Contract No. DC/2013/09

Advance Works for Shek Wu Hui Sewage Treatment Works – Further Expansion Phase 1A and Sewerage Works at Ping Che Road

Design, Construction and the Enhanced Safety Measures for Metal Scaffolding

12 June 2017

Presented by :
MR. WONG CHUN HONG, KEN
Site Agent
Tsun Yip Waterworks Construction Co. Ltd.

TSUN YIP
WATERWORKS CONSTRUCTION COMPANY LTD

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- Project background on DC/2013/09
- General Guideline and Code of Practice of metal scaffolding
- Design Consideration of Metal Scaffolding
- Construction Arrangement of Metal Scaffolding
- Enhanced Safety Measures and Awareness during Inspection of Metal Scaffolding

Project Background

DC/2013/09

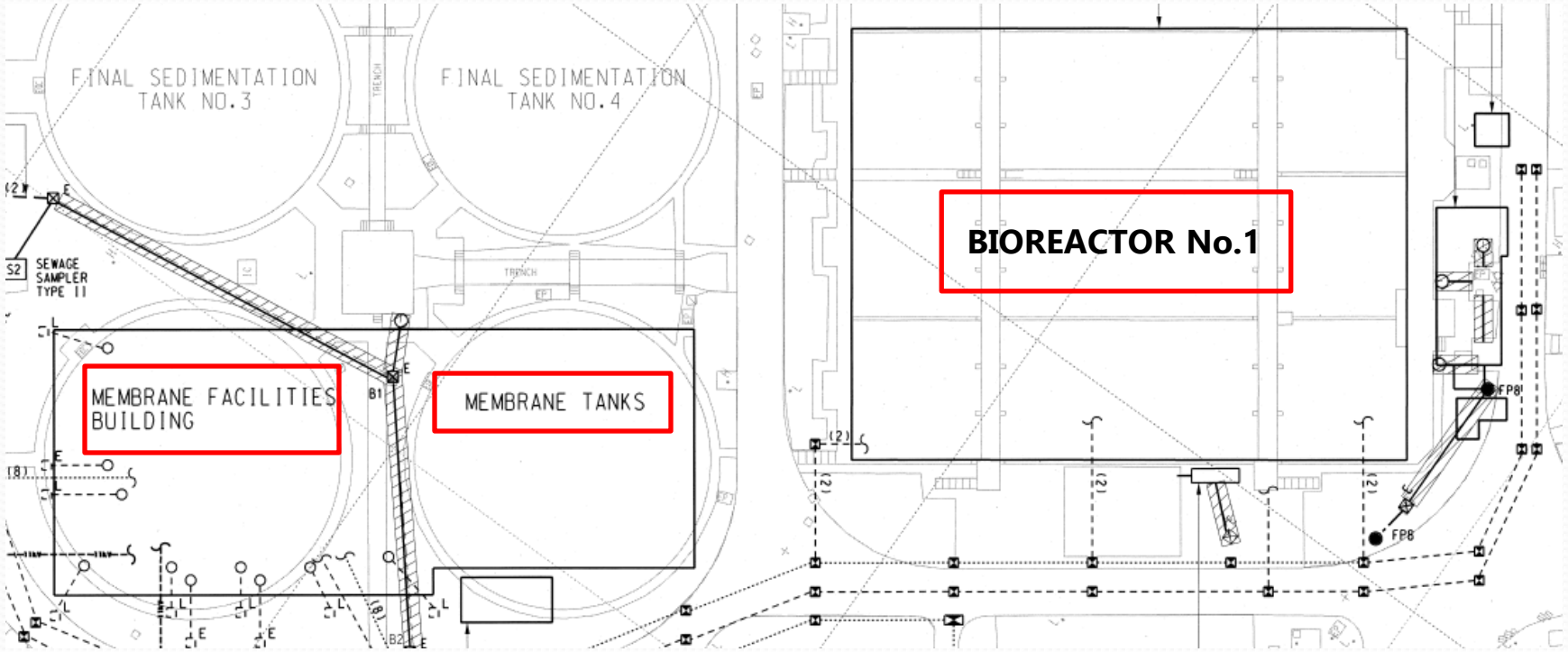
- Traditional GCC Contract
- Contractor: Tsun Yip Waterworks Construction Co. Ltd.
  進業水務建築有限公司
- Designer and Employer: Drainage Services Department
- Commencement Date: 21 July 2015
- Contract Sum: HK$156M
- Advance Works for SWHSTW Further Expansion Phase 1A
  - Conversion of one existing bioreactor to membrane bioreactor (MBR) for increasing capacity by 20,000m^3/day
- Ping Che Road Sewerage
  - Construction of 1.5km rising main of 200mm diameter at Ping Che Road

Existing Layout of SWHSTW

Bird View of Membrane Facilities Building under Construction

Advance Works

- Modification of existing Bioreactor BR1
- Demolition of two existing Final Sedimentation Tanks Nos. 1 & 2
- Construction of Membrane Facilities Building (MFB) & Membrane Tanks (MT)
- Pipeworks, roadworks, cable trench and drawpits, ancillary structures



Membrane Facilities Building – External View

Membrane Facilities Building – Internal View

Construction of MFB

Demolition of Existing FST

Piling Works

Excavation of Basement

Blinding Layer for Pile Cap

Bar Fixing for Basement

Falsework Erection at Basement

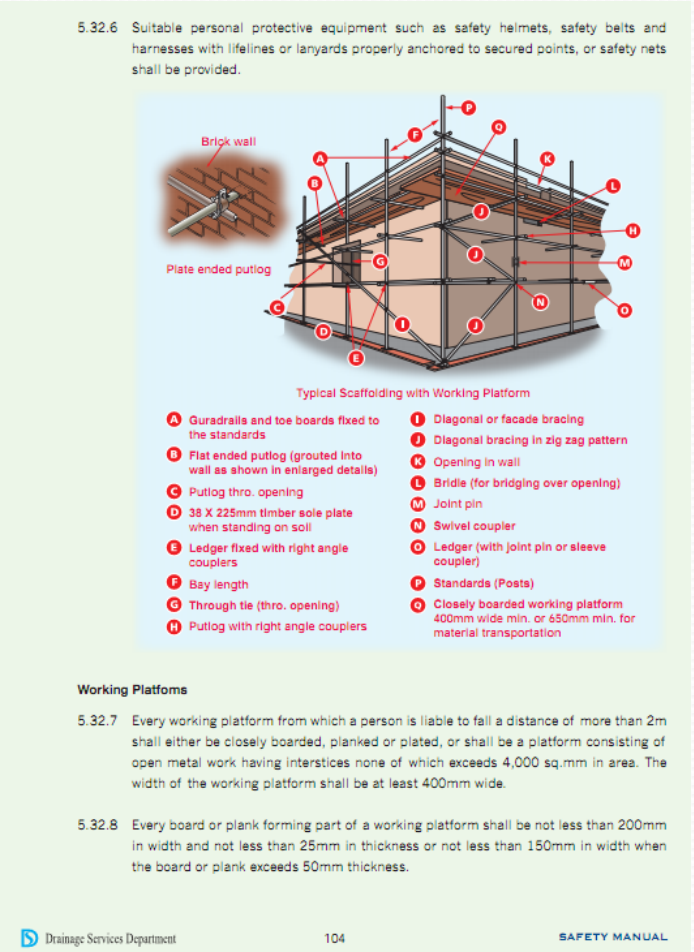
General Guideline
and
Code of Practice of Metal Scaffolding

General Guideline and Code of Practice of Metal Scaffolding

- DSD Safety Manual
- Code of Practice for Metal Scaffolding Safety (LD)
- Code of Practice for Temporary Works Procedures and the Permissible Stress Design of Falsework (BS5975)

General Guideline and Code of Practice of Metal Scaffolding

- DSD Safety Manual 5.31, 5.32
- Temporary Works and Working Platforms
- Checking guideline
- http://www.dsd.gov.hk/EN/Files/Technical_Manual/technical_manuals/Safety_Manual.pdf



5.32.6 Suitable personal protective equipment such as safety helmets, safety belts and harnesses with lifelines or lanyards properly anchored to secured points, or safety nets shall be provided.

Typical Scaffolding with Working Platform

A Guradrails and toe boards fixed to the standards
B Flat ended putlog (grouted into wall as shown in enlarged details)
C Putlog thro. opening
D 38 X 225mm timber sole plate when standing on soil
E Ledger fixed with right angle couplers
F Bay length
G Through tie (thro. opening)
H Putlog with right angle couplers
I Diagonal or facade bracing
J Diagonal bracing in zig zag pattern
K Opening in wall
L Bridle (for bridging over opening)
M Joint pin
N Swivel coupler
O Ledger (with joint pin or sleeve coupler)
P Standards (Posts)
Q Closely boarded working platform 400mm wide min. or 650mm min. for material transportation

Working Platforms

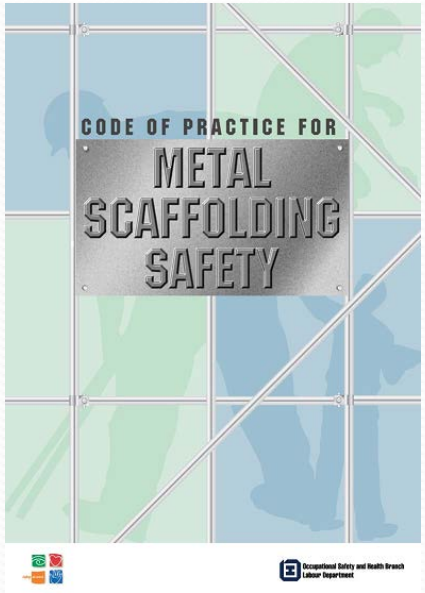
5.32.7 Every working platform from which a person is liable to fall a distance of more than 2m shall either be closely boarded, planked or plated, or shall be a platform consisting of open metal work having interstices none of which exceeds 4,000 sq.mm in area. The width of the working platform shall be at least 400mm wide.

5.32.8 Every board or plank forming part of a working platform shall be not less than 200mm in width and not less than 25mm in thickness or not less than 150mm in width when the board or plank exceeds 50mm thickness.

Drainage Services Department 104 SAFETY MANUAL

General Guideline and Code of Practice of Metal Scaffolding

- Code of Practice of Metal Scaffolding Safety
- Labour Department
- FIUO and CSSR
- Safety Management System at Metal Scaffolding Works
  - Design and planning
  - Method statement
  - Selection of subcontractor
  - Competent person and trained workmen



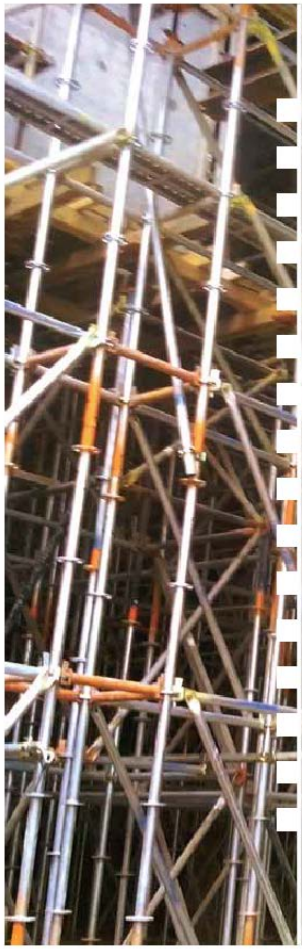
General Guideline and Code of Practice of Metal Scaffolding

- Code of Practice for Temporary Works Procedures and the Permissible Stress Design of Falsework (BS5975)
- Guidance on design, specification, construction, use and dismantling of falsework
- Material properties and selection (e.g. steel, timber)
- Procedure control of temporary works
  - Organization
  - On site checking

Design Consideration of Metal Scaffolding

- Purpose of the scaffolding (Platform, access, falsework for canopy, beam or slab)
- Location of the Falsework (slope, soil ground, structure)
- Loading to falsework (e.g thickness of slab, free fall of concrete)
- Construction joint (e.g. height of platform, concrete pressure)
- Conservative approach → Safe Side

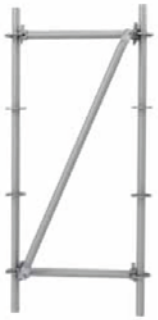
Scaffolding and Falsework Design



Rounder Standard	直杆
Rounder Ledger	橫杆
Rounder Diagonal Brace	斜杆
Rounder Head Jack	頂積
Rounder Base Jack	底積
Rounder Base Sleeve Short	腳套
Rounder Joint	駁心
Catwalk 300/500	鈎板300/500系列
Toe-Board	踢腳板
Scaffold Rolling Wheel	通架輪子
Medium Catwalk Bearer	中承杆
Toe Board Connector	踢腳板連接碼
Double Coupler	雙手扣
Walkway Bracket	九比架
Wall Ties Connector	連牆器
Aluminum Stair	鋁梯

Rounder Ledger 橫杆 (Dim. 48.3Ø x 3.2mm thickness)

Product Code 編碼	Specification 規格 L=X x Y(mm)	Weight (kg/unit) 重量 (千克/支)
RS100600	1095=1000 x 600	5.60
RS100900	1248=1000 x 900	6.31
RS101200	1448=1000 x 1200	7.02
RS101500	1678=1000 x 1500	7.70
RS101829	1952=1000 x 1829	8.60
RS102400	2459=1000 x 2400	10.40
RS103658	3645=1000 x 3658	14.9
RS150600	1565=1500 x 600	7.44
RS150900	1676=1500 x 900	7.83
RS151200	1829=1500 x 1200	8.38
RS151500	2016=1500 x 1500	9.04
RS151829	2249=1500 x 1829	9.87
RS152400	2702=1500 x 2400	11.30
RS153658	3813=1500 x 3658	15.5
RS200600	2049=2000 x 600	9.16
RS200900	2135=2000 x 900	9.46
RS201200	2257=2000 x 1200	9.90
RS201500	2411=2000 x 1500	10.45
RS201829	2610=2000 x 1829	11.15
RS202400	3008=2000 x 2400	12.57
RS203658	4036=2000 x 3658	16.23



Allround in standard testing configuration up to 7 meters in height is rated for the following permissible loadings:

With ledger lifts of 2.0 metres internal – up to 40kN per standard;
With ledger lifts of 1.5 metres internal – up to 50kN per standard;
With ledger lifts of 1.0 metres internal – up to 60kN per standard.
(All above safety factor 1.6)

Permissible loadings can be increased considerably further by:

Using reinforced base jacks and head jacks (U-heads);
Additional bracing (ledgers and diagonals), and/or;
Joining standards with our unique twin wedge couplers.

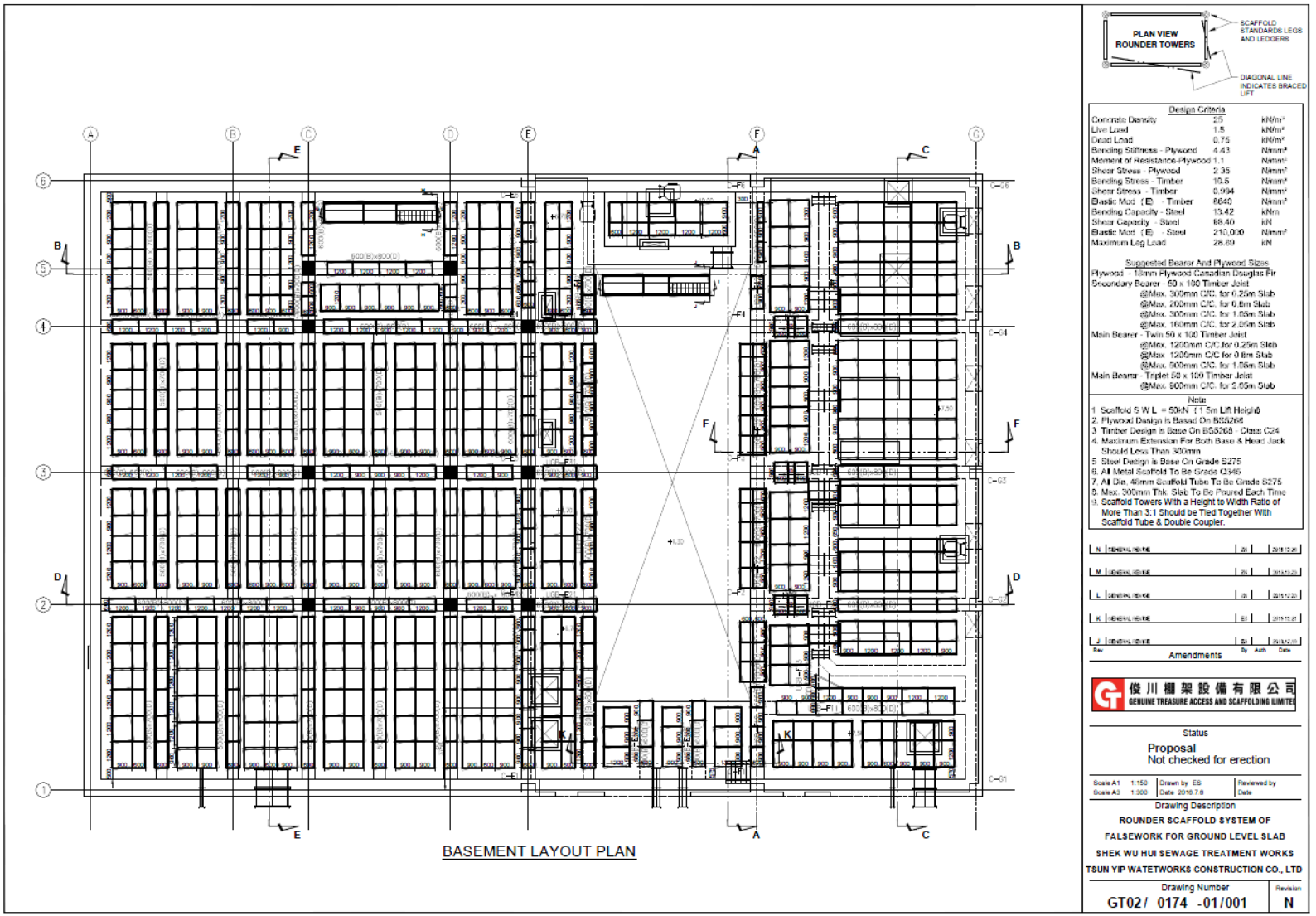
Appropriate static calculations should be performed to prove the appropriate configuration of Rounder components for each individual situation.

Scaffolding and Falsework Design

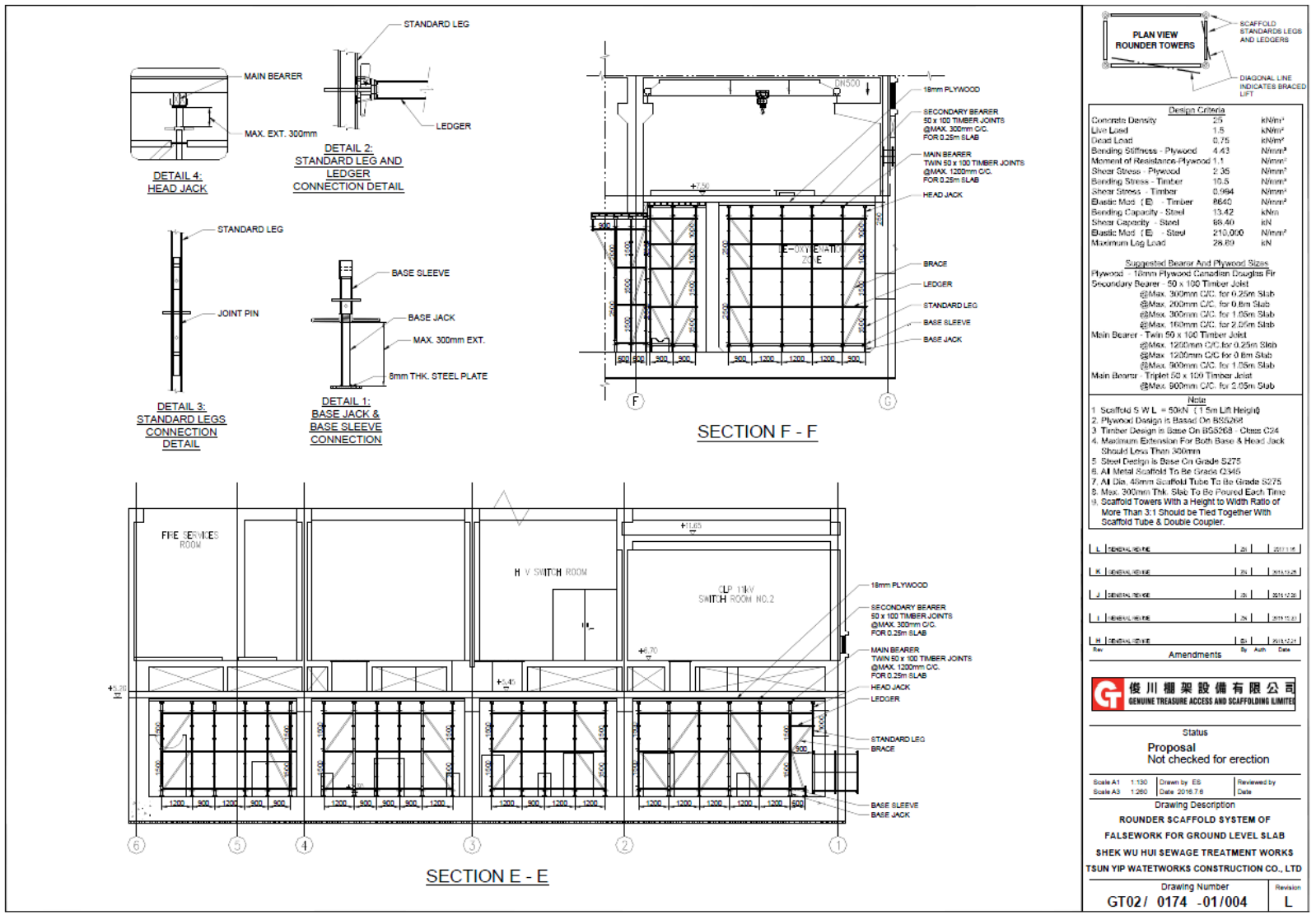
Design Brief:

- 50kN capacity scaffolding system
- design code: BS5975, BS5268
- Code of Practice for Metal Scaffolding Safety
- 1.2m(separation) x 0.9m(span) grid support
- Twin 50mm x 100mm Timber Joist as Main Bearer
- 50mm x 100mm Timber Joists, 300mm c/c

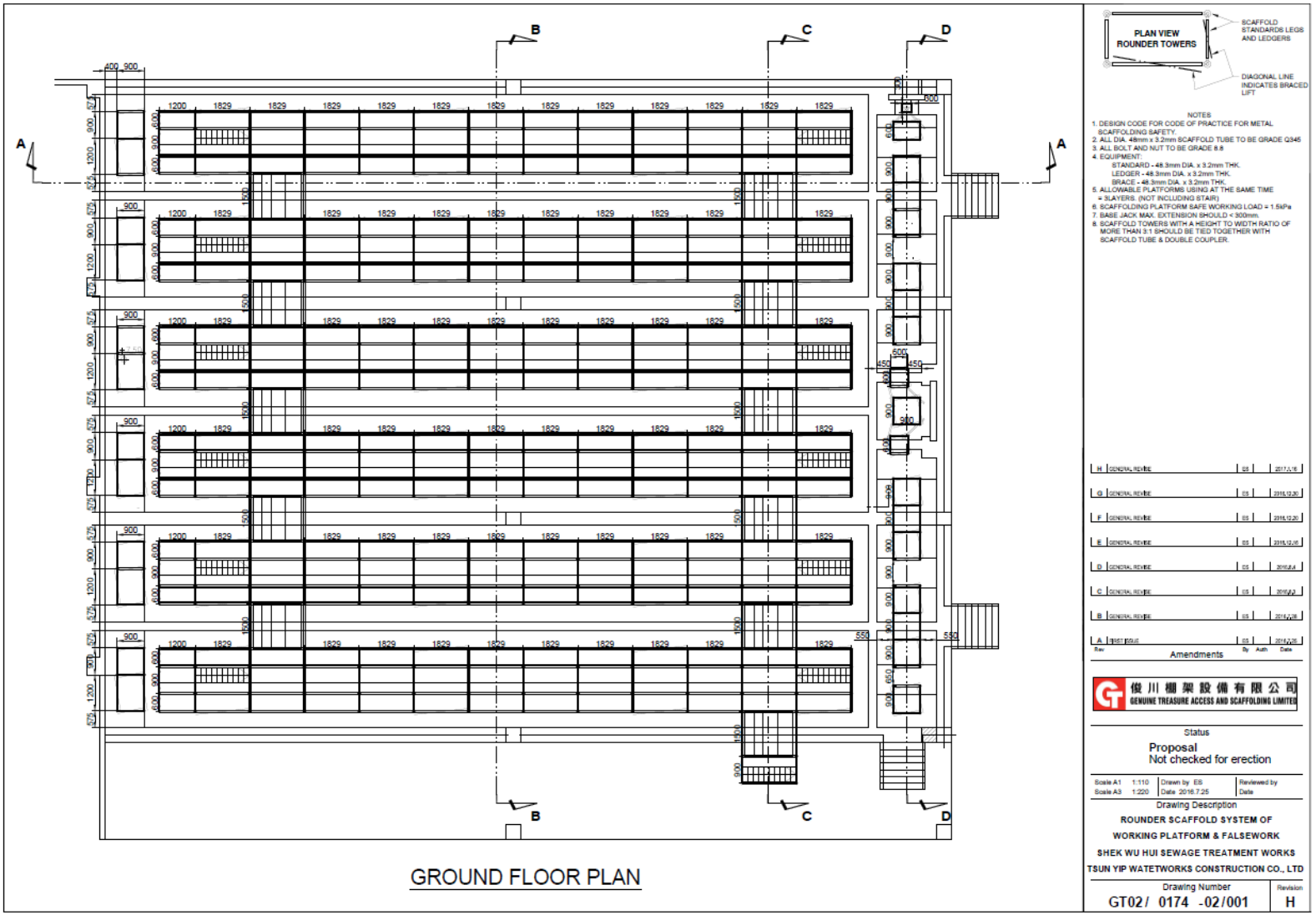
Scaffolding and Falsework Design



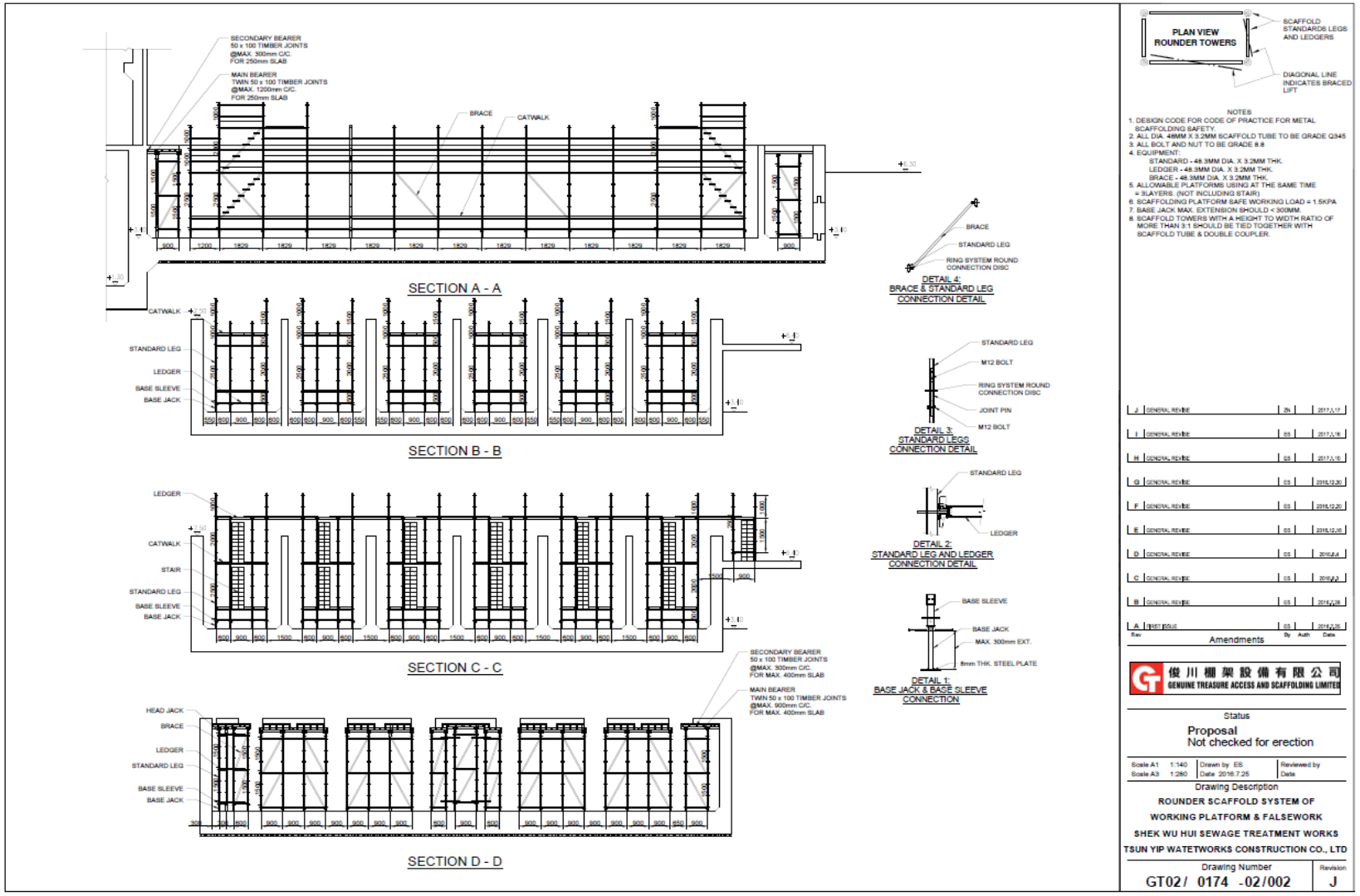
Scaffolding and Falsework Design



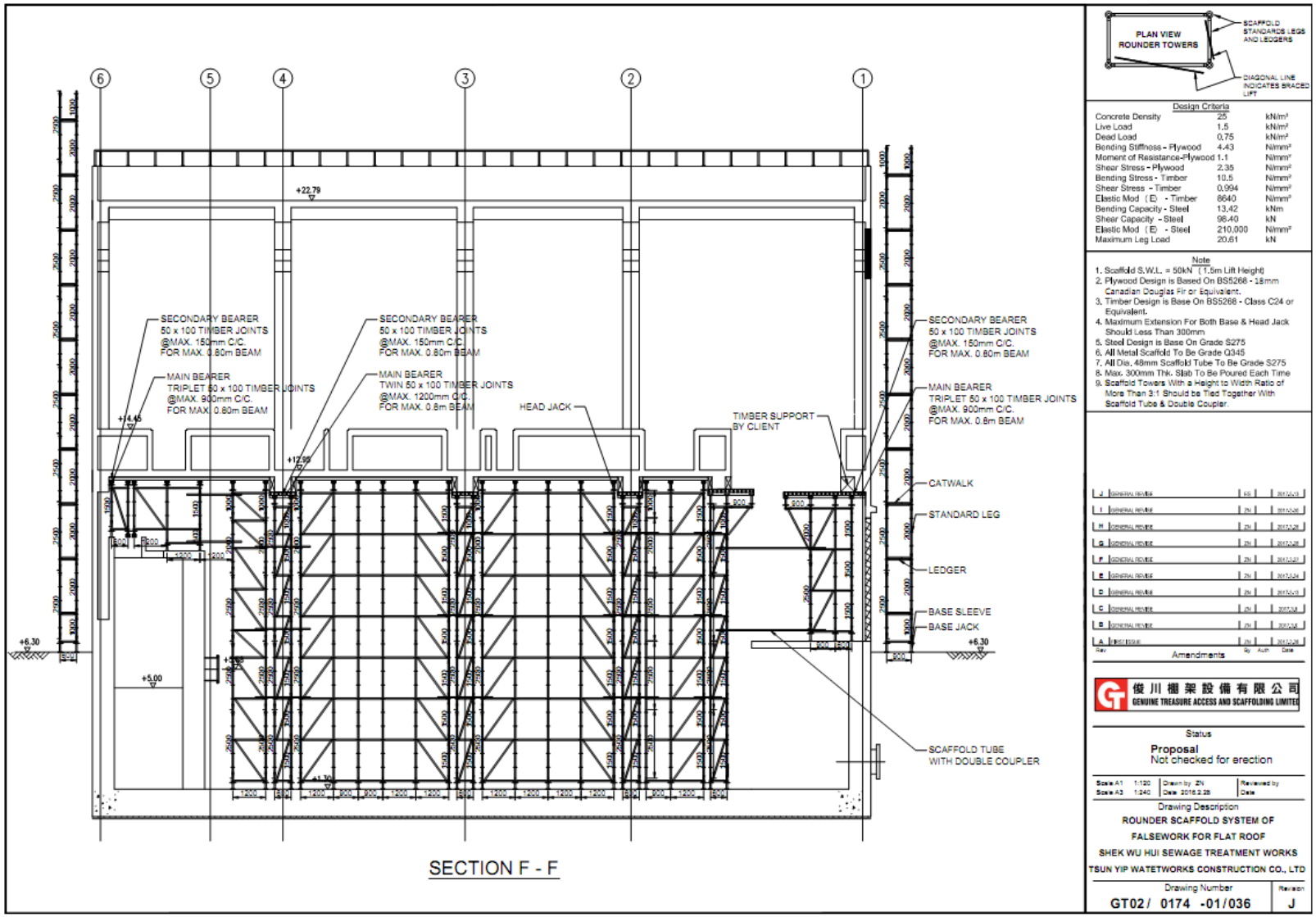
Scaffolding and Falsework Design



Scaffolding and Falsework Design



Scaffolding and Falsework Design



SECTION F - F

Construction Arrangement of Metal Scaffolding

Scaffolding and Falsework

Erection(Falseworks of Main Building)

Erection (Falseworks of Main Building)

Erection (Working Platform)

Requirement in Code of Practice:

Platform width >400mm, gangway for movement of material >650mm

Erection(Working Platform)

Erection(Working Platform)

Site Enhancement Measures During Erection

Normal Practice:

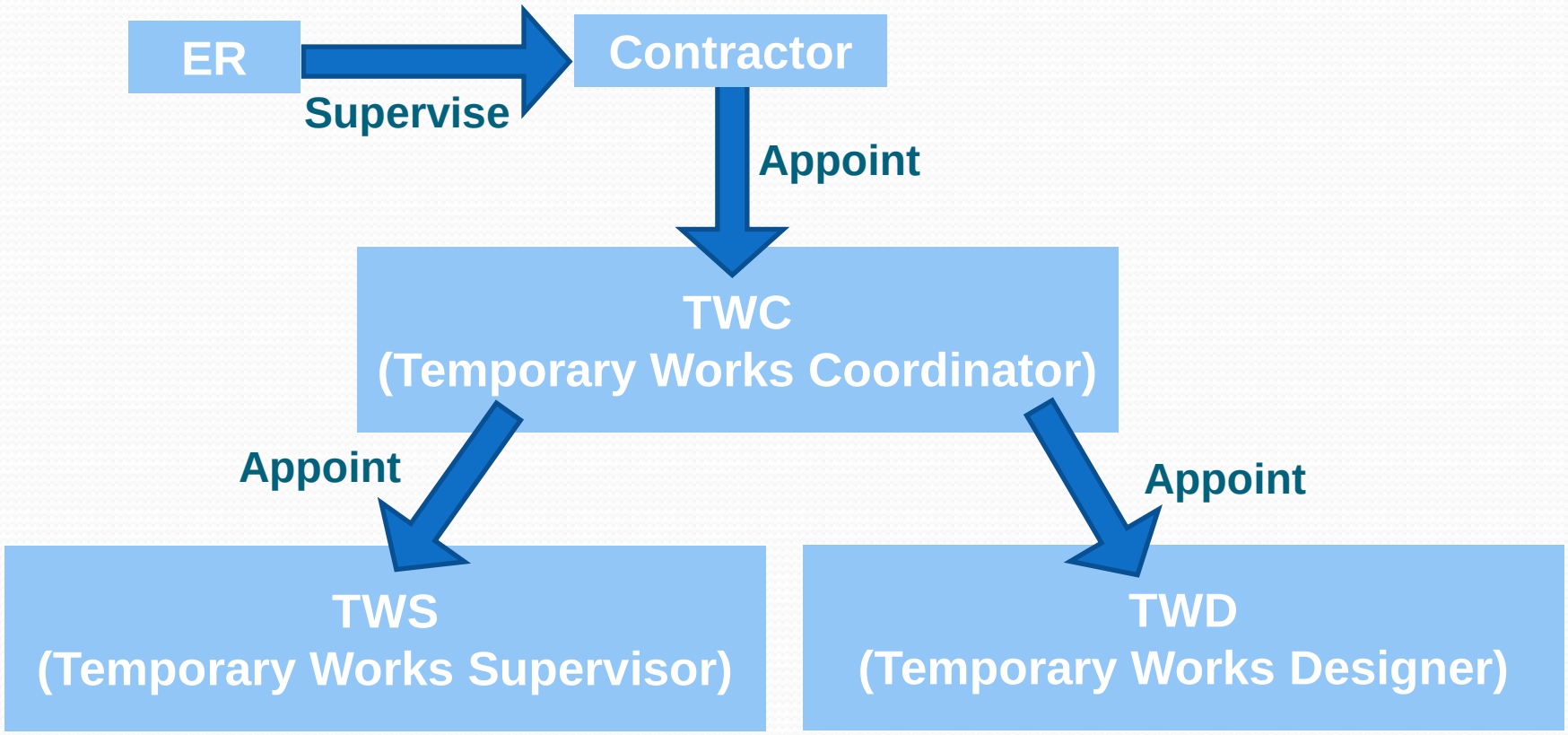
- Form 5 issued by Competent Person
- ICE Construction Check Certificate

Enhanced Measures:

- Enhanced Organization for the Temporary Works
- Specific Daily Checklist for the Condition of Falseworks
- Additional Bracing or Ledge for Structural Integrity
- Additional Diagonal Bracing
- Use Triple Timbers at Joist where appropriate
- Review of checklist and falsework condition during weekly safety walk and coordination meeting

Enhanced Organization for the Temporary Works

BS5975:2008 Section 6.3.1 – Organization Aspect



Enhanced Organization for the Temporary Works

Roles and Responsibilities of Contractor/ ER

Temporary Works Coordinator (TWC)

Role

- Appointed by Contractor
- Point of contact between the designer and the site team

Responsibilities

Co-ordinate all temporary works activities

Ensure :

- a temporary works register is established
- a design brief is prepared
- a satisfactory temporary works design is constructed before loading
- changes are managed
- checks are managed

Enhanced Organization for the Temporary Works

Roles and Responsibilities of Contractor/ ER

Temporary Works Supervisor (TWS)

Role

- Responsible to TWC
- Assist TWC in the supervision and checking of the temporary works

Responsibilities

- Supervise the erection, use, maintenance and dismantling of the temporary works
- Carry out checks of the scheme during construction / demolition of falsework
- Record and report to TWC to ensure any modifications to the scheme / changes in site conditions are drawn to the attention of the designer

Temporary Works Safety

Roles and Responsibilities of Contractor/ ER

Temporary Works Designer (TWD)

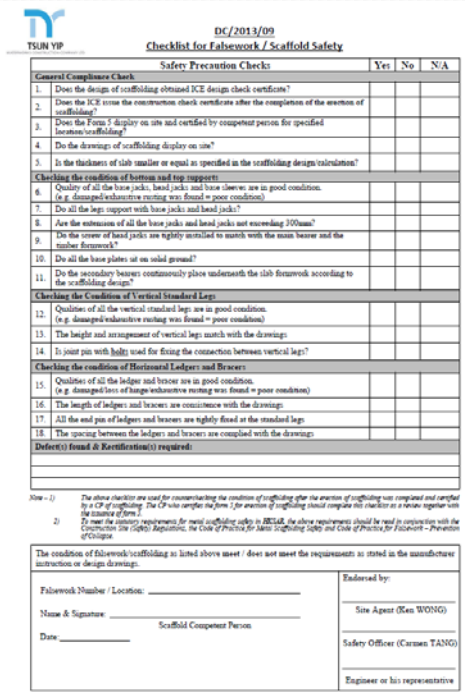
Role

- Appointed by TWC
- Advice and assist TWC with the production of Temporary Works schemes and methods of construction

Responsibilities

- Provide Temporary Works schemes and construction information
- Ensure a Design Risk Assessment is carried out and mitigation responses are known to all parties
- Provide onsite inspection of temporary works where necessary
- Ensure that the design is independently checked for structural adequacy and compliance with relevant standards

Site Enhancement Measures During Erection



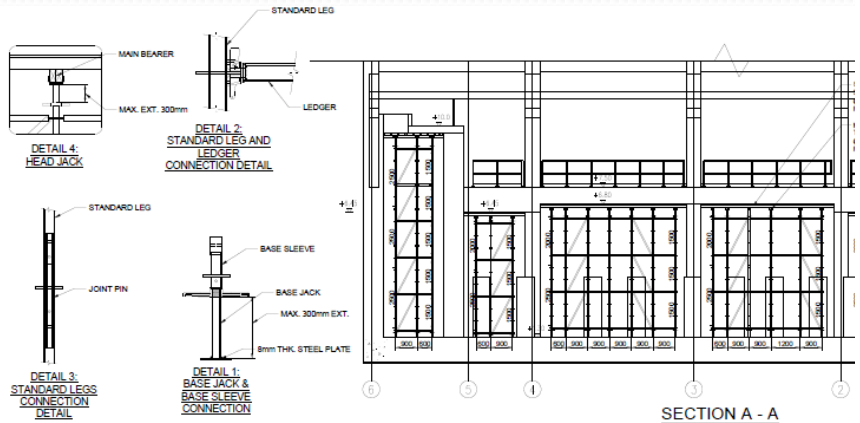
TSUN YIP
WATERWORKS CONSTRUCTION COMPANY LTD

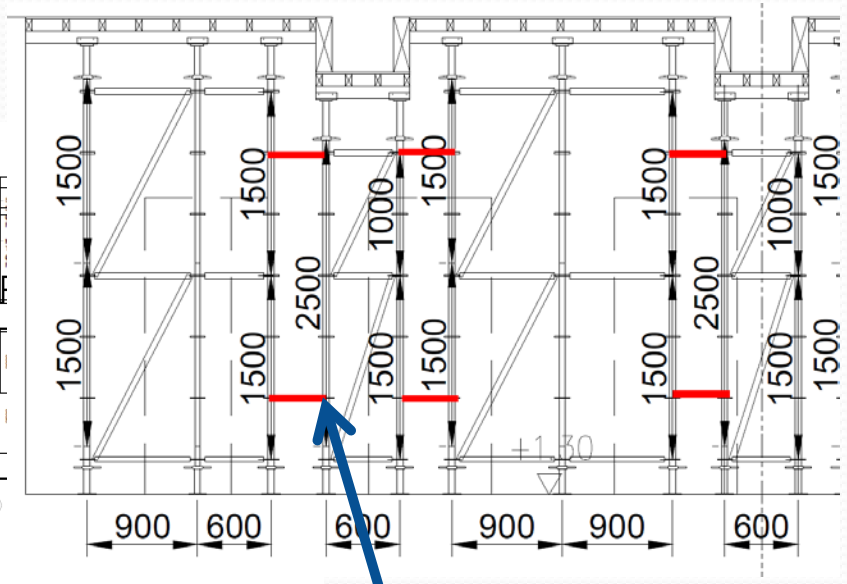
DC/2013/09
Checklist for Falsework / Scaffold Safety

Safety Precaution Checks		Yes	No	N/A
General Compliance Check				
1.	Does the design of scaffolding obtained ICE design check certificate?			
2.	Does the ICE issue the construction check certificate after the completion of the erection of scaffolding?			
3.	Does the Form 5 display on site and certified by competent person for specified location/scaffolding?			
4.	Do the drawings of scaffolding display on site?			
5.	Is the thickness of slab smaller or equal as specified in the scaffolding design/calculation?			
Checking the condition of bottom and top supports				
6.	Quality of all the base jacks, head jacks and base sleeves are in good condition. (e.g. damaged/exhaustive rusting was found = poor condition)			
7.	Do all the legs support with base jacks and head jacks?			
8.	Are the extension of all the base jacks and head jacks not exceeding 300mm?			
9.	Do the screw of head jacks are tightly installed to match with the main bearer and the timber formwork?			
10.	Do all the base plates sit on solid ground?			
11.	Do the secondary bearers continuously place underneath the slab formwork according to the scaffolding design?			
Checking the Condition of Vertical Standard Legs				
12.	Qualities of all the vertical standard legs are in good condition. (e.g. damaged/exhaustive rusting was found = poor condition)			

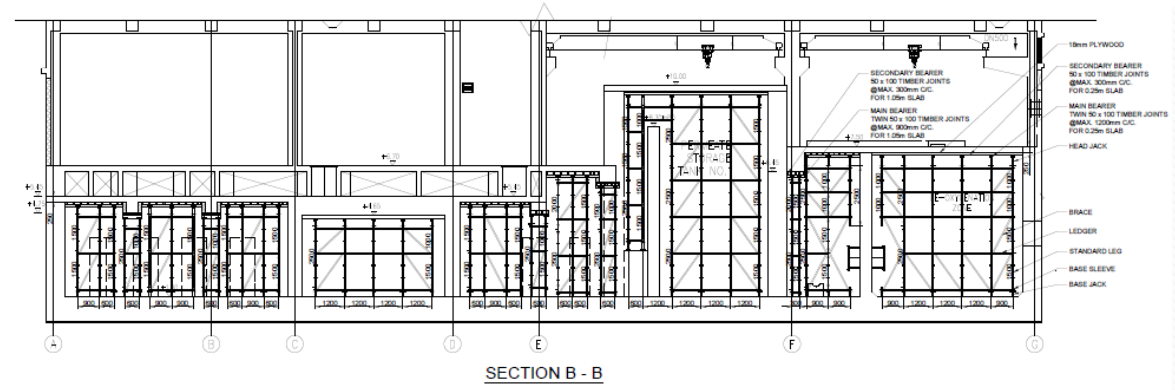
Tailor Made Checklist for Falsework Safety

Site Enhancement Measures During Erection

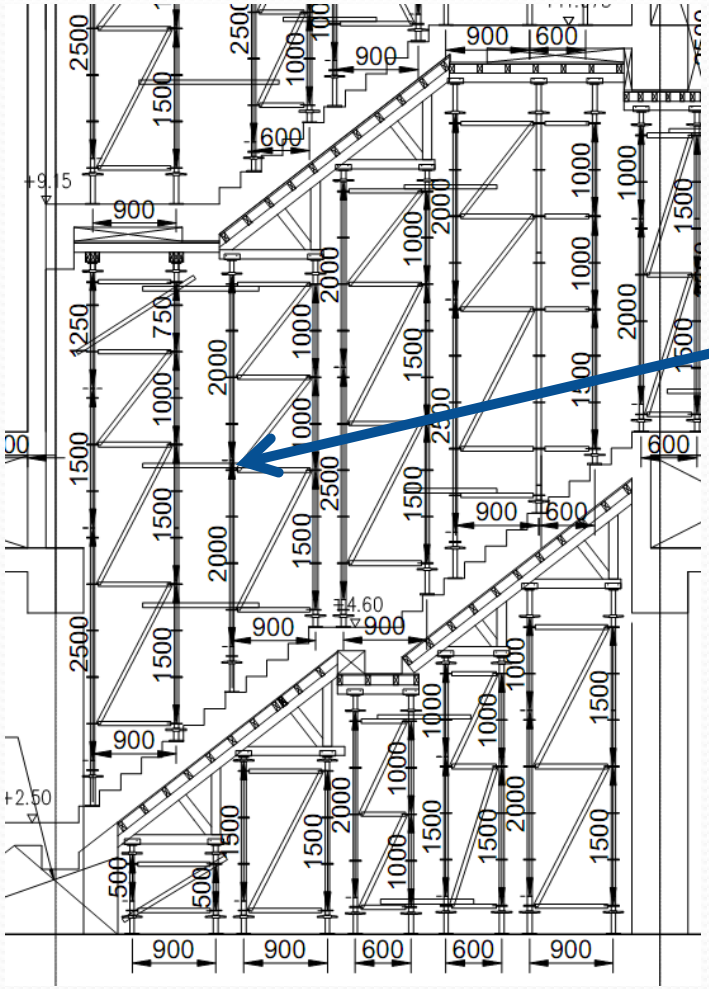




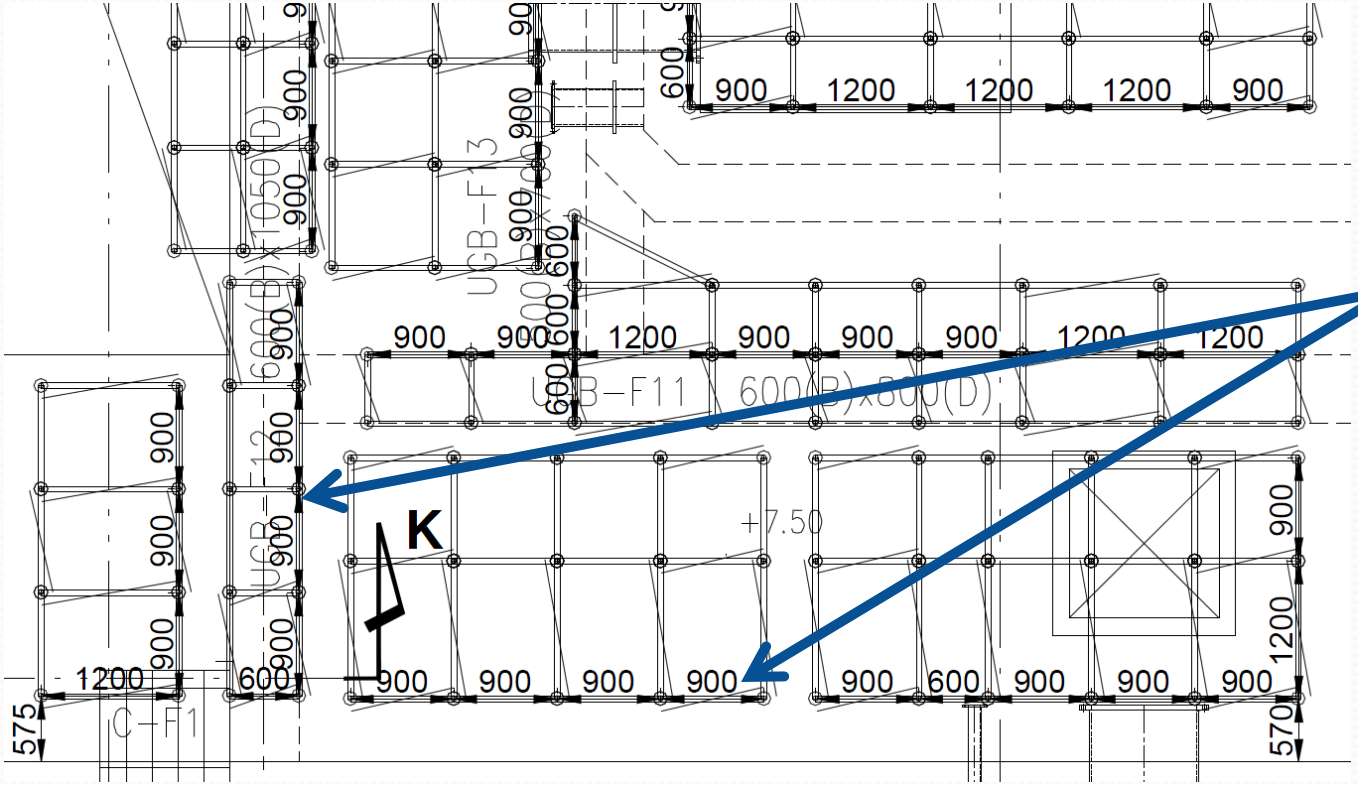
Additional Ledge



Site Enhancement Measures During Erection



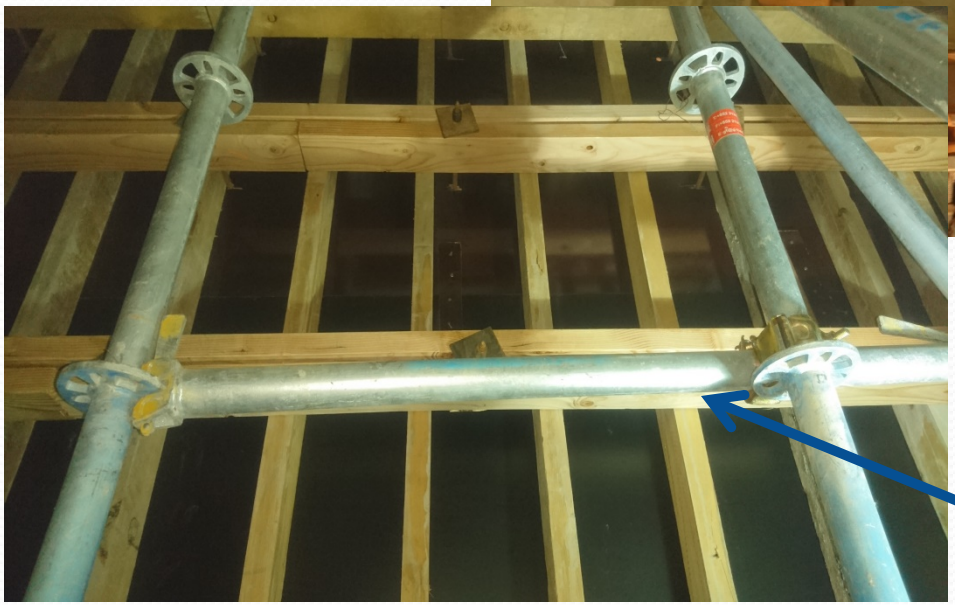
Site Enhancement Measures During Erection



Reduced distance between vertical standard leg

Site Enhancement Measures During Erection

Triple Timber at Joist



Additional Ledge

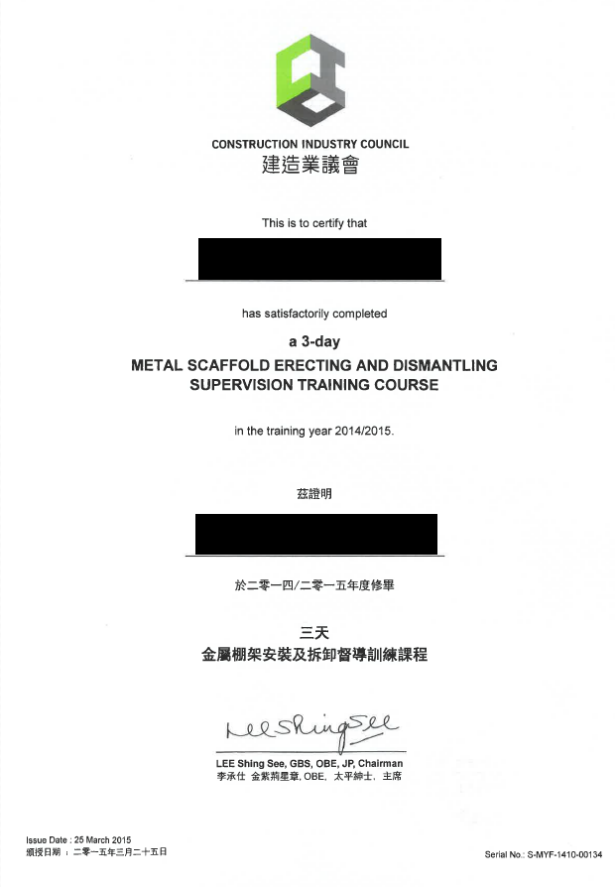
Site Enhancement Measures During Erection

Additional Diagonal Brace

Provide wireless portable lighting inside the falsework

Awareness During Inspection

Trained Workmen and Competent Person for Metal Scaffolding



Awareness During Inspection

Within 300mm as design requirement ?

Awareness During Inspection

Base jack sit on solid ground ?

The amount and location of diagonal bracing inline with the design drawing?

Awareness During Inspection

Form 5
(Under CSSR)

表 格 五
FORM 5

建築地盤(安全)規例
棚 架
每十四日一次或在其他場合執行的檢查結果報告
本表格乃由勞工處處長為施行建築地盤(安全)規例第38F(1)條而認可

Construction Sites (Safety) Regulations

SCAFFOLDS
REPORTS OF RESULTS OF FORTNIGHTLY OR OTHER INSPECTIONS

Form approved by the Commissioner for Labour for the purposes of regulation 38F(1) of the Construction Sites (Safety) Regulations

有關棚架的說明或所在地點 Description or location	檢查日期 Date of inspection	檢查結果 註明該棚架是否處於安全操作狀態 Result of inspection State whether the scaffold is in safe working order	檢查者簽署及職銜 Signature and designation of person who made the inspection
(1)	(2)	(3)	(4)
Mainbase Tak Ascent Tower	17/1/2017	In safe working order	Site Agent

任何合資格檢驗員或合資格的人，如向承建商交付他明知有任何要項屬虛假的證明書或報告，即屬犯罪；一經定罪，可處罰款二十萬元及監禁十二個月。
Any competent examiner or competent person who delivers to a contractor a certificate or makes a report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of $200,000 and to imprisonment for 12 months.

CSSR-F5

Form 5 displayed at entrance of platform and regular check by CP every 14 days

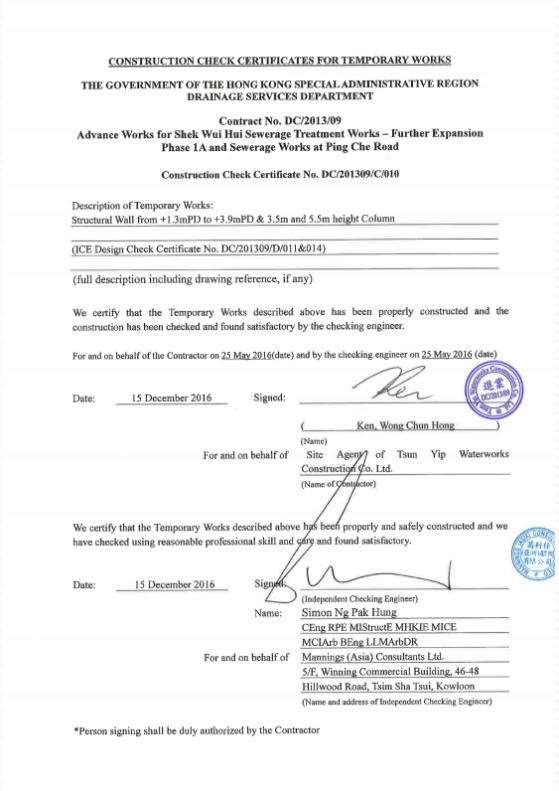
ICE Inspection

Certification before Concreting

SCAFFOLDS
REPORTS OF RESULTS OF FORTNIGHTLY OR OTHER INSPECTIONS

Construction Sites (Safety) Regulations

Form 5 Certificate



CONSTRUCTION CHECK CERTIFICATES FOR TEMPORARY WORKS

THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION
DRAINAGE SERVICES DEPARTMENT

Contract No. DC/2013/09
Advance Works for Shek Wui Hui Sewerage Treatment Works – Further Expansion
Phase 1A and Sewerage Works at Ping Che Road

Construction Check Certificate No. DC/201309/C/010

Description of Temporary Works:
Structural Wall from +1.3mPD to +3.9mPD & 3.5m and 5.5m height Column

(ICE Design Check Certificate No. DC/201309/D/011&014)

(full description including drawing reference, if any)

We certify that the Temporary Works described above has been properly constructed and the construction has been checked and found satisfactory by the checking engineer.

For and on behalf of the Contractor on 25 May 2016(date) and by the checking engineer on 25 May 2016 (date)

Date: 15 December 2016 Signed:

(Ken, Wong Chun Hong)
(Name)

For and on behalf of Site Agent of Tsun Yip Waterworks Construction Co. Ltd.
(Name of Contractor)

We certify that the Temporary Works described above has been properly and safely constructed and we have checked using reasonable professional skill and care and found satisfactory.

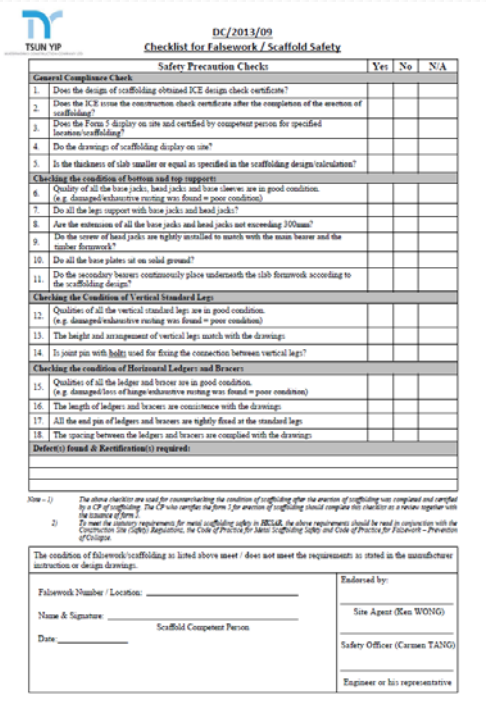
Date: 15 December 2016 Signed:
(Independent Checking Engineer)

Name: Simon Ng Pak Hung
CEng RPE MIStructE MHKIE MICE
MCIArb BEng LLMArbDR

For and on behalf of Mannings (Asia) Consultants Ltd.
5/F, Winning Commercial Building, 46-48
Hillwood Road, Tsim Sha Tsui, Kowloon
(Name and address of Independent Checking Engineer)

*Person signing shall be duly authorized by the Contractor

ICE Construction Check Certificate



TSUN YIP

DC/2013/09
Checklist for Falsework / Scaffold Safety

	Safety Precaution Checks	Yes	No	N/A
General Compliance Check				
1.	Does the design of scaffolding obtained ICE design check certificate?			
2.	Does the ICE issue the construction check certificate after the completion of the erection of scaffolding?			
3.	Does the Form 5 display on site and certified by competent person for specified location/scaffolding?			
4.	Do the drawings of scaffolding display on site?			
5.	Is the thickness of slab smaller or equal as specified in the scaffolding design/calculation?			
Checking the condition of bottom and top support:				
6.	Quality of all the base jack, head jacks and base sleeves are in good condition. (e.g. damaged/exhaustive rusting was found = poor condition)			
7.	Do all the legs support with base jacks and head jacks?			
8.	Are the extension of all the base jacks and head jacks not exceeding 300mm?			
9.	Do the screw of head jacks are tightly installed to match with the main bearer and the timber formwork?			
10.	Do all the base plates sit on solid ground?			
11.	Do the secondary bearers continuously place underneath the slab formwork according to the scaffolding design?			
Checking the Condition of Vertical Standard Legs				
12.	Qualities of all the vertical standard legs are in good condition. (e.g. damaged/exhaustive rusting was found = poor condition)			
13.	The height and arrangement of vertical legs match with the drawings			
14.	Is joint pin with bolts used for fixing the connection between vertical legs?			
Checking the condition of Horizontal Ledgers and Bracers				
15.	Qualities of all the ledger and bracer are in good condition. (e.g. damaged/loss of hinge/exhaustive rusting was found = poor condition)			
16.	The length of ledgers and bracers are consistence with the drawings			
17.	All the end pin of ledgers and bracers are tightly fixed at the standard legs			
18.	The spacing between the ledgers and bracers are complied with the drawings			
Defect(s) found & Rectification(s) required:				

Note – 1) The above checklist are used for counterchecking the condition of scaffolding after the erection of scaffolding was completed and certified by a CP of scaffolding. The CP who certifies the Form 5 for erection of scaffolding should complete this checklist as a review together with the issuance of form 5.
2) To meet the statutory requirements for metal scaffolding safety in HKSAR, the above requirements should be read in conjunction with the Construction Site (Safety) Regulations, the Code of Practice for Metal Scaffolding Safety and Code of Practice for Falsework – Prevention of Collapse.

The condition of falsework/scaffolding as listed above meet / does not meet the requirements as stated in the manufacturer instruction or design drawings.

Falsework Number / Location: _____
Name & Signature: _____
Scaffold Competent Person
Date: _____

Endorsed by:
Site Agent (Ken WONG)
Safety Officer (Carmen TANG)
Engineer or his representative

Checklist

Conclusion – Falsework Safety

Work Cycle

Design	■ Falsework scheme (incl. layout, spacing & bracing) ■ Design calculations and assumptions ■ Method statement to illustrate process step by step ■ Risk assessment
Construction	☐ Briefing / training to workers ☐ Regular inspections to identify any non-conformances ☐ Final inspection and if satisfactory, permit to load issued by Competent Person (CP)
Modification	■ Designer to review the non-conformances / requests for changes to the design (if any)
Demolition	☐ After concrete strength is achieved ☐ Carried out according to approved method statement and sequence of dismantling ☐ Filing of documents, incl. design brief, drawings, method statement, check certificates, risk assessment, permits, etc.

Design, Construction and the Enhanced Safety Measures for Metal Scaffolding

~END~