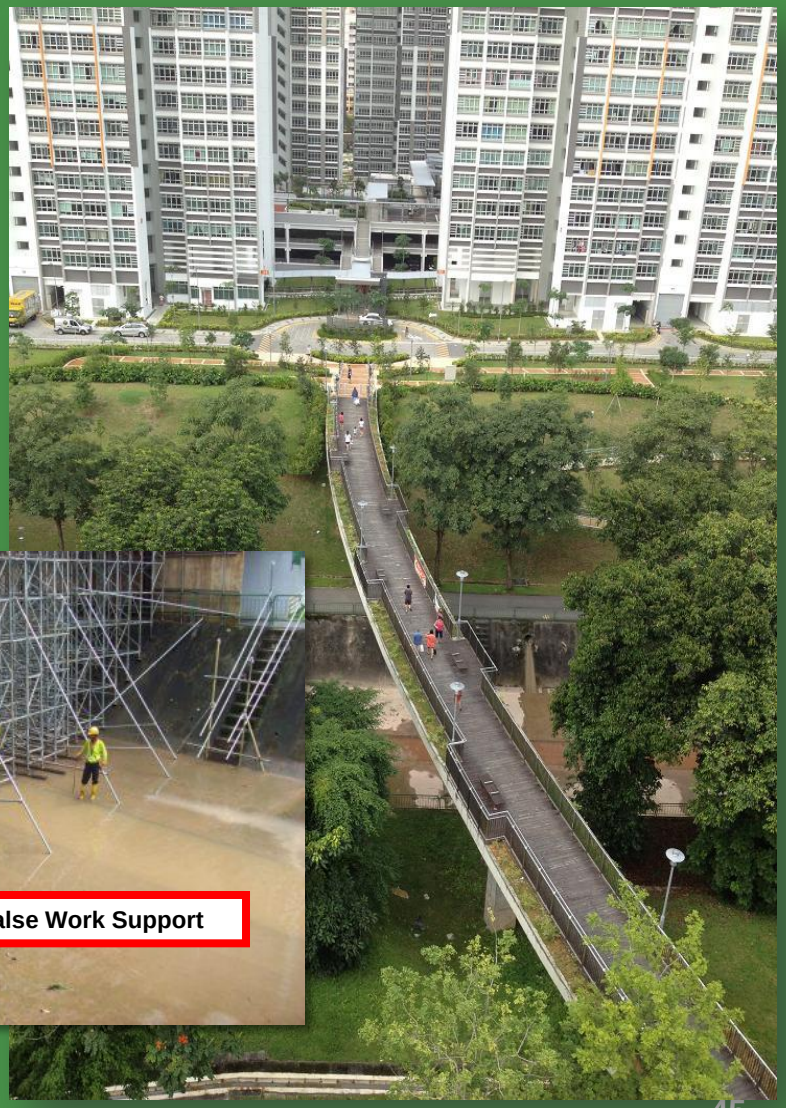







# 5. Technical Contribution and Innovation
## Constraints & Complexity

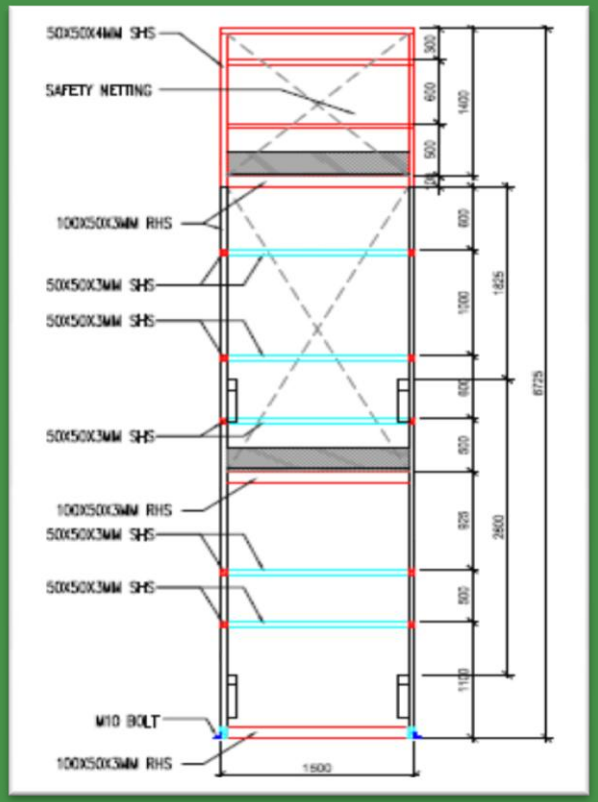
4. Site constraints pose a major challenge to construct the 103m pedestrian bridge in precast. Together the contractor and consultants work with relevant authorities and overcome by converting it to cast in situ





# 5. Technical Contribution and Innovation
# Constraints & Complexity

5. To maintain and enhance site access serving to all blocks, contractor implemented Integrated Safety Screen with working platform to minimize safety hazards and to increase the quality and productivity.











# 5. Technical Contribution and Innovation Constraints & Complexity

6. More than 100 types of precast components with total area of 50,000m2

- Contractor refined precast components coordination in production and delivery through ;
  - Clear classification into respective block
  - Clear classification into type
  - Daily updating and monitoring with the respective suppliers.
  - Using different color codes to assigned delivery

This had enhanced excellent productivity with minimum down time.

# 5. Technical Contribution and Innovation Constraints & Complexity

7. Working with NGO (Nature Society Singapore) lobbying to conserve the existing 40-years old natural habitat to support the endangered 12 bird species as their nesting habitat.

**Petition to Save the Sg Ulu Pandan Woodland**

(Posted 18 February 2008)

A petition to save the Sg Ulu Pandan Woodland has been submitted in February (2008) by a group of extremely concerned residents from the housing estates in the area. A total of 1330 signatures were collected. 1075 come from residents in the housing estates around the Woodland (Clementi, Mt. Sinai, Holland Road, Dover, Sunset Way, Ghim Moh, etc.) as well as recreational users of the Ulu Pandan Park Connector. The Petition campaign took about 6 weeks and the support obtained from the residents around the Woodland is pretty impressive --- an on the ground campaign over such a short haul. Like the case of the residents at Zehnder Road for a similar woodland, this action-oriented manifestation of the community support for the saving of our remaining natural greenery should be taken seriously to heart by our decision-makers and land-use planners --- as a strong indication of the surging groundswell for a more concrete commitment to green causes like nature conservation and the protection of our remaining woodlands and forests as green lungs and carbon sinks. "



# 5. Technical Contribution and Innovation
## Constraints & Complexity

7. Gradual removal of trees in stages( in consultation with NGO) to allow the endangered birds species time for migration to new nesting



# 6. PROJECT PHOTOGRAPHS












# 6. PROJECT PHOTOGRAPHS









# 6. PROJECT PHOTOGRAPHS







# 6. PROJECT PHOTOGRAPHS










# 5. PROJECT PHOTOGRAPHS









# 6. PROJECT PHOTOGRAPHS







# 6. PROJECT PHOTOGRAPHS











# Thank You

***QUESTIONS AND ANSWERS***