MALAYSIA GREEN TECHNOLOGY

ONE OF THE WAYS TO IMPROVE THE OUTFLOW OF CURRENCY IS THE UTILIZATION OF INDUSTRIAL BUILDING SYSTEM (IBS)

IBS Superstructure In Malaysia 3 in 1

Load Bearing Wall + Modular Shear Keys Wet Joint + Box System

- Speed, Quality & Environment

HC PRECAST SYSTEM

PATENTED UNITED STATE : US 6.819.870B2

PATENTED MALAYSIA : MY - 124213-A IN 2006

PATENTED MALAYSIA : MY - 139712-A IN 2009

INDUSTRIALISED BUILDING SYSTEM (IBS)

It is a system which suits all architectural demands & not a machine or component

“ significantly difference from traditional cast in-situ construction which relies heavily on customized site work ”

- **The wall is designed to provide adequate fire resistance according to demand (with minimum 2hours as per BS8110)**
- **The system is designed and approved by PE and endorsed by independent checker**
- **Thickness of the wall can be customized according to requirement**
- **Our design and casting are following strictly to British Standard**

TRAINING UNIT

8 years exposed to weather, precast wall, staircase, half slab & beam with in-situ column.

- **No touch-up**
- **No leaking**
- **No water proofing**
- **No crack**

FACTORY CAPACITY : 21 ACRES

Future development 13 acres : 2,500 to 3,500 units of single storey (1000 ft2) per year

Existing production 8 acres : 1,800 to 2,500 units of single storey (1000 ft2) per year

CONTENTS

1. BENEFITS INDUSTRIAL BUILDING SYSTEM : GREEN TECHNOLOGY

i) COUNTRY :

- 40% Labour Reduce
- Currency
- Social

ii) GOVERNMENT :

- Quality
- Speed
- Environment
- Green Technology

iii) PRIVATE DEVELOPER :

- Quality
- Speed
- Environment
- Green Technology

iv) END-USER :

- Quality

v) CONSULTANT :

- ARCHITECT
  (Flexibility & Customized)
- C&S
  (Construction Method Sequence)
- M&E
  (Schematic Diagram of Shop Drawing)
- QS
  (No Variation Order)

vi) SYSTEM PROVIDER :

- IBS/MANUFACTURE
- Payment Secure

vii) CONTRACTOR :

- Payment Secure

2. PROPOSE TO GOVERNMENT & PRIVATE DEVELOPER

Invite industrialized building system provider with manufacturing facility (flexibility to suit all architectural demands) to participate to built the show unit with work below and superstructure without finishing for the Government & Private Developer to identify the system in terms of quality, speed and environment for supply in its development.

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1. Architect
- **Appointed by the Government & Private Developer.**
- **Design of single storey bungalow of 1,000 ft2 (affordable home), up to superstructure without finishing.**
- **With M&E requirement.**
- **Wall finishing with plaster or skim coat only.**
- **Door and window frame included except door leaf.**
- **Ground floor without tiling.**

2. Industrialized building system manufacturer have formed their BQ for superstructure (in terms of wall area) and to submit work program with sequence of work for record purposes.

3. Proper record by the Government & Private representative during construction, in terms of labour and machinery involved per day up to completion (superstructure only).

4. Conquas or QLassic consultant (2) engaged by the Government & Private Developer.

5. Cost Comparison for each Industrialized Building System Manufacturer by the Government & Private Developer (for superstructure only). Cost will be fixed for the selected manufacturer and supply to its development.

3. RM 90.00 (m2) / RM 900.00 (m3)

SUPERSTRUCTURE (FRAME & WALLS) :

1. **ISO : 9001 : 2008**
2. **Design Calculation**
3. **PE Endorsement**
4. **M&E Shop Drawing**
5. **Supply & Lay**
6. **Flexibility Suit Architectural Demands**
7. **Customized**
8. **Quality Control & Assurance**
9. **Speed as Required**
10. **No Leaking**

3.1 RM 90.00 (m2) / RM 900.00 (m3)

Scope of Work for Superstructure :

Included :-

- **Superstructure design calculation.**
- **Supply & Install.**
- **Setting out (panel)**
- **TBM for each block & 4 + 2 Boundary point per unit (must)be provided.**
- **Mobile crane.**
- **Shop drawing for M&E location layout related to panel wall casting. (Subject to client / consultant confirmation)**

Excluded :-

- **Substructure design by others.**
- **Supply & install metal door & window frame.**
- **Supply & install M&E conduit.**
- **Skim coat.**
- **Storage yard at project site : 50mm thick crusher-run base.**
- **Access road at project site.**
- **Temporary water & electricity supply.**
- **Quarters for workers.**
- **Security at site for our material & system formworks.**
- **Contractor all Risks Insurance.**

4. INDUSTRIALISED BUILDING SYSTEM CONCEPT

a) CONVENTIONAL METHOD :

i) ARCHITECT (2D layout plan & Elevation)

ii) C&S (2D layout plan & Structural detail)

iii) M&E (2D Superstructure drawing & schematic diagram)

iv) QS (Bill Of Quantity)

b) GREEN TECHNOLOGY : 40% LABOUR REDUCE :

- Approval By Client, Confirmation & Endorsement By Consultant

c) SYSTEM PROVIDER : IBS/MANUFACTURE :

- **Flexibility to suit Architectural , C&S demands**
- **While taking care of water leakage**
- **Comply building by law**
- **In proper connections**
- **Less joint improve aesthetic appearance**

i) ARCHITECT :

- **2D layout**
- **3D drawing**

ii) C&S : Superstructure :-

- **Frame & Wall (2D & 3D layout detail of precast element & off/on site work)**

iii) M&E : Schematic diagram :

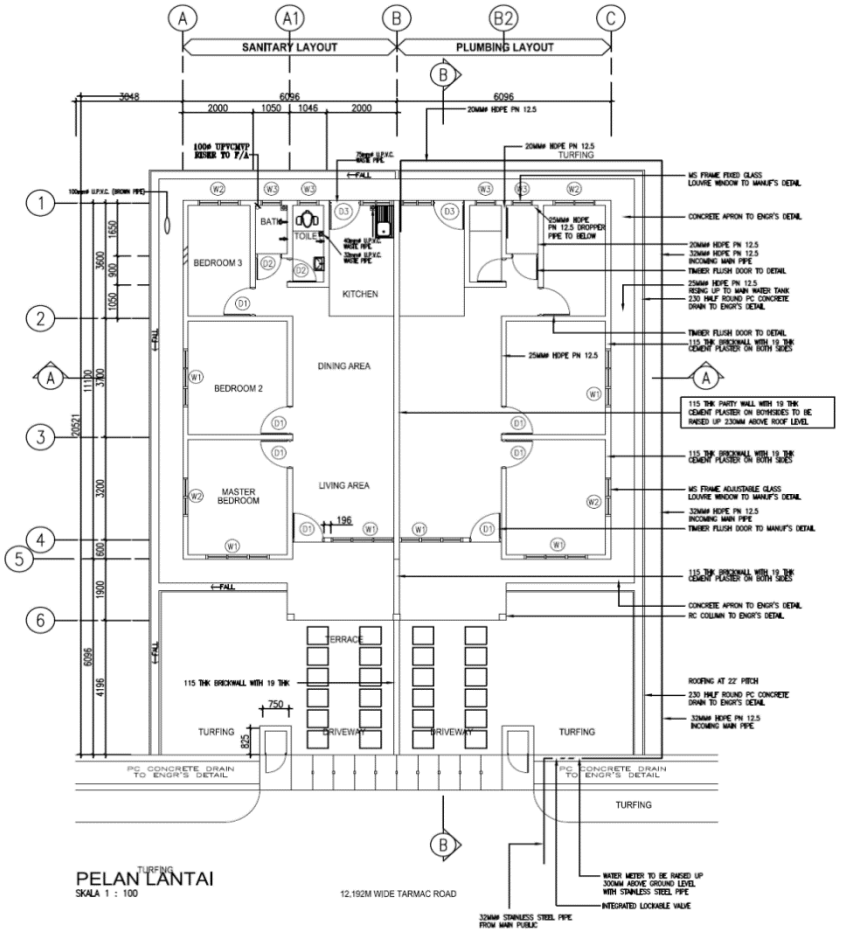
- **Shop drawing**

iv) QS :

- **No variation order (vo)**
- **3D Superstructure drawing**

4.a CONVENTIONAL METHOD : Single Storey

- i.1) ARCHITECT DRAWING : Layout Plan



DOOR SCHEDULE

TYPE	DISCRIPTION	SIZES (mm)	AREA (M^2)
D1	TIMBER FRAME PLY FLUSH DOOR TO DETAIL	900 X 2100	1.89
D2	TIMBER FRAME PLY FLUSH DOOR TO DETAIL	750 X 2100	1.575
D3	TIMBER FRAME PLY FLUSH DOOR TO DETAIL	900 X 2150	1.94

WINDOW SCHEDULE

TYPE	DISCRIPTION	SIZES (mm)	AREA (M^2)
W1	MS FRAME ADJUSTABLE GLASS LOUVRE WINDOW TO MANUF'S DETAIL	1800 X 1200	2.16
W2	MS FRAME ADJUSTABLE GLASS LOUVRE WINDOW TO MANUF'S DETAIL	1200 X 1200	1.44
W3	MS FRAME FIXED GLASS LOUVRE WINDOW TO MANUF'S DETAIL	600 X 600	0.36
W4	MS FRAME ADJUSTABLE GLASS LOUVRE WINDOW TO MANUF'S DETAIL	875 X 1200	1.05

A

DRAWN :
DATE :
CHECKED :
EXAM'D :
APPR'D :
SCALE :

Architect :

Architectural Drawing

DRAWING TITLE :

Single Storey Semi D

DRAWING NO : –

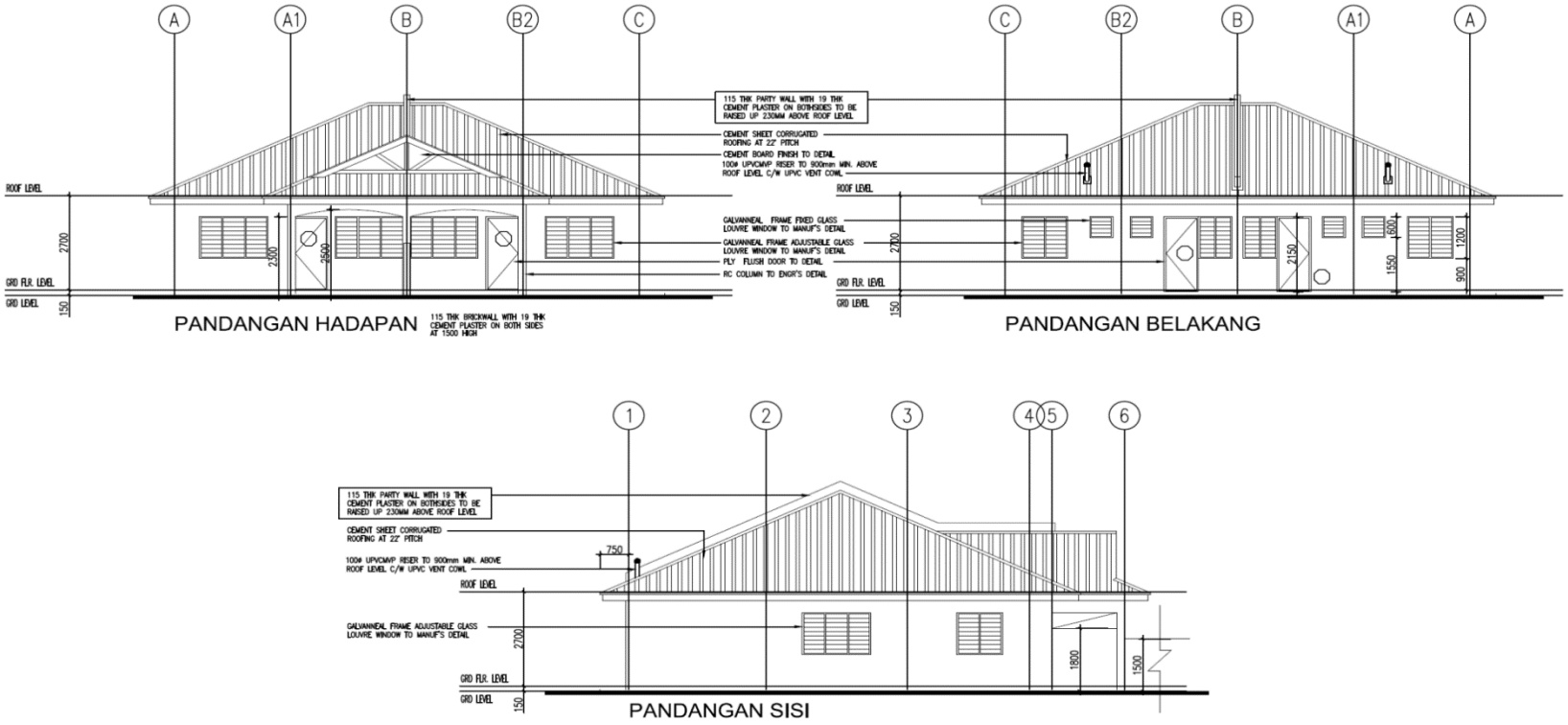
REV :

SYSTEM : –

REV :

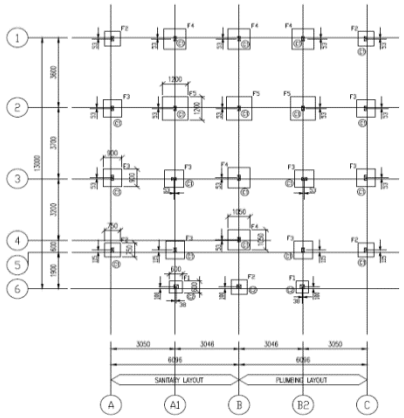
4.a CONVENTIONAL METHOD : Single Storey

- i.2) ARCHITECT DRAWING : Elevation

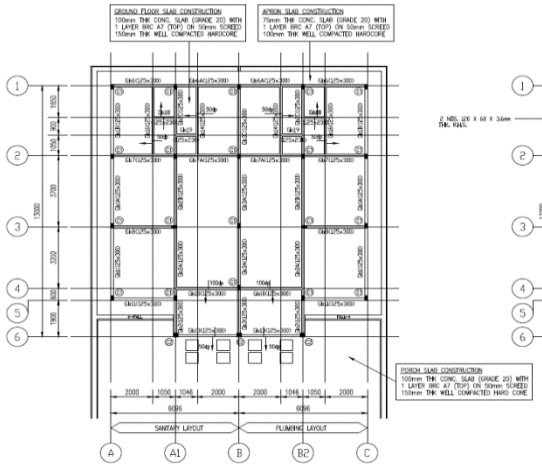


DRAWN :		**Architect :** Elevation	B
DATE :			DRAWING TITLE : Single Storey Semi D
CHECKED :			DRAWING NO : — REV :
EXAM'D :			SYSTEM : — REV :
APPR'D :			
SCALE :			

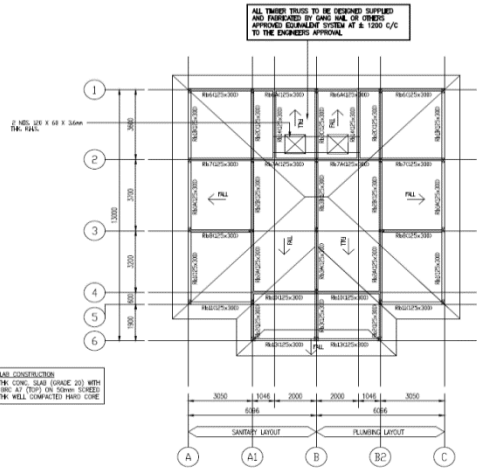
4.a CONVENTIONAL METHOD : Single Storey
- ii.1) C&S DRAWING : Footing, Foundation, Gr. Flr & Roof Layout Plan



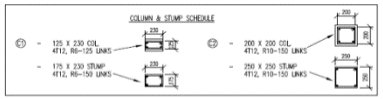
FOUNDATION LAYOUT PLAN

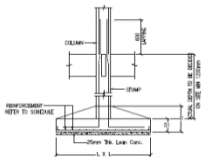


GROUND FLOOR PLAN



ROOF PLAN





TYPICAL FOOTING DETAIL

FOOTING TYPE	FOOTING SCHEDULE				
	SIZE L X L	D	D1	REINFORCEMENT
F1	600 X 600	150	150	4T10 BOTHWAYS
F2	750 X 750	175	175	ST10 BOTHWAYS
F3	900 X 900	230	175	ST10 BOTHWAYS
F4	1050 X 1050	230	175	6T10 BOTHWAYS
F5	1200 X 1200	300	230	8T10 BOTHWAYS

NOTES:

1) ALL FOOTING, STUMPS & COLUMNS TO BE GRADE 25/20 CONC.
2) ALL BEAMS & SLABS TO BE GRADE 25/20 CONC.
3) REINFORCED CONCRETE:-
   a) THE CONCRETE GRADE SHALL UNLESS OTHERWISE STATED HAVE A CHARACTERISTIC STRENGTH OF AT LEAST 25N/mm2 AT 28 DAYS.
   b) PORTLAND CEMENT USE SHALL COMPLY WITH BS12.
   c) COARSE AND FINE AGGREGATES SHALL COMPLY WITH B.S 882.
4) CONC. COVER TO REINFORCEMENT

STRUCTURAL ELEMENT	NOT IN CONTACT WITH GROUND	IN CONTACT WITH GROUND
SLAB	20	35
BEAM	25	35
COLUMN	30	35
WALL	25	35
STAIRCASE	20	
PILE CAP		35

5) REINFORCEMENT SHALL COMPLY WITH BS 4466,4461,4449
   THE CHARACTERISTIC STRENGTH OF STEEL (R)
   IN THESE PLANS SHALL HAVE AT LEAST 250N/mm2.
   THE CHARACTERISTIC STRENGTH OF STEEL (T)
   IN THESE PLANS SHALL AT LEAST 460 N/mm2.
6) EXCAVATED FOUNDATIONS AND STEEL REINFORCEMENT ARE TO BE APPROVED BY ENGINEER BEFORE PLACING OF CONCRETE. POSITION OF LAPS FOR MAIN REINFORCEMENT TO BE AS SHOWN ON DRAWINGS.
7) MILD & HIGH TENSILE STEEL - ALL TENSION & COMPRESSION LAP LENGTH TO BE 40 x BAR DIA. (UNLESS OTHERWISE STATED)

Note of Roof Truss System

1). Design, supply, fabricated and deliver to site using GANG NAIL SYSTEM or other equal and approved including fixing and hoisting in position all fabricated timber roof truss, rafters, chord, bearers tie, strut, packing piece, wall plate, truss connector, straps and other associated works, materials and labour required for the complete installation of the fabricated timber trusses to the approval of the Engineer.

2). The Contractor shall provide a written guarantee from the manufacturer for a period of ten (10) years from the date of practical completion to cover against faulty materials, workmanship and installation and other defects or design fault, whereby all failure of the fabricated roof trusses system in whole or in part are to be rectified at no cost.

3). Wrot timber is to be used wherever exposed including painting with approved gloss paint.

4). The design which must have rafter spacing of not more than 1200mm centre is subject to the approval of the Engineer and must be properly examined and certified by a PROFESSIONAL STRUCTURE ENGINEER.

5.) Strength group of timber to be minimum SG4 (MS 544 : Part 2 : 2001).

6). The Contractor is required to produce and submit to the Engineer the certified proposed drawings together with his Tender Document and if accepted thereafter to submit certified working and as-built drawing during after construction as appropriate.

7.) The Engineer may order the samples to be taken for the following tests:
   i) Test on salt retention
   ii) Timber species

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APPR'D :	
SCALE :	

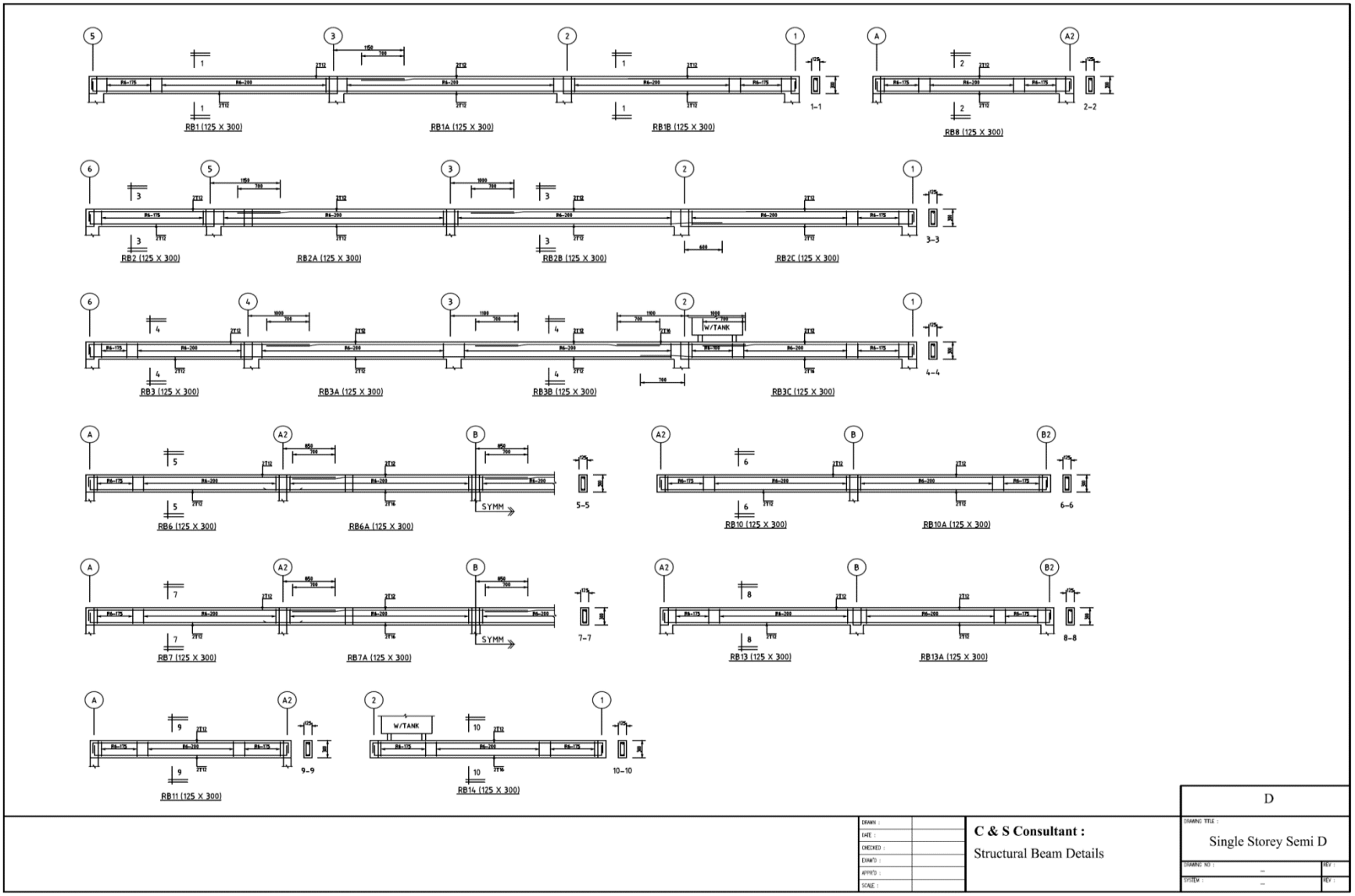
C & S Consultant :
Structural Drawing

C

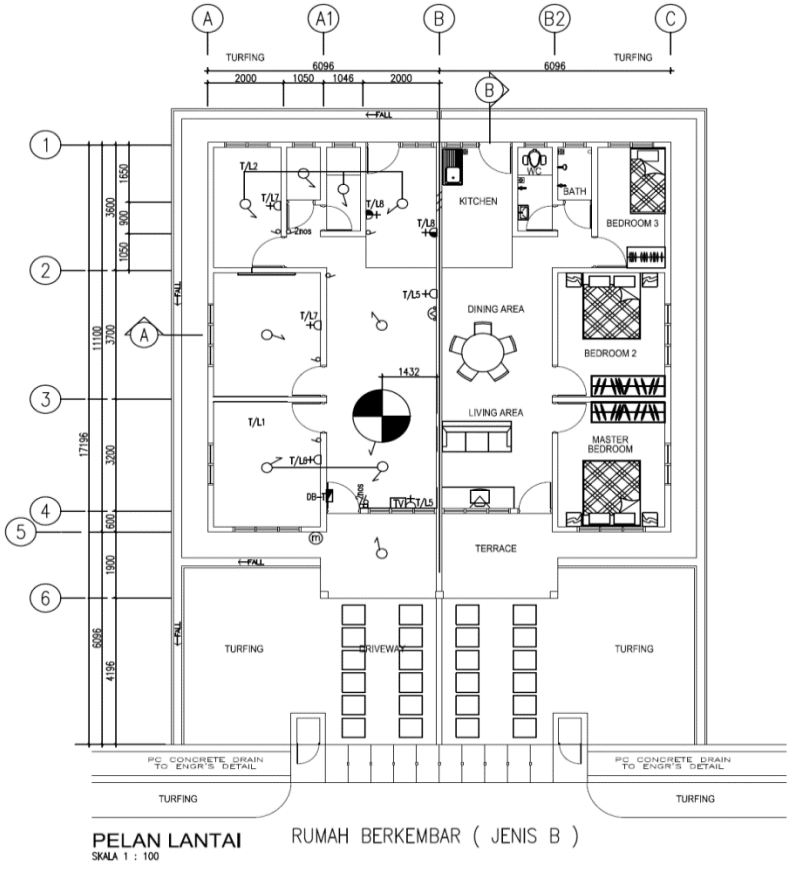
DRAWING TITLE :
Single Storey Semi D

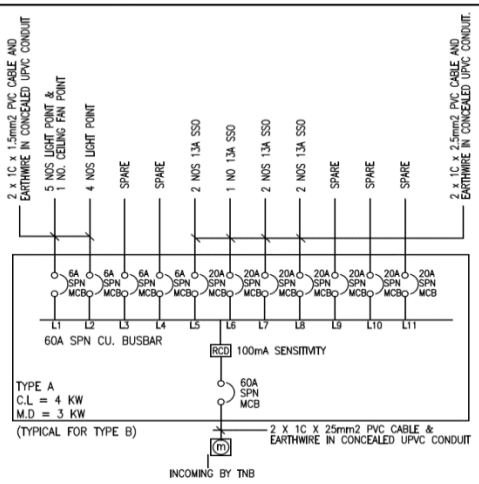
DRAWING NO : — REV :
SYSTEM : — REV :

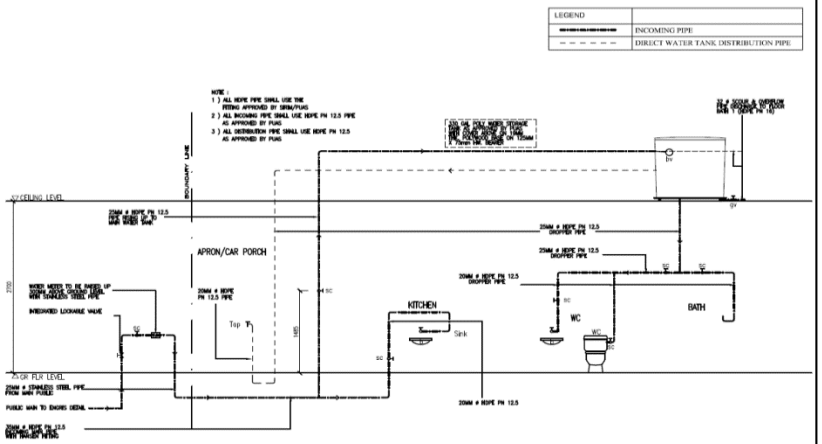
4.a CONVENTIONAL METHOD : Single Storey
- ii.2) C&S DRAWING : Gr. Beam Structural detail



4.a CONVENTIONAL METHOD : Single Storey
- iii.1) M&E DRAWING : Layout & Schematic Diagram







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APP'D :	
SCALE :	

M & E Consultant :
Mechanical & Electrical Drawing

E

DRAWING TITLE :
Single Storey Semi D

DRAWING NO : — REV :
SYSTEM : — REV :

4.a CONVENTIONAL METHOD : Double storey

- i.1) ARCHITECT DRAWING : Gr.Flr Layout Plan

LEGEND

FINISHES

FLOOR / SKIRTING / CEILING / WALL

FLOOR
CT - CERAMIC TILES
PT - PORCELAIN TILES
CS - CEMENT SCREED
IC - IMPRINT CONCRETE FINISH
LT - LAMINATED TIMBER FLOORING
BB - BROOM-BRUSH CONCRETE

SKIRTING
SC - CERAMIC TILE SKIRTING
SP - PORCELAIN TILE SKIRTING
ST - HDF SKIRTING

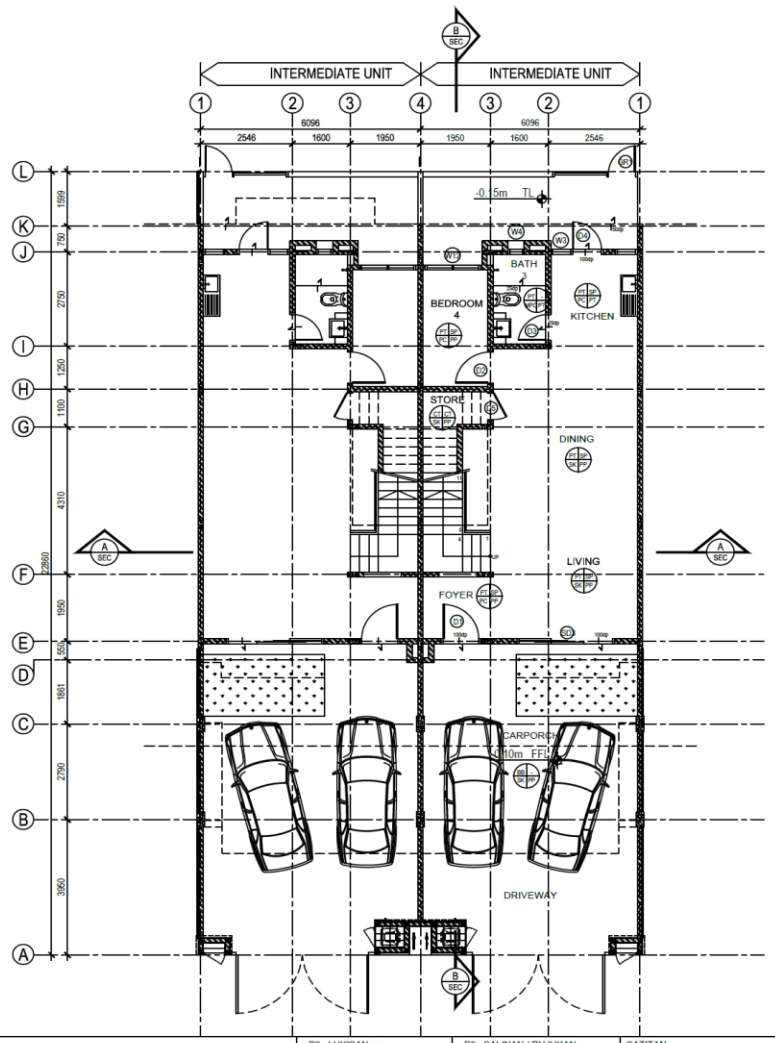
CEILING
SK - SKIM COAT PLASTER & PAINT
PC - PLASTER CEILING
MPC - MOISTURE RESISTANT PLASTER CEILING
FC - FIBRE-CEMENT BOARD CEILING

WALL
PP - CEMENT PLASTER AND PAINT
CT - CERAMIC TILES

SANITARY / PLUMBING

ITEM	DESCRIPTION
b	WASH BASIN
bt	BASHTUB
wc	WATER CLOSET
bd	BIDET
fl	FLOOR TRAP
sh	SOAP HOLDER
shw	SHOWER
t	TAP
SH	TOILET HOLDER
sink	KITCHEN SINK
mh	MANHOLE
vp	VENT PIPE
swp	SOIL & WASTE PIPE
rwdp	RAIN WATER DOWN PIPE
gt	GULLY TRAP
	FLOOR DROP
rwo	RAIN WATER OUTLET

NOTE: SANITARY AND PLUMBING LAYOUT REFER TO M&E ENGINEER'S DRAWING



TAJUK: GAMUDA SERAI HILL	LUKISAN: GROUND FLOOR PLAN	BIL. LUKISAN: 2014 / P106	BIL. SALINAN / RUJUKAN: SV/A.2.101 Rev C
		UKURAN : 1:125	DILUKIS : YZ / KENNY
		TARIKH : MAY 2014	DISEMAK : LENNY

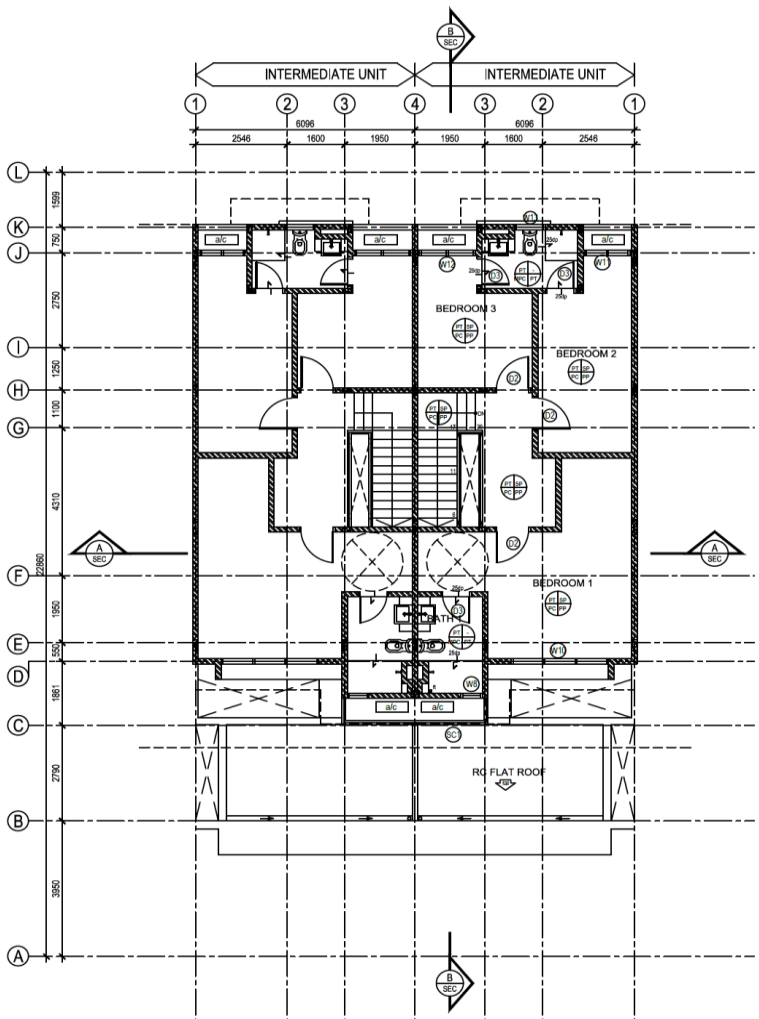
CATITAN
09/06/14 A ISSUED FOR TENDER
02/07/14 B ISSUED FOR REVISED

1

CL&O ARCHITECTS SDN BHD
79-2, BLOCK G, ZENITH CORPORATE PARK, JALAN SS7/26, 47301 PETALING JAYA, SELANGOR DARUL EHSAN
TEL : 603-7887 8193
FAX : 603-7887 8193
EMAIL : cloa@cloa.com.my (1038958-P)

4.a CONVENTIONAL METHOD : Double storey

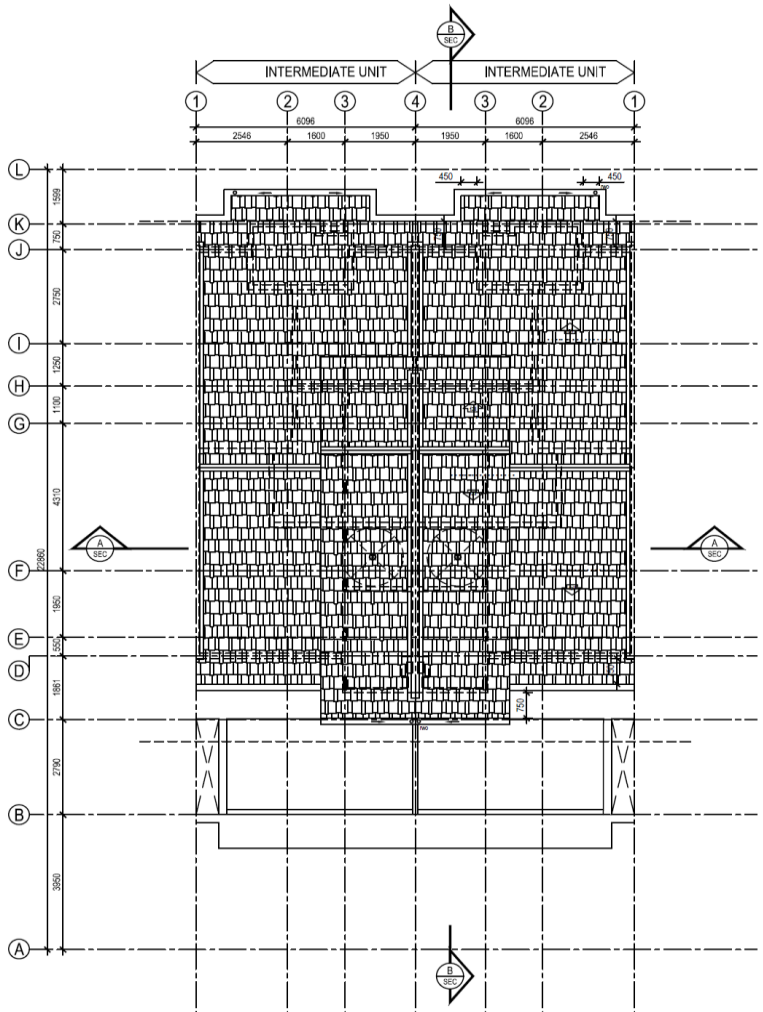
- i.2) ARCHITECT DRAWING : 1st Flr Layout Plan



TAJUK **GAMUDA SERAI HILL**	LUKISAN **FIRST FLOOR PLAN**	BIL. LUKISAN 2014 / P106	BIL. SALINAN / RUJUKAN SV/A.2.102 Rev C	CATITAN 09/06/14 A ISSUED FOR TENDER 02/07/14 B ISSUED FOR REVISED	CL&O ARCHITECTS SDN BHD 79-2, BLOCK G, ZENITH CORPORATE PARK, JALAN SS7/26, 47301 PETALING JAYA, SELANGOR DARUL EHSAN TEL : 603-7887 8193 FAX : 603-7887 8193 EMAIL : cloa@cloa.com.my (1038658-P)
		UKURAN : 1:125	DILUKIS : YZ / KENNY		
		TARIKH : MAY 2014	DISEMAK : LENNY		

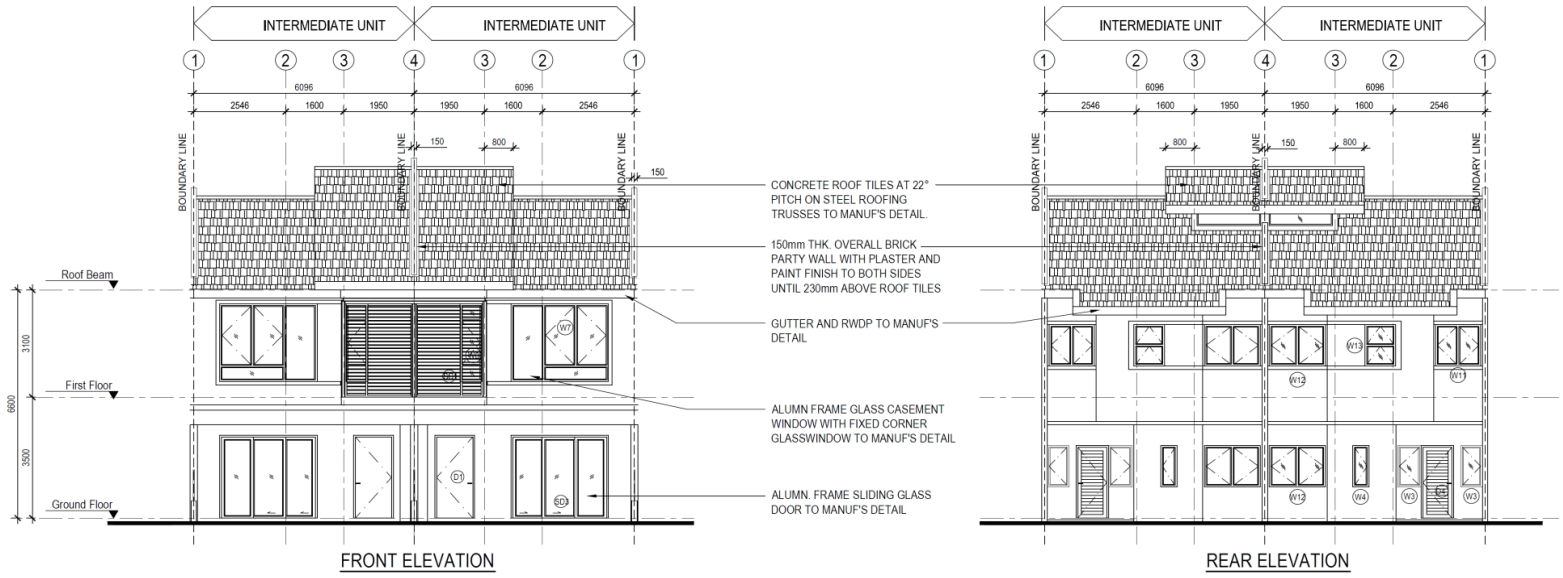
4.a CONVENTIONAL METHOD : Double Storey

- i.3) ARCHITECT DRAWING : Roof Plan



TAJUK **GAMUDA SERAI HILL**	LUKISAN **ROOF PLAN**	BIL. LUKISAN 2014 / P106	BIL. SALINAN / RUJUKAN SV/A.2.103 Rev C	CATITAN 09/06/14 A ISSUED FOR TENDER 02/07/14 B ISSUED FOR REVISED	CL&O ARCHITECTS SDN BHD 79-2, BLOCK G, ZENITH CORPORATE PARK, JALAN SS7/26, 47301 PETALING JAYA, SELANGOR DARUL EHSAN TEL : 603-7887 8183 FAX : 603-7887 8183 EMAIL : cloa@cloa.com.my (1038668-P)
		UKURAN : 1:125	DILUKIS : YZ / KENNY		
		TARIKH : MAY 2014	DISEMAK : LENNY		

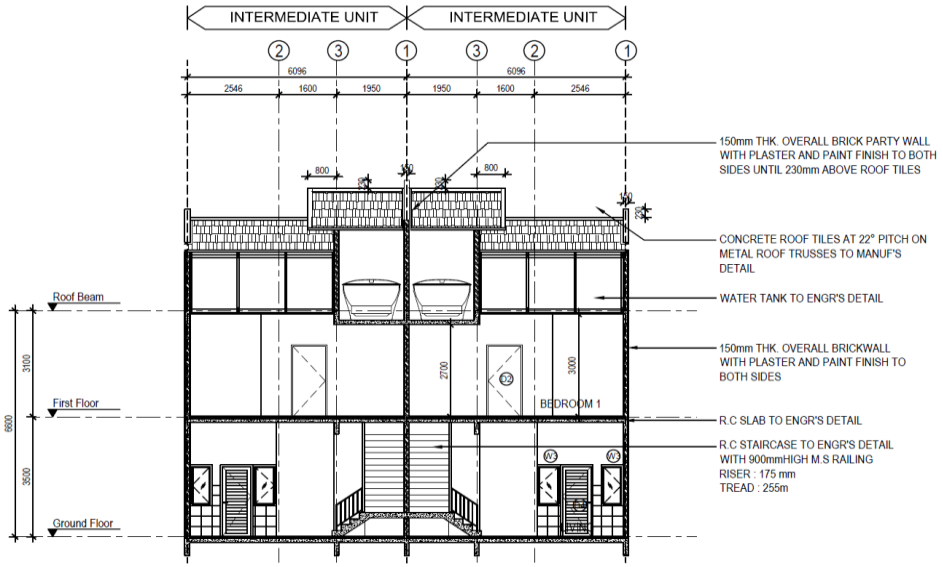
4.a CONVENTIONAL METHOD : Double Storey
- i.4) ARCHITECT DRAWING : Elevation



TAJUK **GAMUDA SERAI HILL**	LUKISAN **FRONT ELEVATION** **REAR ELEVATION**	BIL. LUKISAN 2014 / P106	BIL. SALINAN / RUJUKAN SV/A.4.101 Rev C	CATITAN 09/06/14 A ISSUED FOR TENDER 02/07/14 B ISSUED FOR REVISED	CL&O ARCHITECTS SDN BHD 79-2, BLOCK G, ZENITH CORPORATE PARK, JALAN SS7/26, 47301 PETALING JAYA, SELANGOR DARUL EHSAN TEL : 603-7867 6193 FAX : 603-7867 6193 EMAIL : clos@clos.com.my (1039658-P)
		UKURAN : 1:125	DILUKIS : YZ / KENNY		
		TARIKH : MAY 2014	DISEMAK : LENNY	4	

4.a CONVENTIONAL METHOD : Double Storey

- i.5) ARCHITECT DRAWING : Section Plan

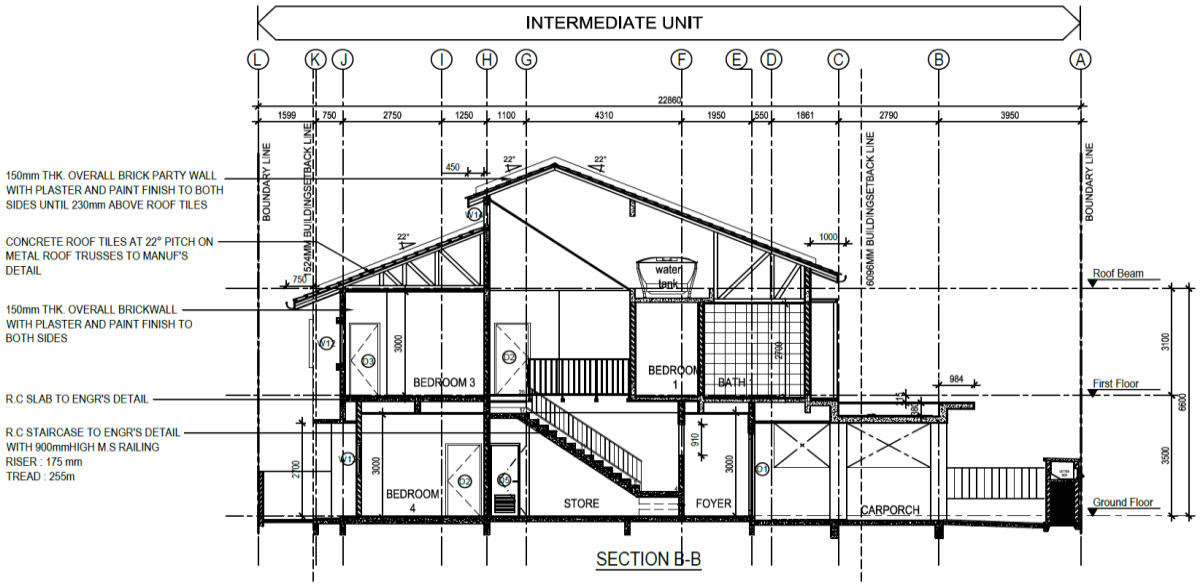


SECTION A-A

TAJUK **GAMUDA SERAI HILL**	LUKISAN **SECTION A-A**	BIL. LUKISAN 2014 / P106	BIL. SALINAN / RUJUKAN SV/A.3.101 Rev C	CATITAN 09/06/14 A - ISSUED FOR TENDER 02/07/14 B - ISSUED FOR REVISED	CL&O ARCHITECTS SDN BHD 79-2, BLOCK G, ZENITH CORPORATE PARK, JALAN SS7/26, 47301 PETALING JAYA, SELANGOR DARUL EHSAN TEL : 603-7887 8193 FAX : 603-7887 8193 EMAIL : cloa@cloa.com.my (1038668-P)
		UKURAN : 1:125	DILUKIS : YBZ/YANA/KENNY		
		TARIKH : JUNE 2014	DISEMAK : LENNY		

4.a CONVENTIONAL METHOD : Double Storey

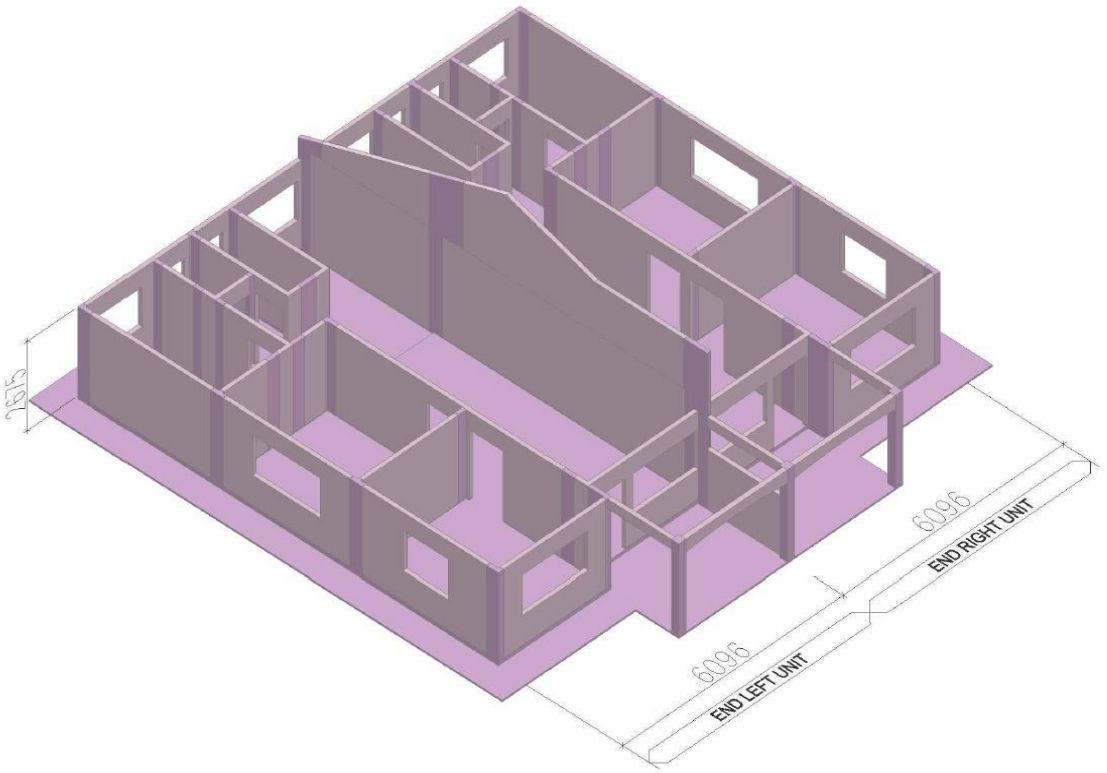
- i.6) ARCHITECT DRAWING : Section Plan

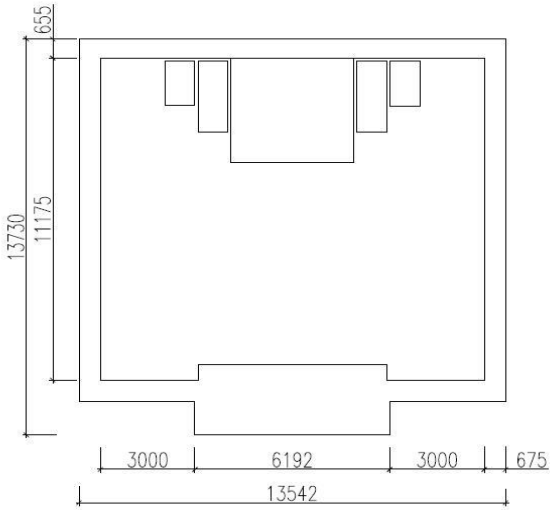


TAJUK **GAMUDA SERAI HILL**	LUKISAN **SECTION B-B**	BIL. LUKISAN 2014 / P106	BIL. SALINAN / RUJUKAN SV/A.3.102 Rev C	CATITAN 09/06/14 A - ISSUED FOR TENDER 02/07/14 B - ISSUED FOR REVISED	CL&O ARCHITECTS SDN BHD 79-2, BLOCK G, ZENITH CORPORATE PARK, JALAN SS7/26, 47301 PETALING JAYA, SELANGOR DARUL EHSAN TEL : 603-7887 8193 FAX : 603-7887 8193 EMAIL : clca@clca.com.my (1036658-P)
		UKURAN : 1:125	DILUKIS : YBZ/YANA/KENNY		
		TARIKH : JUNE 2014	DISEMAK : LENNY		

4.b GREEN TECHNOLOGY : 40 % LABOUR REDUCE

- 1. Approval by Client, Confirmation & Endorsement by Consultant





86% Precast Element at Factory

14% Wet work on site (by System Formwork)

	Ground Floor
	Precast Element
	In-Situ Work

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	MAY 2015
CHECKED :	LEE
APPD :	MNG
APPVD :	MNG
SCALE :	NTS

Single Storey Semi D
End Left & Right Unit
836 Sqft

DRAWING TITLE : 1
DRAWING NO : – REV : –
SYSTEM : – REV : –

4.b GREEN TECHNOLOGY : 40 % LABOUR REDUCE

- 2. Approval by Client, Confirmation & Endorsement by Consultant

Summary

Item	Description	Unit	End Left Unit		End Right Unit	
			Precast	In-situ	Precast	In-situ
1)	Ground Floor					
a.	Panel	m^3	22.219	-	22.219	-
b.	Wet Joint	m^3	-	3.802	-	3.802
c.	Precast Beam	m^3	0.384	-	0.384	-
	Sub Total	m^3	22.603	3.802	22.603	3.802
	Total	m^3	26.405		26.405	
	Percentage	%	85.60	14.40	85.60	14.40
	GFA	m^2	77.63		77.63	

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

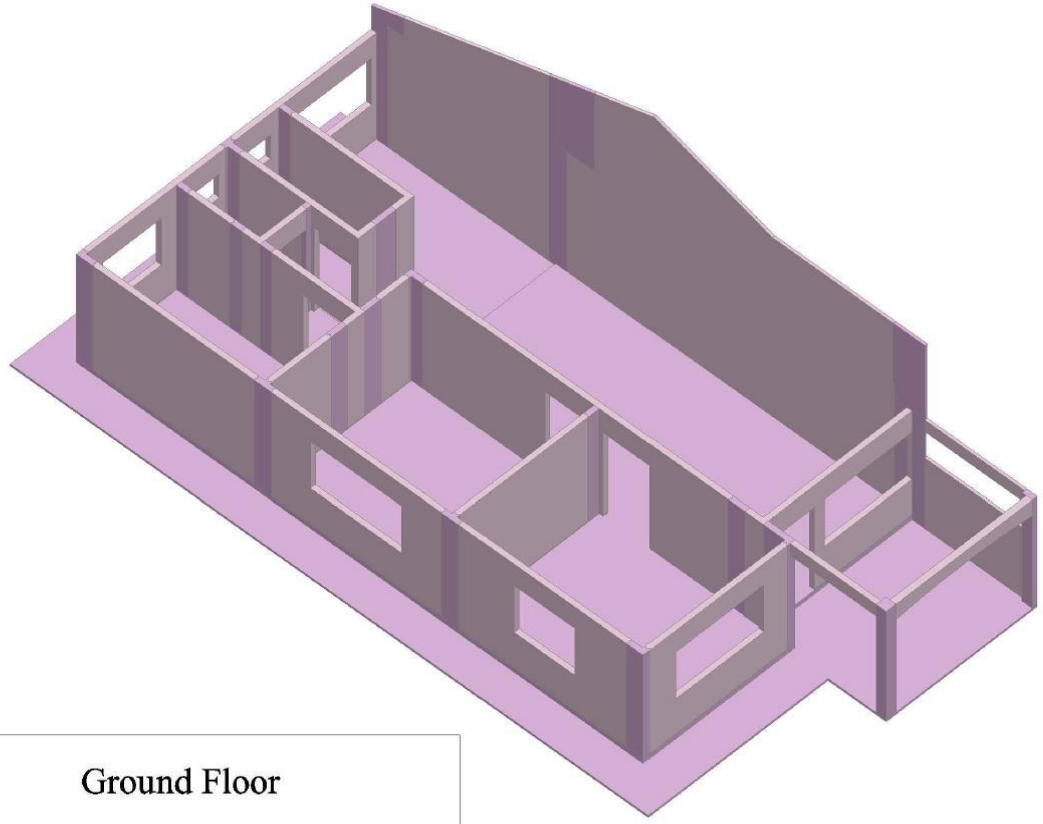
DRAWN :	ZUL
DATE :	MAY 2015
CHECKED :	LEE
EXAM'D :	WNG
APPR'D :	WNG
SCALE :	NTS

Single Storey Semi D
End Left & Right Unit
836 Sqft

DRAWING TITLE : 2
DRAWING NO : --
REV : --
SYSTEM : --
REV : --

4.b GREEN TECHNOLOGY : 40 % LABOUR REDUCE

- 3. Approval by Client, Confirmation & Endorsement by Consultant



Ground Floor

Precast Element

In-Situ Work

Single Storey Semi-D - End Left Unit : RM 23,764.50

86% Precast Element at Factory
14% Wet work on Site (by system formwork)

Item	Description	Unit	End Left Unit	
			Precast	In-situ
1)	Ground Floor			
a.	Panel	m^3	22.219	-
b.	Wet Joint	m^3	-	3.802
c.	Precast Beam	m^3	0.384	-
	Sub Total	m^3	22.603	3.802
	Total	m^3	26.405	
	Rate / m^3	RM	900.00	
	Total Amount	RM	23,764.50	
	GFA	m^2	77.63	
	Rate / m^2 GFA	RM	306.13	
	Rate / ft^2 GFA	RM	28.44	
	Percentage	%	85.60	14.40

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No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER
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Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	JUL
DATE :	MAY 2015
CHECKED :	LEE
EXAM'D :	MNG
APPR'D :	MNG
SCALE :	NTS

Single Storey Semi D
End Left & Right Unit
836 Sqft

DRAWING TITLE : 3

DRAWING NO : –

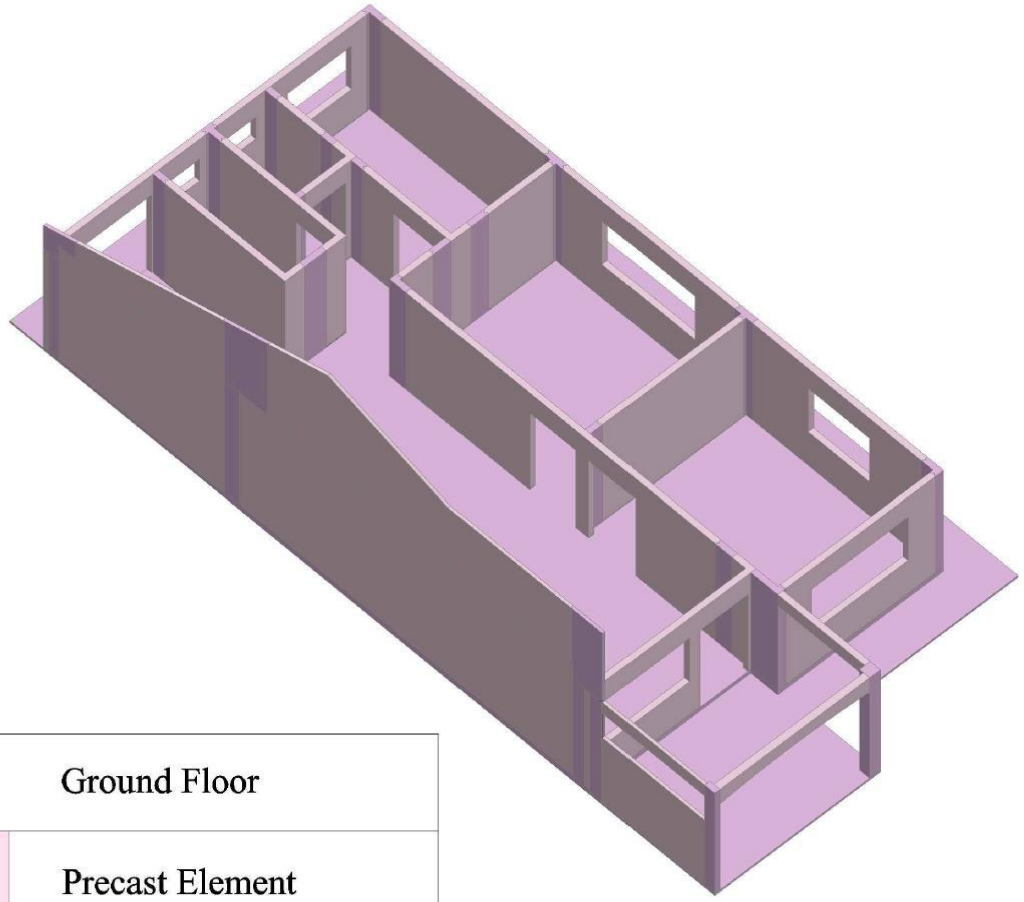
REV : –

SYSTEM : –

REV : –

4.b GREEN TECHNOLOGY : 40 % LABOUR REDUCE

- 4. Approval by Client, Confirmation & Endorsement by Consultant



Ground Floor

Precast Element

In-Situ Work

Single Storey Semi-D - End Right Unit : RM 23,764.50

86% Precast Element at Factory
14% Wet work on Site (by system formwork)

Item	Description	Unit	Intermediate Right Unit	
			Precast	In-situ
1)	Ground Floor			
a.	Panel	m^3	22.219	-
b.	Wet Joint	m^3	-	3.802
c.	Precast Beam	m^3	0.384	-
	Sub Total	m^3	22.603	3.802
	Total	m^3	26.405	
	Rate / m^3	RM	900.00	
	Total Amount	RM	23,764.50	
	GFA	m^2	77.63	
	Rate / m^2 GFA	RM	306.13	
	Rate / ft^2 GFA	RM	28.44	
	Percentage	%	85.60	14.40

SYSTEM PROVIDER
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Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	MAY 2015
CHECKED :	LEE
APPD :	MNC
APPR'D :	MNC
SCALE :	NTS

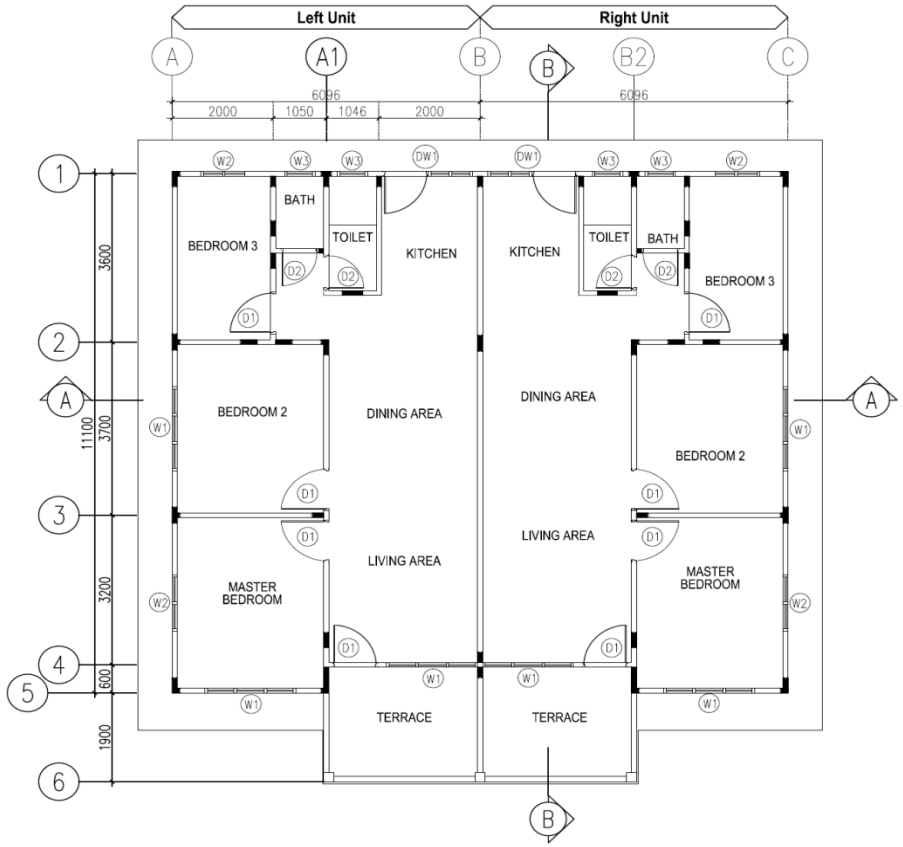
Single Storey Semi D
End Left & Right Unit
836 Sqft

DRAWING TITLE : 4

DRAWING NO : – REV : –

SYSTEM : – REV : –

4.c SYSTEM PROVIDER : Single Storey
- i.1) ARCHITECT : Layout Plan



DOOR SCHEDULE

TYPE	DISCRIPTION	SIZES (mm)
D1	GALVANNEAL PLY FLUSH DOOR TO DETAIL	900 X 2100
D2	GALVANNEAL FRAME PLY FLUSH DOOR TO DETAIL	750 X 2100
DW1	GALVANNEAL FRAME PLY FLUSH DOOR TO GALVANNEAL FRAME ADJUSTABLE ABSCURED LOUVRE WINDOW TO MANUF'S DETAIL	900 X 2150 + 875 X 1200

WINDOW SCHEDULE

TYPE	DISCRIPTION	SIZES (mm)
W1	GALVANNEAL FRAME ADJUSTABLE GLASS LOUVRE WINDOW TO MANUF'S DETAIL	1800 X 1200
W2	GALVANNEAL FRAME ADJUSTABLE GLASS LOUVRE WINDOW TO MANUF'S DETAIL	1200 X 1200
W3	GALVANNEAL FRAME FIXED GLASS LOUVRE WINDOW TO MANUF'S DETAIL	600 X 600

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SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mail:enquiry@hcprecast.com, www.hcprecast.com

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41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	OCT 2014
CHECKED :	LEE
EXAM'D :	MNG
APPR'D :	MNG
SCALE :	NTS

Layout Plan

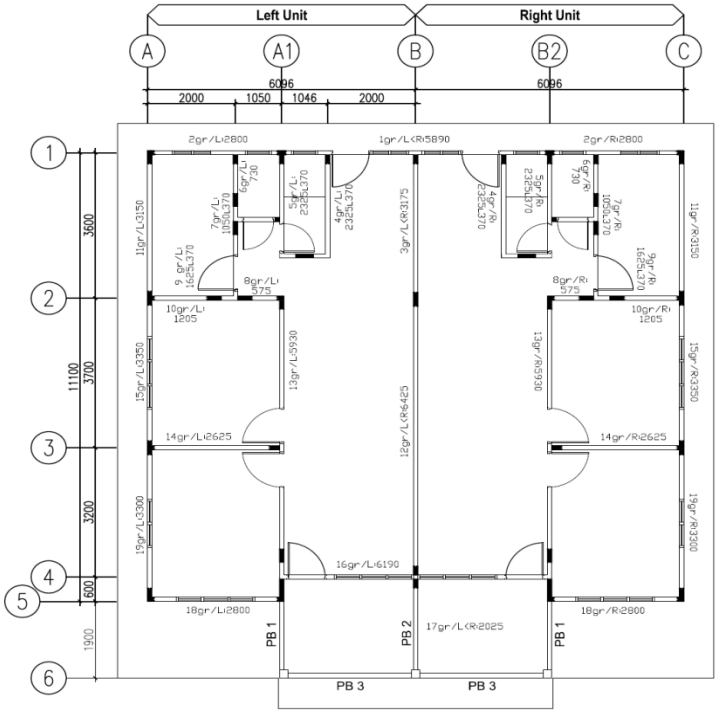
DRAWING TITLE : Single Storey Semi D

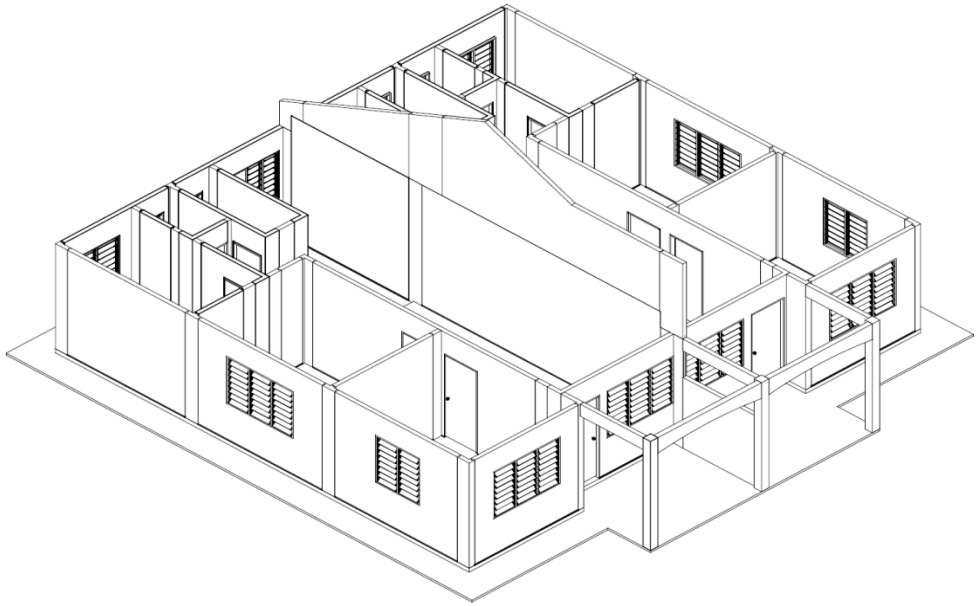
DRAWING NO : – REV : –

SYSTEM : – REV : –

4.c SYSTEM PROVIDER : Single Storey

- i.2) ARCHITECT : Layout , 3D Wall & Column

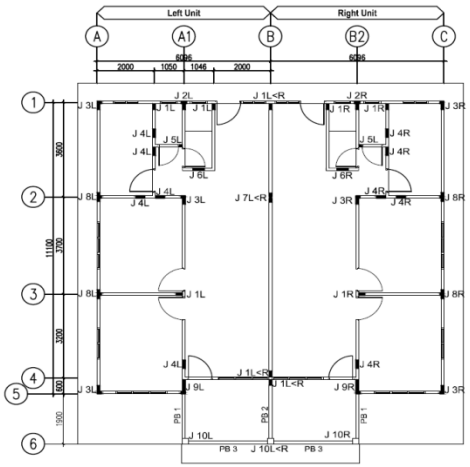




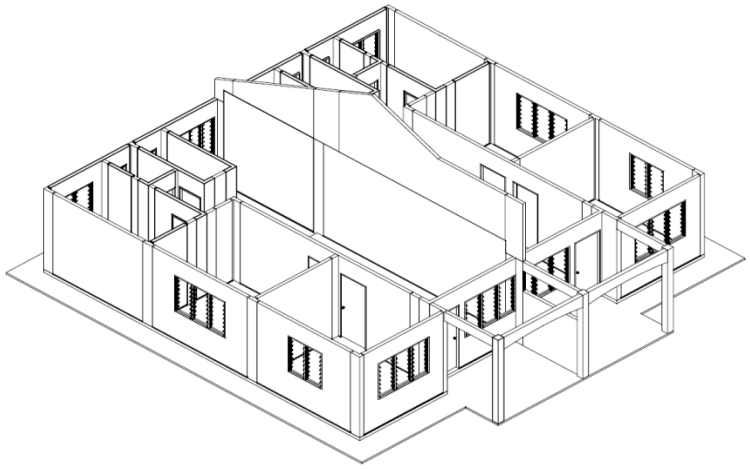
13

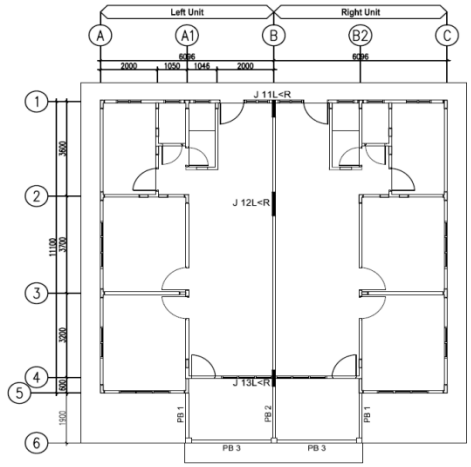
SYSTEM PROVIDER: **HC PRECAST SYSTEM SDN. BHD.** (586697-M) No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993 e-mail:enquiry@hcprecast.com, www.hcprecast.com	MANUFACTURER: **HC MANUFACTURING SDN. BHD.** (585570-T) No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993	DRAWN : ZUL; DATE : OCT 2014; CHECKED : LEE; APP'D : MNG; SCALE : NTS	Layout Plan & 3D	DRAWING TITLE : Single Storey Semi D; DRAWING NO : –; REV : –; SYSTEM : –; REV : –

4.c SYSTEM PROVIDER : Single Storey
- ii.1) C&S : Layout Plan , 3D Wall & Column Schedule



Ground Floor Column Layout





Party Wall Column Layout

Ground Floor Column Schedule

No	MJ	Column
1	J 1L	
2	J 2L	
3	J 3L	
4	J 4L	
5	J 5L	
6	J 6L	
7	J 7L	
8	J 8L	
9	J 9L	
10	J 10L	

Party Wall Column Schedule

No	MJ	Column
1	J 11L	
2	J 12L	
3	J 13L	

Beam Schedule

No	PB	BEAM
1	PB 1	
2	PB 2	
3	PB 3	

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SYSTEM PROVIDER

HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
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e-mail:enquiry@hcprecast.com, www.hcprecast.com

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41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

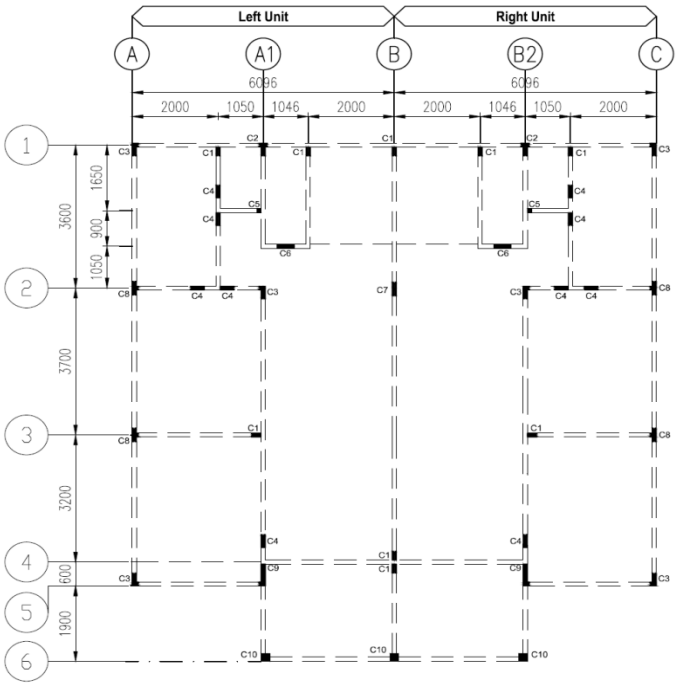
DRAWN :	ZUL
DATE :	OCT 2014
CHECKED :	LEE
EXAM'D :	MNG
APPR'D :	MNG
SCALE :	NTS

Column & Beam Layout

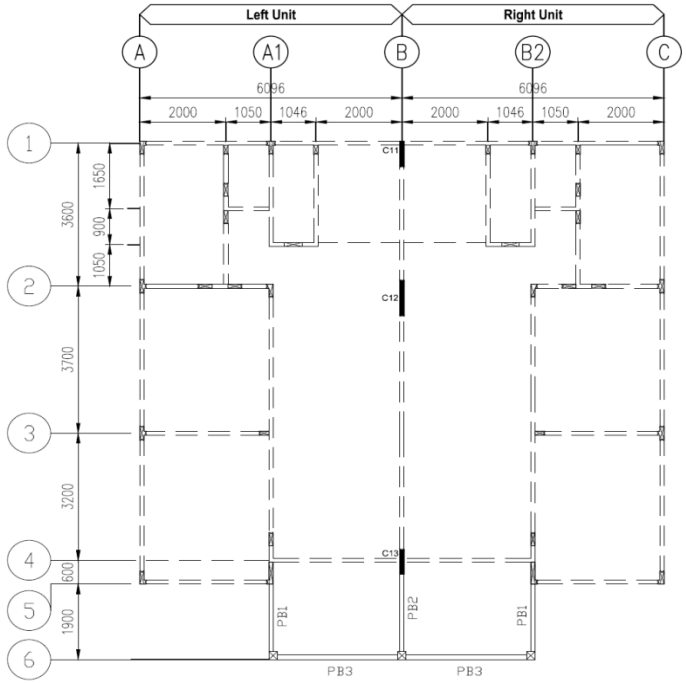
DRAWING TITLE :
Single Storey Semi D

DRAWING NO : – REV : –
SYSTEM : – REV : –

4.c SYSTEM PROVIDER : Single Storey
- ii.2) C&S : Gr Flr Column, Roof Beam & Patty Wall Layout Plan



Ground Floor Column Layout Plan



Roof Beam & Party Wall Column Layout Plan

16

DRAWN :
DATE :
CHECKED :
EXAM'D :
APPR'D :
SCALE :

C & S Consultant :

Ground Floor Column Layout Plan, Roof Beam & Party Wall Column Layout Plan

DRAWING TITLE :
Single Storey Semi D

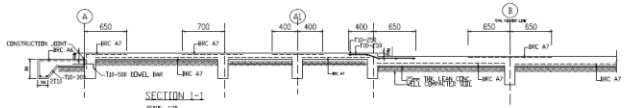
DRAWING NO : — REV : —

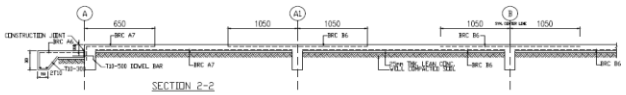
SYSTEM : — REV : —

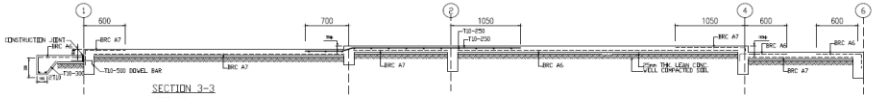
4.c SYSTEM PROVIDER : Single Storey
- ii.3) C&S : Raft Foundation, Column & Beam details

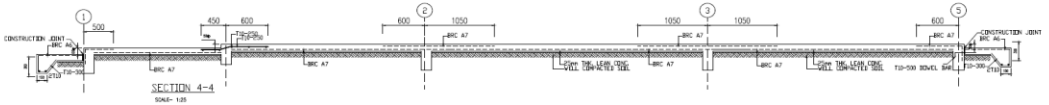
COLUMN SCHEDULE

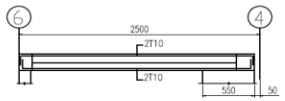
PARTY WALL TO ROOF													
SIZE											AS SHOWN	AS SHOWN	AS SHOWN
REINFT											4T12	5T12	4T12
LINKS											R6-200 c/c	R6-200 c/c	R6-200 c/c
ROOF TO GROUND													
SIZE	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN			
REINFT	3T12	3T12	3T12	3T12	1T12	3T12	3T12	3T12	3T12	4T12			
LINKS	R6-200 c/c	R6-200 c/c	R6-200 c/c	2R6-200 c/c	—	R6-200 c/c	2R6-200 c/c	R6-200 c/c	R6-200 c/c	R6-200 c/c			
GROUND TO STUMP													
SIZE	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN	AS SHOWN			
REINFT	3T12	3T12	3T12	3T12	1T12	3T12	3T12	3T12	3T12	4T12			
LINKS	R6-200 c/c	R6-200 c/c	R6-200 c/c	2R6-200 c/c	—	R6-200 c/c	2R6-200 c/c	R6-200 c/c	R6-200 c/c	R6-200 c/c			
COLUMN MARK	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13

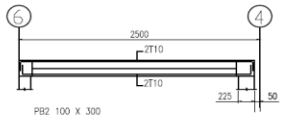


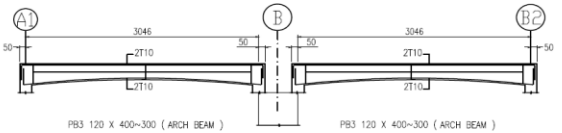












17

DRAWN :	
DATE :	
CHECKED :	
SUBMTD :	
APPRD :	
SCALE :	

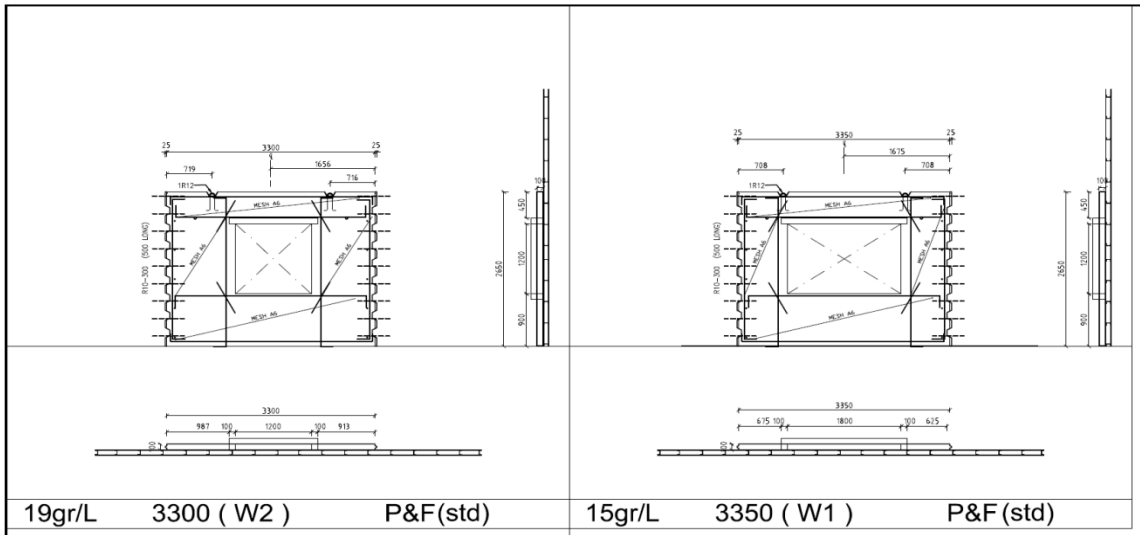
C & S Consultant :
Structural Detail

DRAWING TITLE :
Single Storey Semi D

DRAWING NO : –
REV :
SYSTEM : –
REV :

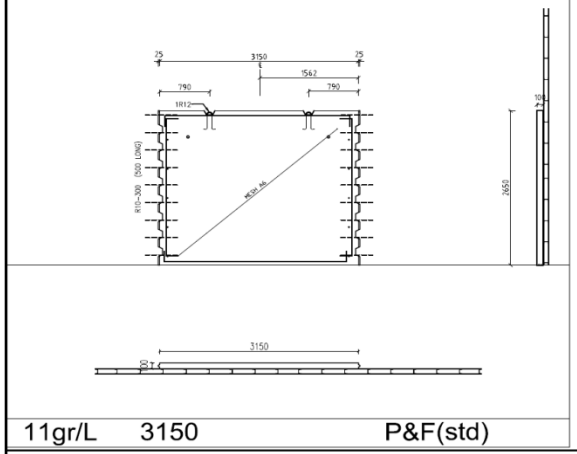
4.c SYSTEM PROVIDER : Single Storey

- ii.4) C&S : Panel List, Structural detail & Layout with numbering

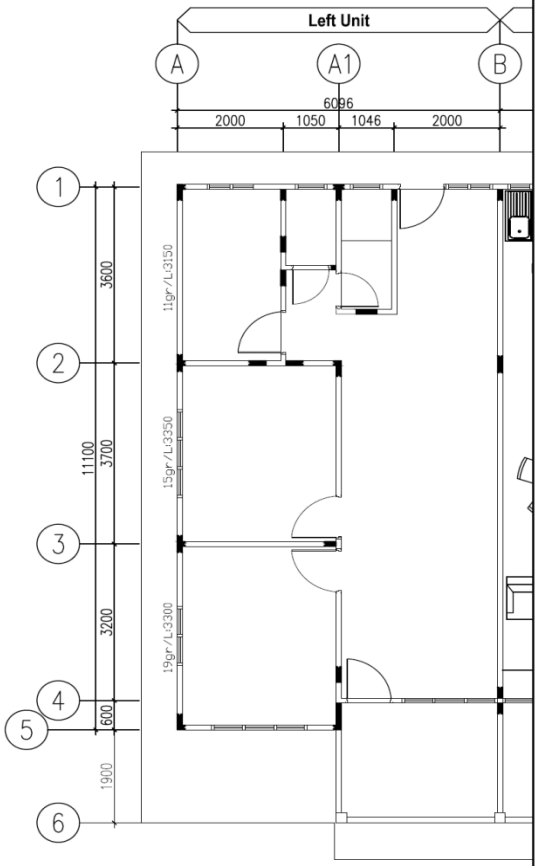


19gr/L 3300 (W2) P&F(std)

15gr/L 3350 (W1) P&F(std)



11gr/L 3150 P&F(std)



18

DRAWN :	KMO
DATE :	AUG
CHECKED :	MENG
EXAM'D :	MENG
APPR'D :	MENG
SCALE :	NTS

C & S Consultant :

Structural Panel List

DRAWING TITLE :

Single Storey Semi D

DRAWING NO : –

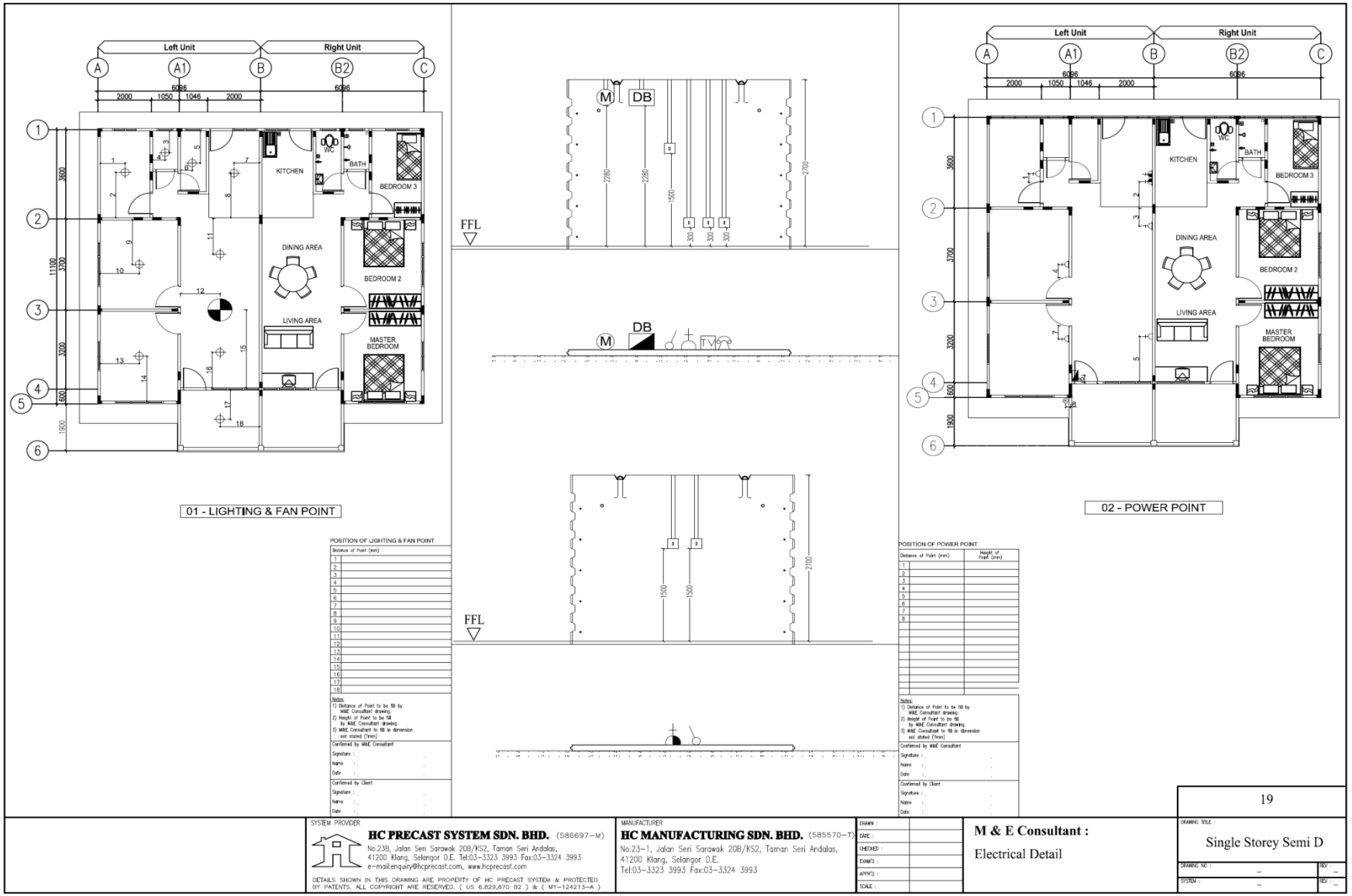
REV : REV:

SYSTEM : –

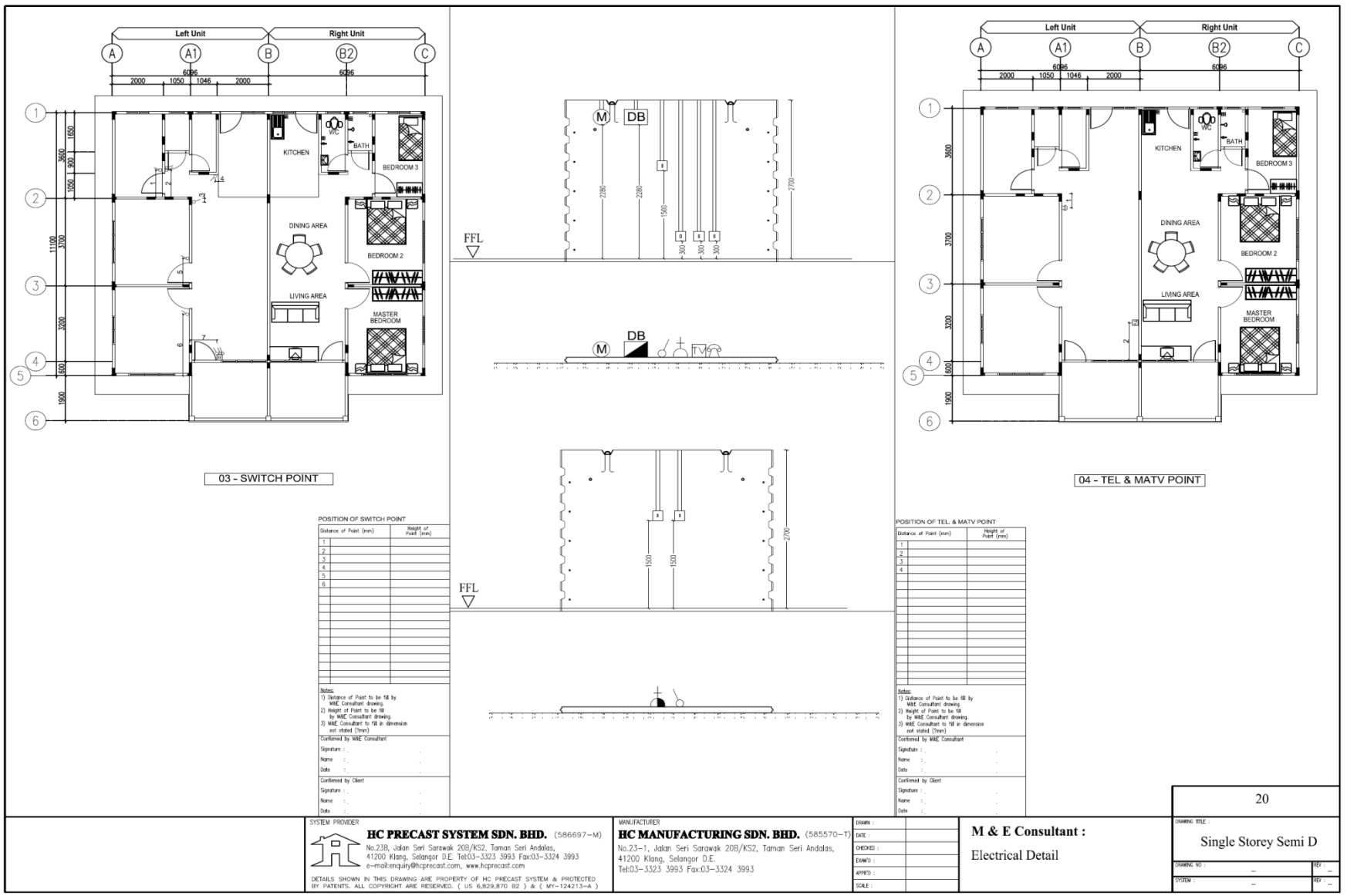
REV : REV:

4.c SYSTEM PROVIDER : Single Storey

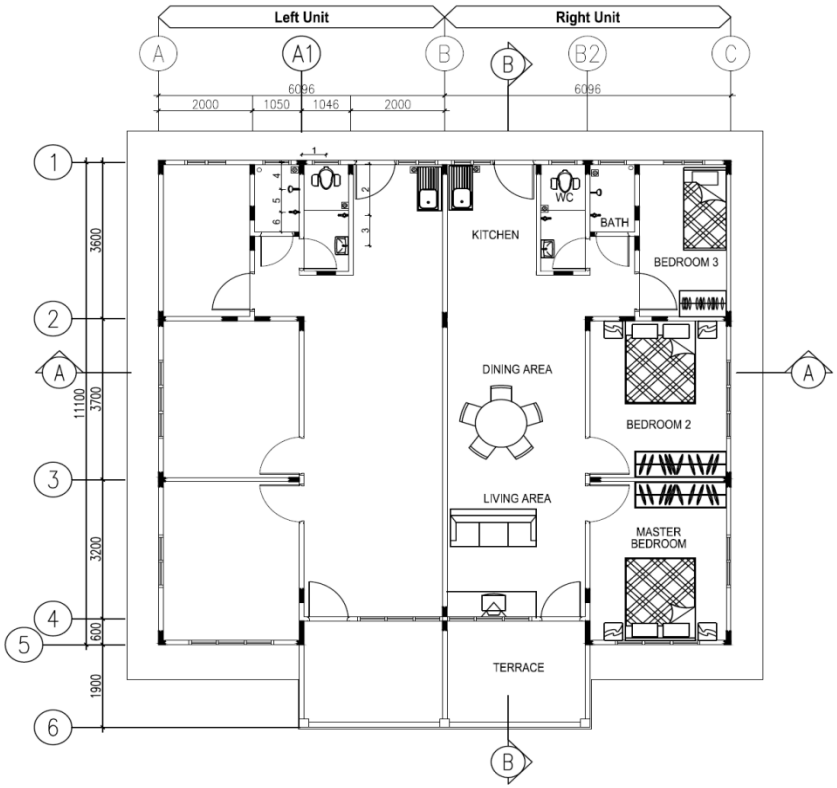
- iii.1) M&E : Shop drawing confirmation & endorsement by Consultant

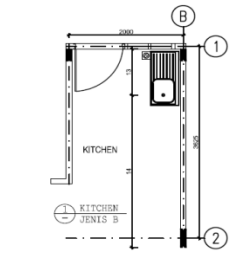


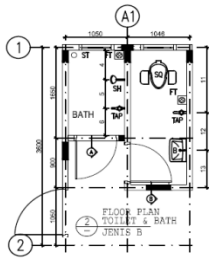
4.c SYSTEM PROVIDER : Single Storey
- iii.2) M&E : Shop drawing confirmation & endorsement by Consultant

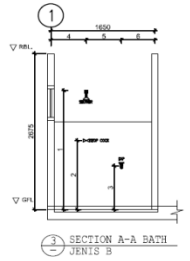


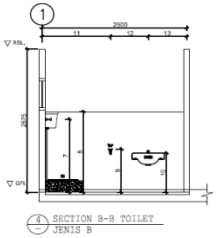
4.c SYSTEM PROVIDER : Single Storey
- iii.3) M&E : Shop drawing confirmation & endorsement by Consultant











POSITION OF BATH & TOILET FITTINGS

ITEM	DISTANCE	ITEM	DISTANCE
1		11	
2		12	
3		13	
4		14	
5			
6			
7			
8			
9			
10			

Notes:
1) Distance of Point to be fill by M&E Consultant drawing.
2) Height of Point to be fill by M&E Consultant drawing.
3) M&E Consultant to fill in dimension not stated (?mm)

Confirmed by M&E Consultant

Signature : . . . . . .

Name : . . . . . .

Date : . . . . . .

Confirmed by Client

Signature : . . . . . .

Name : . . . . . .

Date : . . . . . .

21

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

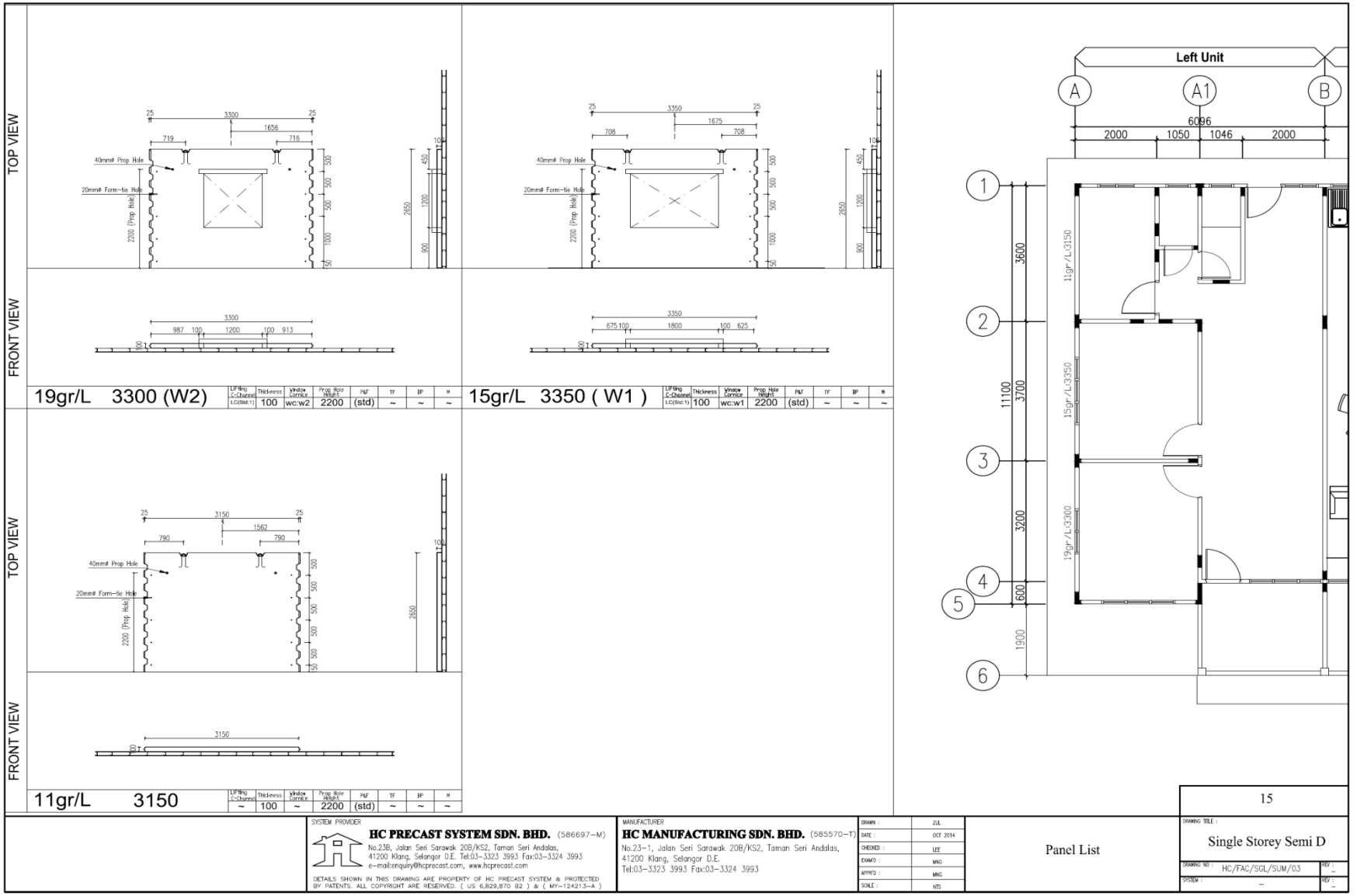
DRAWN :
DATE :
CHECKED :
EXAM'D :
APPR'D :
SCALE :

M & E Consultant :
Sanitary & Plumbing

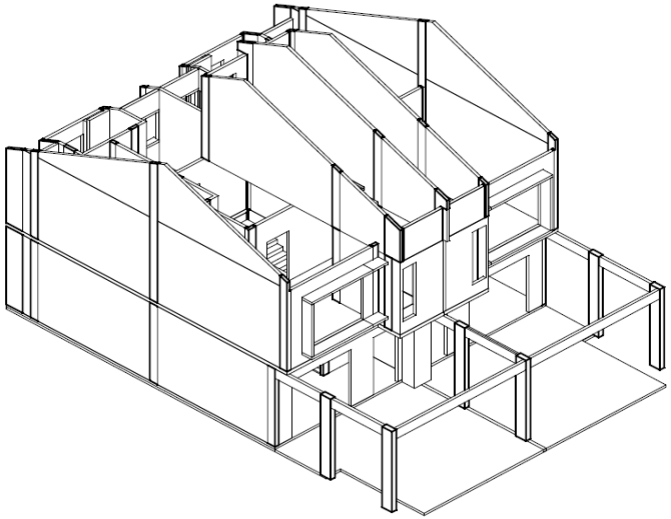
DRAWING TITLE :
Single Storey Semi D

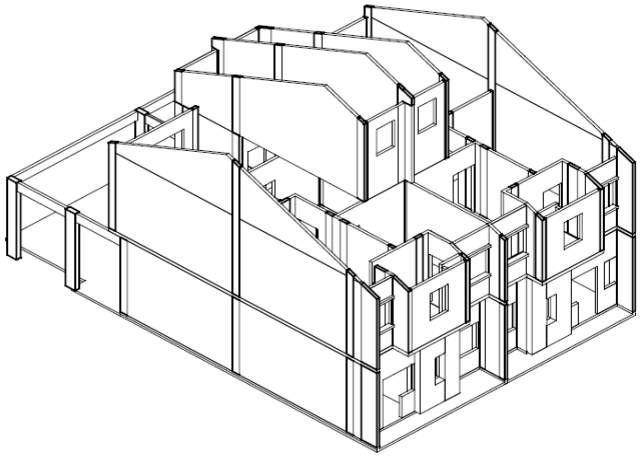
DRAWING NO : -- REV : REV:
SYSTEM : -- REV : REV:

4.c SYSTEM PROVIDER : Single Storey
- iii.4) M&E : Schematic Diagram Panel List & Layout Plan



4.c SYSTEM PROVIDER : Double Storey
- i.1) ARCHITECT : 3D drawing





Double Storey Terrace House

77% Precast Element at Factory (2 units)
23% Wet work on Site (by system formwork)

Item	Description	Concrete Volume (m^3)	
		Off Site	On Site
1)	Ground Floor Precast Wall , Beam & Staircase + Wet Joint	30.187	6.078
2)	First Floor Slab (Half Slab + In-situ)	7.792	13.458
3)	First Floor Precast Wall & Beam + Wet Joint	38.181	5.935
4)	Roof Floor Precast Wall	12.492	1.026
	Sub-Total	88.652	26.497
	Total Concrete Volume (2 units)		115.149

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Tel:03-3323 3993 Fax:03-3324 3993

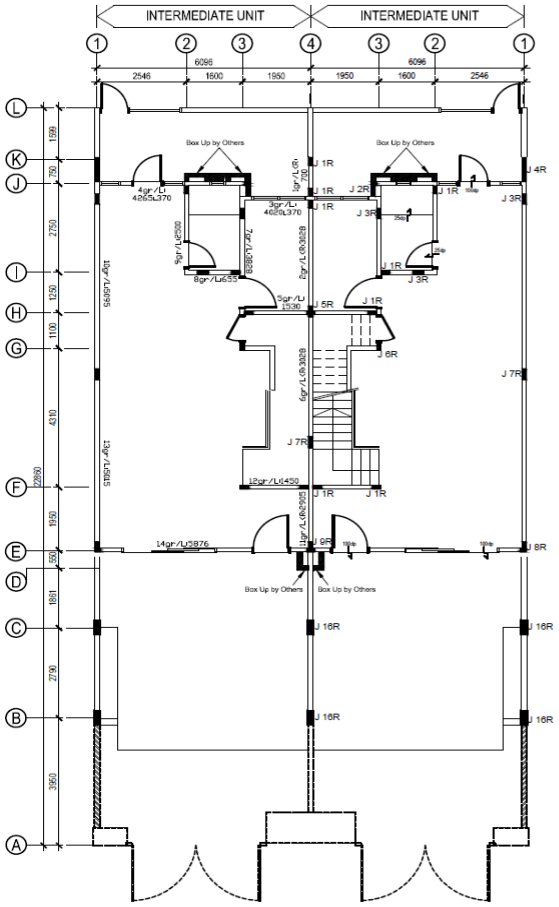
DRAWN :	ZUL
DATE :	JAN 2015
CHECKED :	LEE
DWG'D :	MNG
APPR'D :	MNG
SCALE :	NTS

Double Storey Terrace House
Intermediate Unit Left & Right

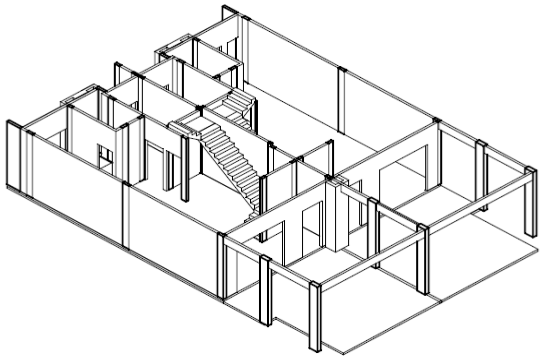
DRAWING TITLE : 1
DRAWING NO : –
REV : –
SYSTEM : –
REV : –

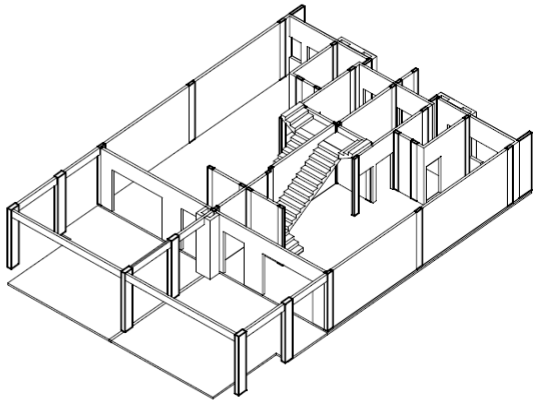
4.c SYSTEM PROVIDER : Double Storey

- i.2) ARCHITECT : Gr. Flr Layout, 3D drawing, Wall & Beam



Ground Floor Layout





Ground Floor Precast Wall

82% Precast Element at Factory (2 units)
18% Wet work on Site (by system formwork)

Item	Description	Pcs / Nos	Concrete Volume (m³)	
			Off Site	On Site
1)	Precast Panel	24	25.813	-
2)	Precast Beam	8	1.207	-
3)	Precast Staircase	6	3.167	
4)	Landing Slab (In-situ)	4		0.561
5)	Wet Joint	39	-	6.147
	Sub-Total		30.187	6.078
	Total Concrete Volume (2 units)			36.895

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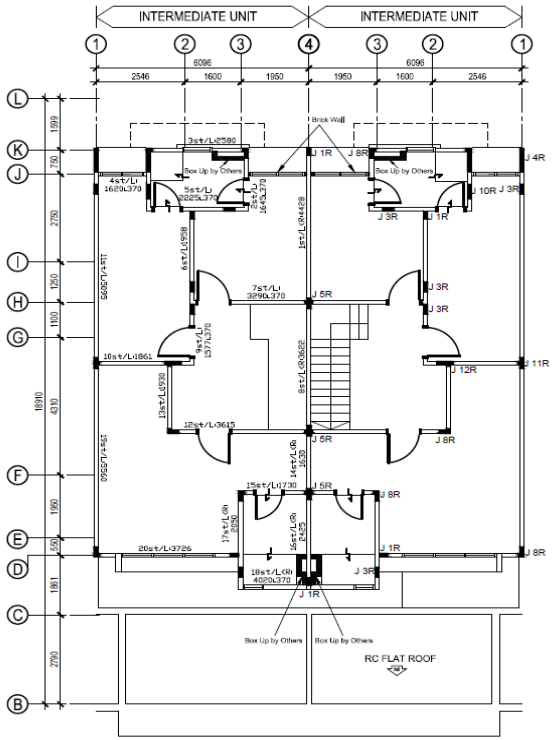
DRAWN :	JUL
DATE :	JAN 2015
CHECKED :	LEE
APPVD :	MNG
SCALE :	NTS

Double Storey Terrace House
Intermediate Unit Left & Right

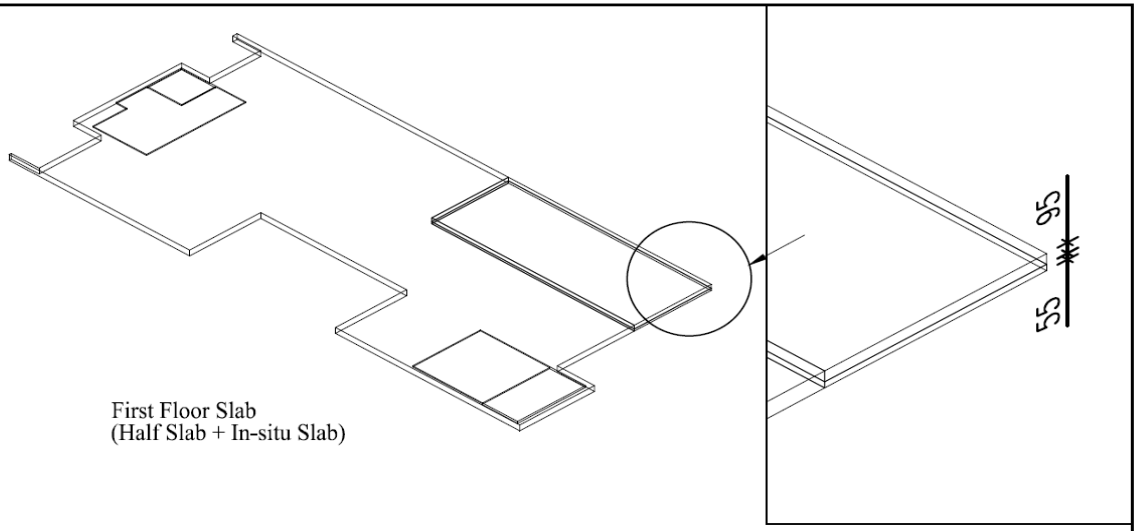
DRAWING TITLE : 2
DRAWING NO : - REV : -
SYSTEM : - REV : -

4.c SYSTEM PROVIDER : Double Storey

- i.3) ARCHITECT : 1st Flr Layout & 3D Slab Flr Plan



First Floor Layout



First Floor Slab
(Half Slab + In-situ Slab)

37% Precast Element at Factory (2 units)
63% Wet work on Site (by system formwork)

Item	Description	Pcs / Nos	Concrete Volume (m^3)	
			Off Site	On Site
1)	Precast Slab	1	7.792	-
2)	In-Situ Slab	1		13.458
	Sub-Total		7.792	13.458
	Total Concrete Volume (2 units)			21.250

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DRAWN :	ZUL
DATE :	JAN 2015
CHECKED :	LEE
DWG'D :	MNG
APPR'D :	MNG
SCALE :	NTS

Double Storey Terrace House
Intermediate Unit Left & Right

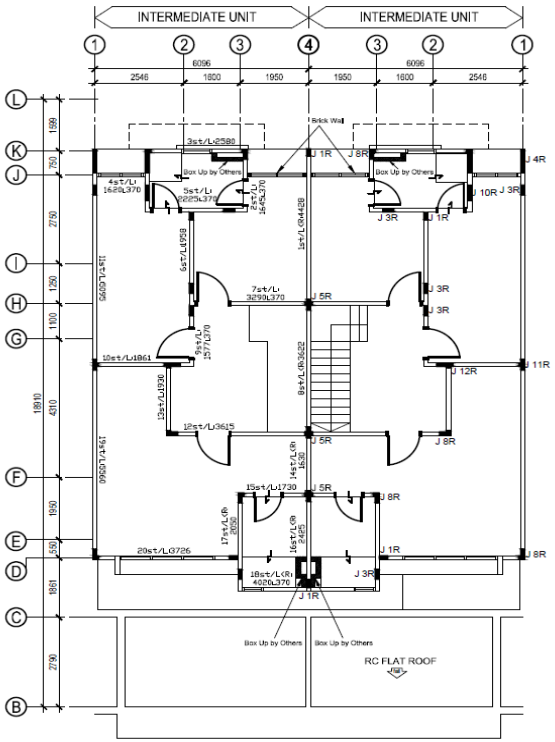
DRAWING TITLE : 3

DRAWING NO : – REV : –

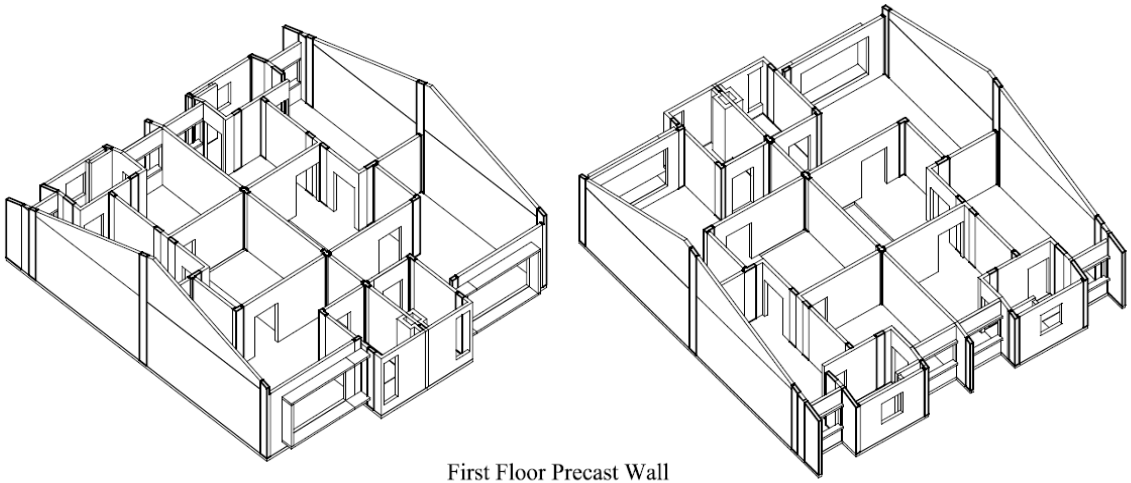
SYSTEM : – REV : –

4.c SYSTEM PROVIDER : Double Storey

- i.4) ARCHITECT : 1st Flr Layout, 3D Wall & Column



First Floor Layout



First Floor Precast Wall

87% Precast Element at Factory (2 units)
13% Wet work on Site (by system formwork)

Item	Description	Pcs / Nos	Concrete Volume (m^3)	
			Off Site	On Site
1)	Precast Panel	35	37.211	-
2)	Coping	10	0.970	-
3)	Wet Joint	38	-	5.935
	Sub-Total		38.181	5.935
	Total Concrete Volume (2 units)		44.116	

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Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	JAN 2015
CHECKED :	LEE
EXAMD :	MNG
APPVD :	MNG
SCALE :	NTS

Double Storey Terrace House
Intermediate Unit Left & Right

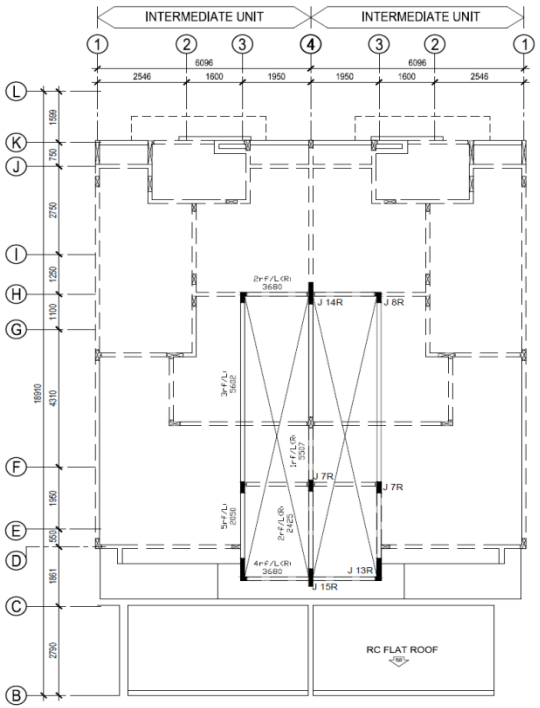
DRAWING TITLE : 4

DRAWING NO : - REV : -

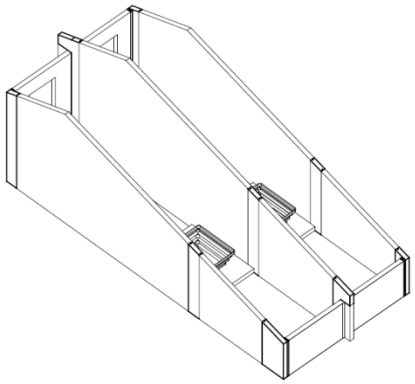
SYSTEM : - REV : -

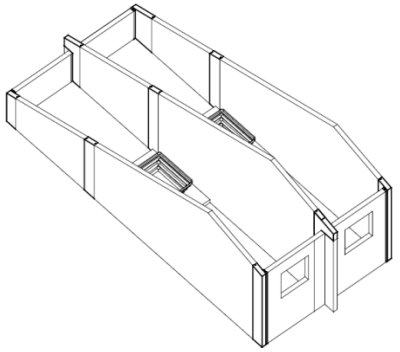
4.c SYSTEM PROVIDER : Double Storey

- i.5) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column



Roof Floor Layout





Roof Floor Precast Wall

92% Precast Element at Factory (2 units)
8% Wet work on Site (by system formwork)

Item	Description	Pcs / Nos	Concrete Volume (m^3)	
			Off Site	On Site
1)	Precast Panel	8	11.384	-
2)	Water Tank Slab	2	1.108	-
3)	Wet Joint	9	-	1.026
	Sub-Total		12.492	1.026
	Total Concrete Volume (2 units)			13.518

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Tel:03-3323 3993 Fax:03-3324 3993

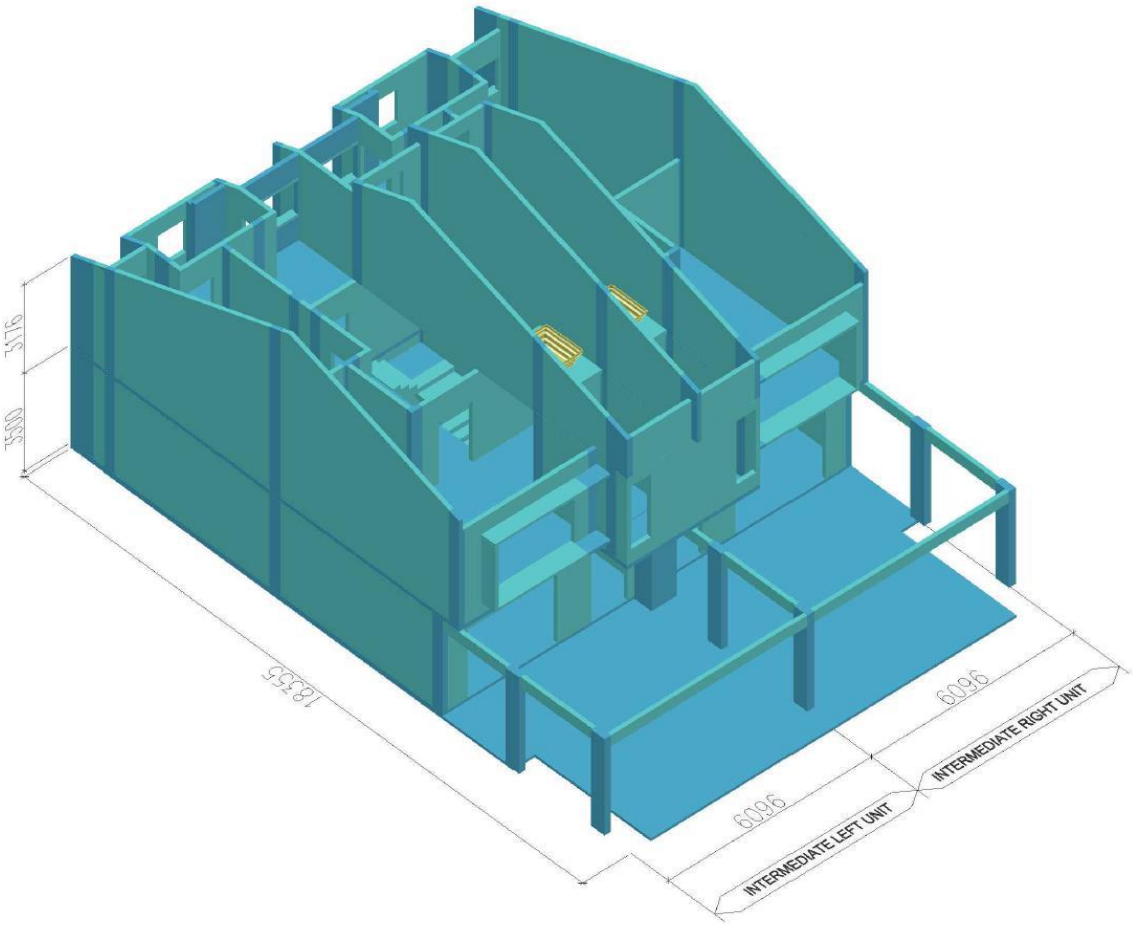
DRAWN :	ZUL
DATE :	JAN 2015
CHECKED :	LEE
EXAM'D :	MNG
APPR'D :	MNG
SCALE :	NTS

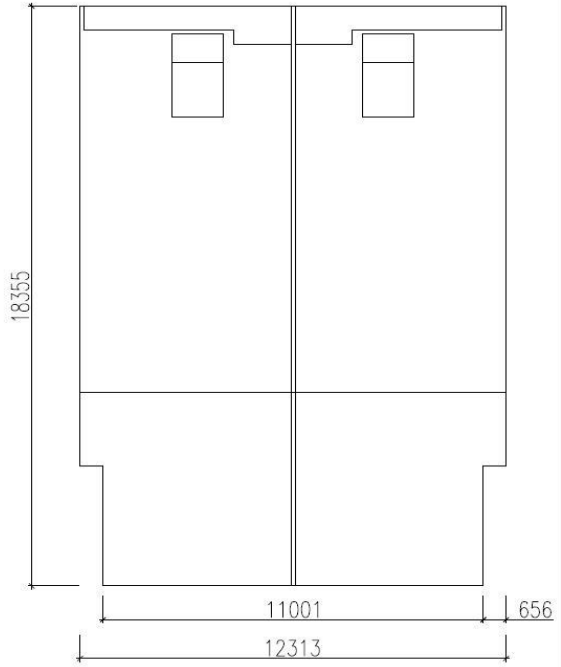
Double Storey Terrace House
Intermediate Unit Left & Right

DRAWING TITLE : 5
DRAWING NO : -- REV : --
SYSTEM : -- REV : --

4.c SYSTEM PROVIDER : Double Storey

- i.a1) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column





Ground Floor & First Floor

Precast Element

In-Situ Work

SYSTEM PROVIDER

HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
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Tel:03-3325 8995 Fax:03-3319 8994

DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	MENG
EXAM'D :	MENG
APPR'D :	MENG
SCALE :	NTS

Double Storey Terrace House
Intermediate Left & Right Unit
1952 Sqft

DRAWING TITLE : 1

DRAWING NO : –

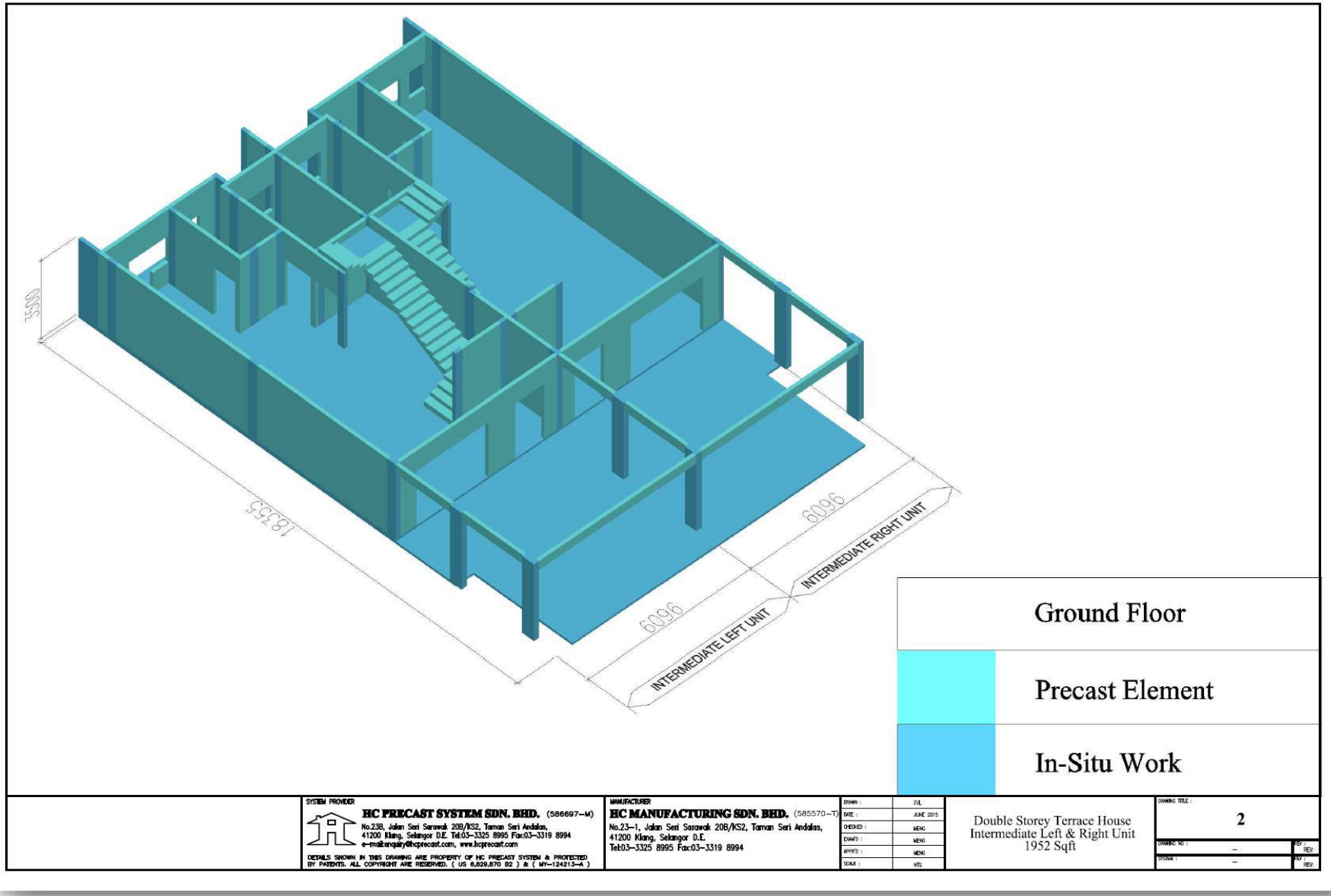
REV : REV.

SYSTEM : –

REV : REV.

4.c SYSTEM PROVIDER : Double Storey

- i.a2) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column



SYSTEM PROVIDER

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Tel:03-3325 8995 Fax:03-3319 8994

DRAWN :	JVL
DATE :	JUNE 2015
CHECKED :	MENG
APPVD :	MENG
SCALE :	NTS

Double Storey Terrace House
Intermediate Left & Right Unit
1952 Sqft

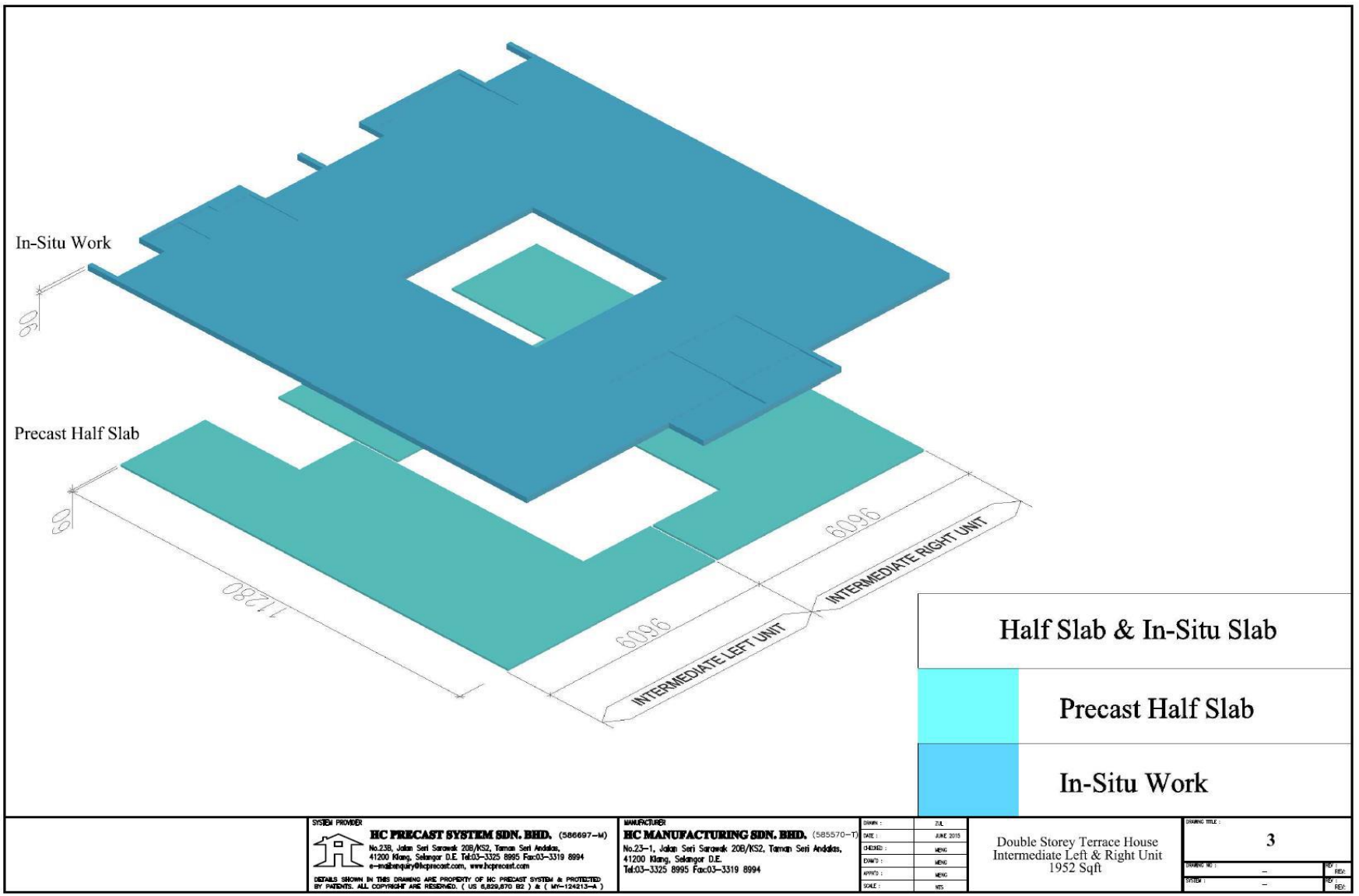
DRAWING TITLE : 2

DRAWING NO : —

SYSTEM : —

REV : REV

4.c SYSTEM PROVIDER : Double Storey
- i.a3) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column



SYSTEM PROVIDER
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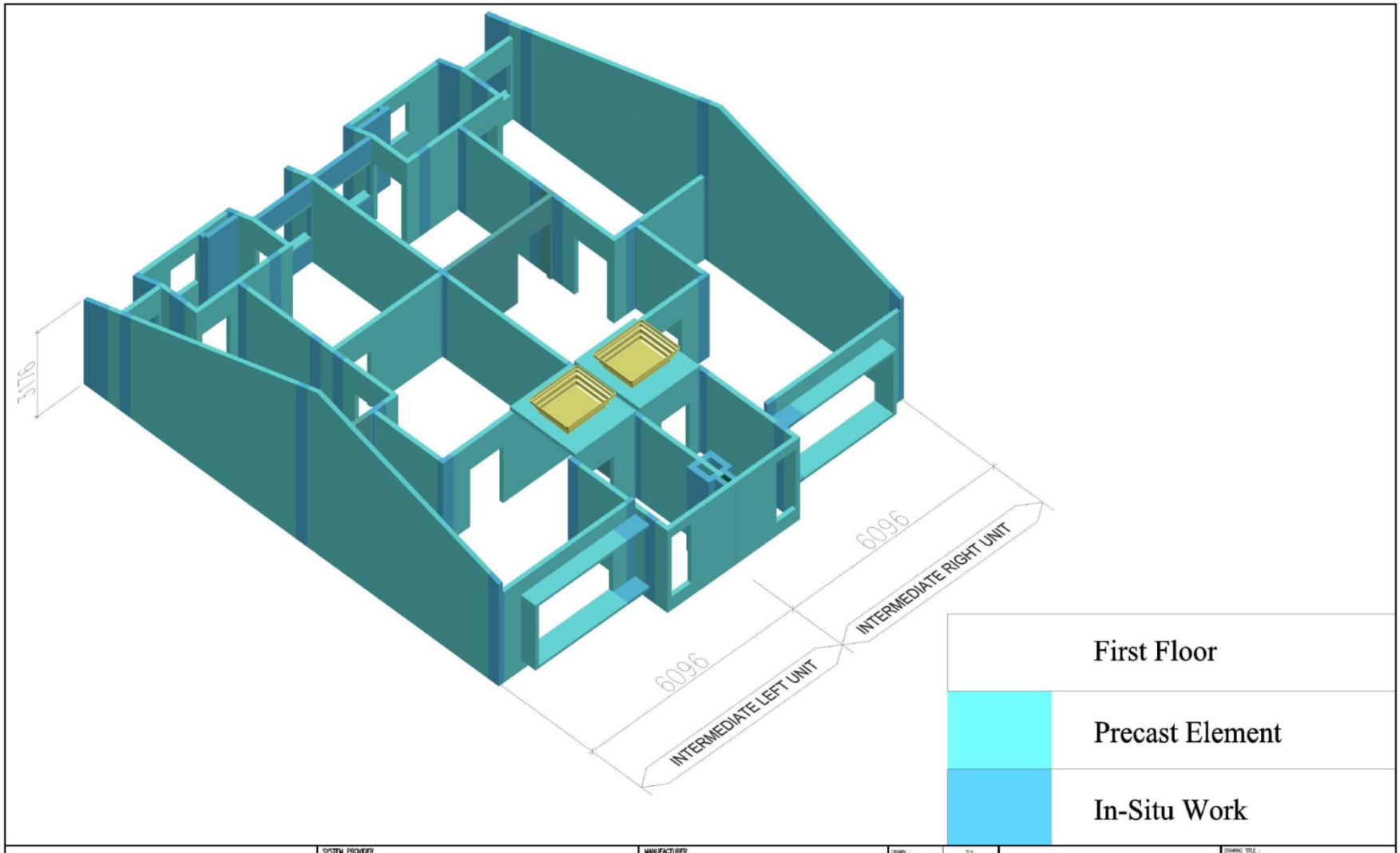
Tel:03-3325 8995 Fax:03-3319 8994

DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	MENG
EXAM'D :	MENG
APPR'D :	MENG
SCALE :	NTS

Double Storey Terrace House
Intermediate Left & Right Unit
1952 Sqft

DRAWING TITLE : 3
DRAWING NO : –
REV : REV.
SYSTEM : –
REV : REV.

4.c SYSTEM PROVIDER : Double Storey
- i.a4) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column



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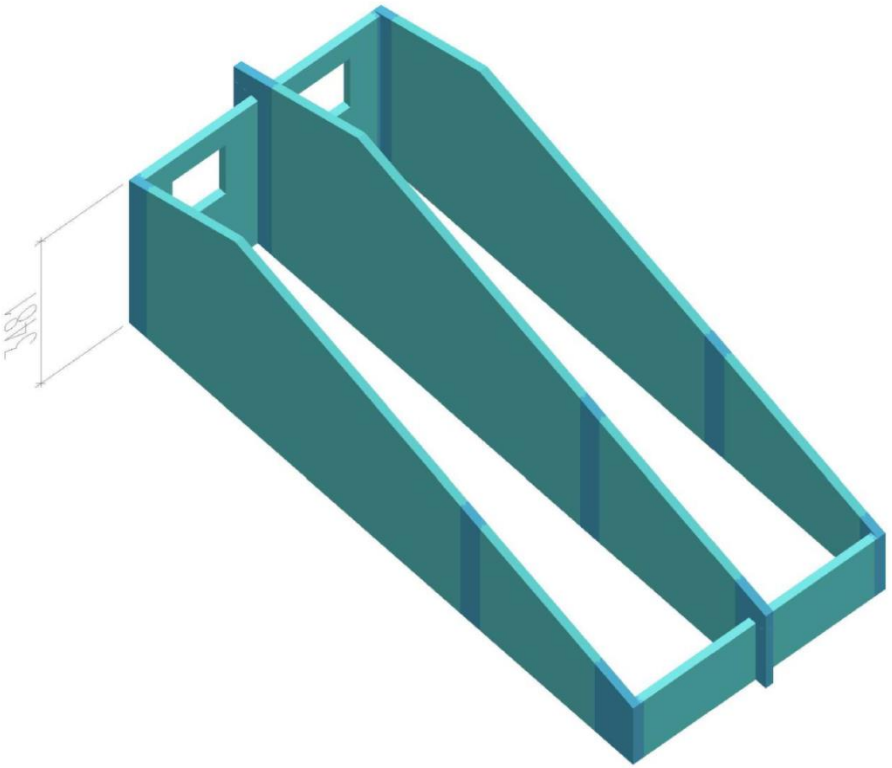
DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	MENG
EXAM'D :	MENG
APPR'D :	MENG
SCALE :	NTS

Double Storey Terrace House
Intermediate Left & Right Unit
1952 Sqft

DRAWING TITLE : 4
DRAWING NO : –
REV : REV.
SYSTEM : –
REV : REV.

4.c SYSTEM PROVIDER : Double Storey

- i.a5) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column



Top Floor

Precast Element

In-Situ Work

SYSTEM PROVIDER

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DRAWN :	JUL
DATE :	JUNE 2015
CHECKED :	MENG
DWG'D :	MENG
APPR'D :	MENG
SCALE :	NTS

Double Storey Terrace House
Intermediate Left & Right Unit
1952 Sqft

DRAWING TITLE : 5

DRAWING NO : – REV : REV.

SYSTEM : – REV : REV.

4.c SYSTEM PROVIDER : Double Storey
- i.a6) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column

Summary

Item	Description	Unit	Intermediate Left Unit		Intermediate Right Unit	
			Precast	In-situ	Precast	In-situ
1)	Ground Floor					
a.	Panel	m³	12.907	-	12.907	-
b.	Wet Joint	m³	-	3.077	-	3.077
c.	Staircase	m³	1.583	0.281	1.583	0.281
2)	First Floor					
a.	Panel	m³	18.500	-	18.500	-
b.	Wet Joint	m³	-	2.968	-	2.968
c.	Half Slab (60mm thk)	m³	3.096	-	3.096	-
d.	In-Situ Slab	m³	-	7.226	-	7.226
e.	Precast Beam	m³	0.604	-	0.604	-
3)	Top Floor					
a.	Panel	m³	5.653	-	5.653	-
b.	Wet Joint	m³	-	0.557	-	0.557
	Sub Total	m³	42.343	14.109	42.343	14.109
	Total	m³	56.452		56.452	
	Percentage	%	75.00	25.00	75.00	25.00
	GFA	m²	181.345		181.345	

SYSTEM PROVIDER
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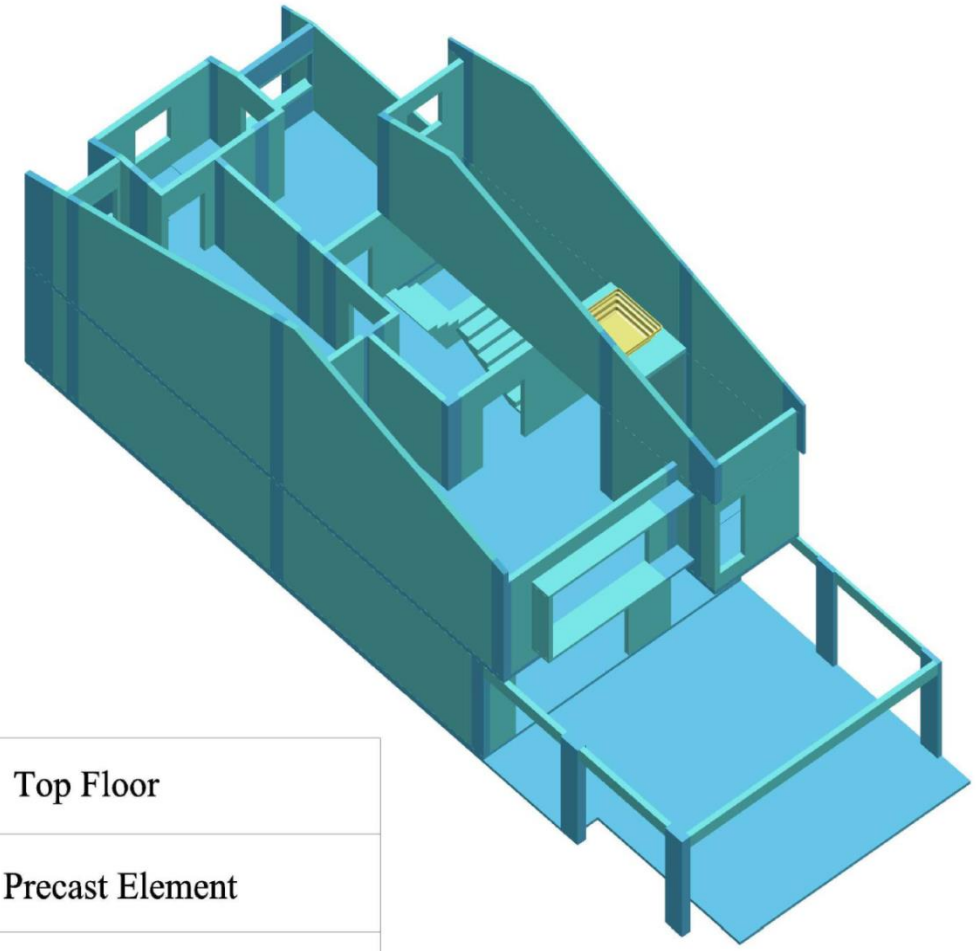
DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	MENG
EXAM'D :	MENG
APPR'D :	MENG
SCALE :	NTS

Double Storey Terrace House
Intermediate Left & Right Unit
1952 Sqft

DRAWING TITLE : 6
DRAWING NO : –
REV : REV:
SYSTEM : –
REV : REV:

4.c SYSTEM PROVIDER : Double Storey
- i.a7) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column



Top Floor

Precast Element

In-Situ Work

Double Storey - Intermediate Left Unit : RM 50,806.80

75% Precast Element at Factory
25% Wet work on Site (by system formwork)

Item	Description	Unit	Intermediate Left Unit	
			Precast	In-situ
1)	Ground Floor			
a.	Panel	m³	12.907	-
b.	Wet Joint	m³	-	3.077
c.	Staircase	m³	1.583	0.281
2)	First Floor			
a.	Panel	m³	18.500	-
b.	Wet Joint	m³	-	2.968
c.	Half Slab (60mm thk)	m³	3.096	-
d.	In-Situ Slab (90mm thk)	m³	-	7.226
e.	Precast Beam	m³	0.604	-
2)	Top Floor			
a.	Panel	m³	5.653	-
b.	Wet Joint	m³	-	0.557
	Sub Total	m³	42.343	14.109
	Total	m³	56.452	
	Rate / m³	RM	900.00	
	Total Amount	RM	50,806.80	
	GFA	m²	181.345	
	Rate / m² GFA	RM	280.167	
	Rate / ft² GFA	RM	26.03	
	Percentage	%	75.00	25.00

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
41200 Klang, Selangor D.E. Tel:03-3325 8995 Fax:03-3319 8994
e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
41200 Klang, Selangor D.E.
Tel:03-3325 8995 Fax:03-3319 8994

DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	MENG
EXAMD :	MENG
APPVD :	MENG
SCALE :	NTS

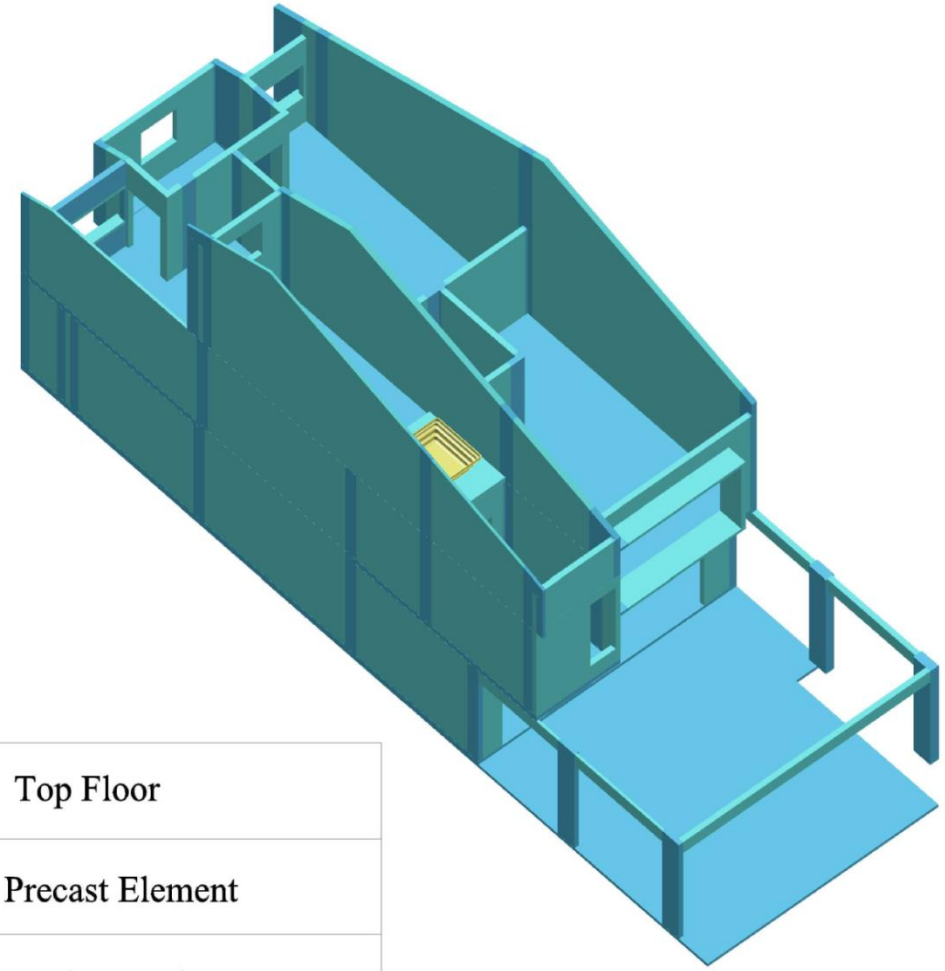
Double Storey Terrace House
Intermediate Left & Right Unit
1952 Sqft

DRAWING TITLE : 7

DRAWING NO : – REV : REV.

SYSTEM : – REV REV.

4.c SYSTEM PROVIDER : Double Storey
- i.a8) ARCHITECT : Roof Patty Wall Layout, 3D Wall & Column



Top Floor

Precast Element

In-Situ Work

Double Storey - Intermediate Right Unit : RM 50,806.80

75% Precast Element at Factory
25% Wet work on Site (by system formwork)

Item	Description	Unit	Intermediate Left Unit	
			Precast	In-situ
1)	Ground Floor			
a.	Panel	m³	12.907	-
b.	Wet Joint	m³	-	3.077
c.	Staircase	m³	1.583	0.281
2)	First Floor			
a.	Panel	m³	18.500	-
b.	Wet Joint	m³	-	2.968
c.	Half Slab (60mm thk)	m³	3.096	-
d.	In-Situ Slab (90mm thk)	m³	-	7.226
e.	Precast Beam	m³	0.604	-
2)	Top Floor			
a.	Panel	m³	5.653	-
b.	Wet Joint	m³	-	0.557
	Sub Total	m³	42.343	14.109
	Total	m³	56.452	
	Rate / m³	RM	900.00	
	Total Amount	RM	50,806.80	
	GFA	m²	181.345	
	Rate / m² GFA	RM	280.167	
	Rate / ft² GFA	RM	26.03	
	Percentage	%	75.00	25.00

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3325 8995 Fax:03-3319 8994
e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
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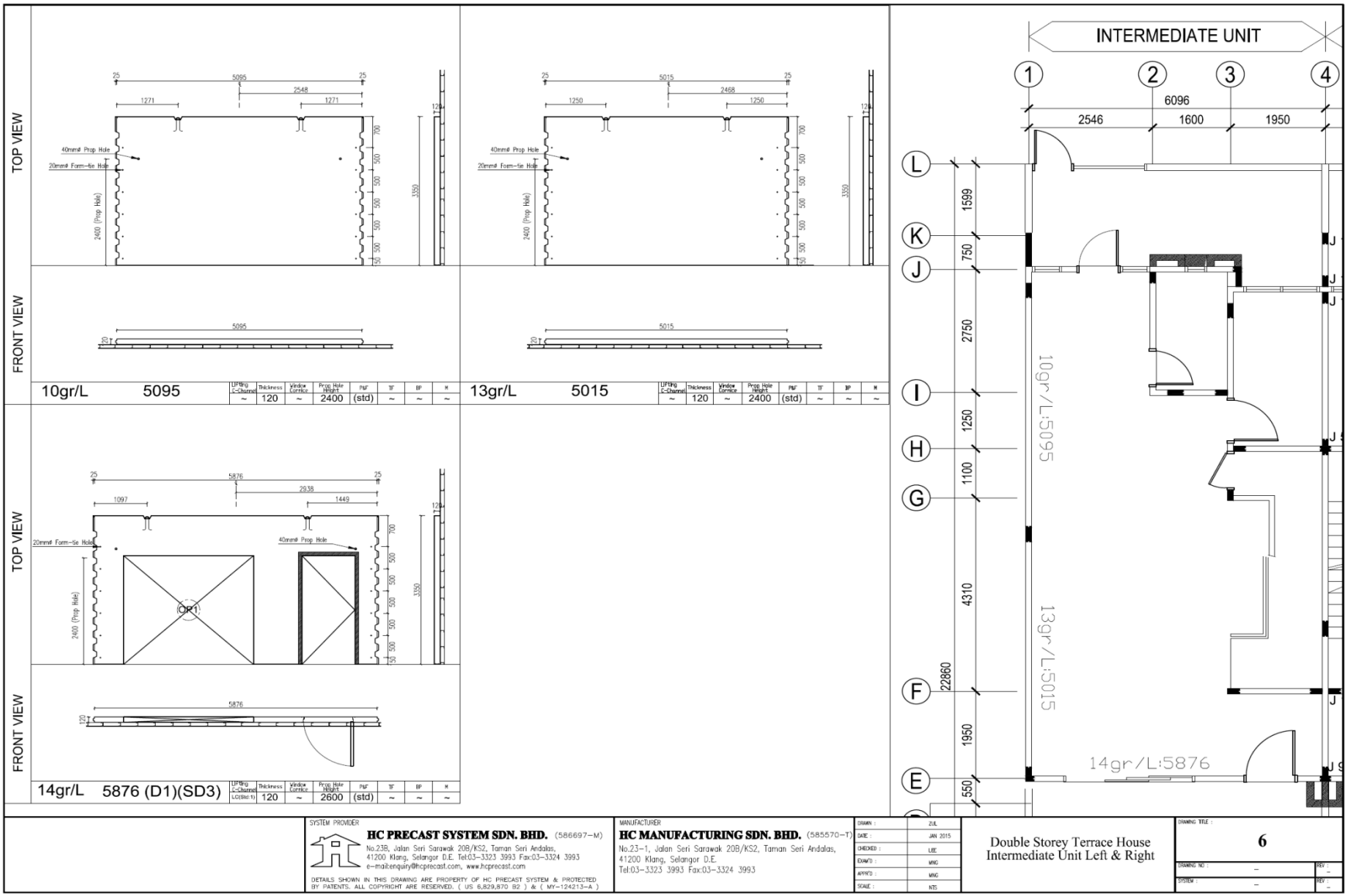
Tel:03-3325 8995 Fax:03-3319 8994

DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	MENG
APPD'D :	MENG
SCALE :	NTS

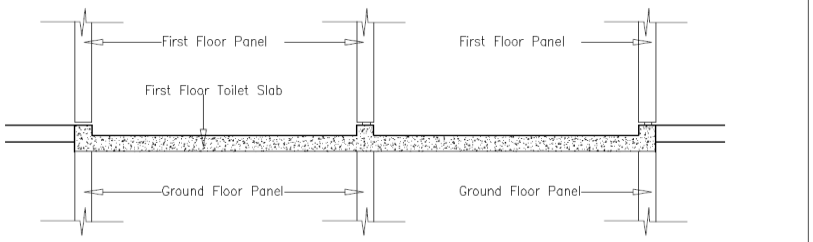
Double Storey Terrace House
Intermediate Left & Right Unit
1952 Sqft

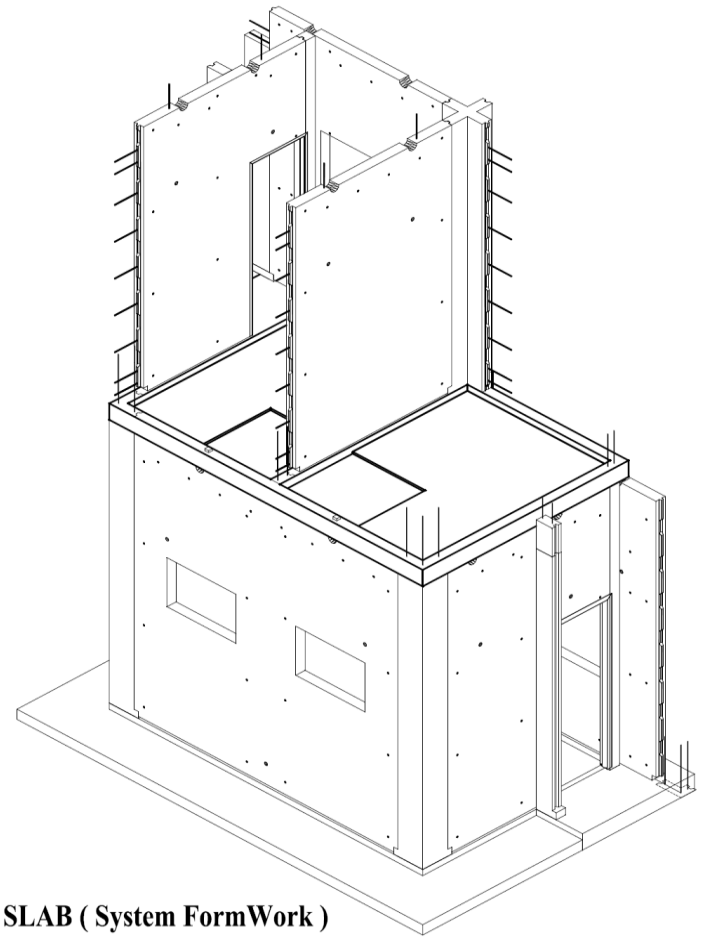
DRAWING TITLE : 8
DRAWING NO : –
REV :
SYSTEM : –
REV :

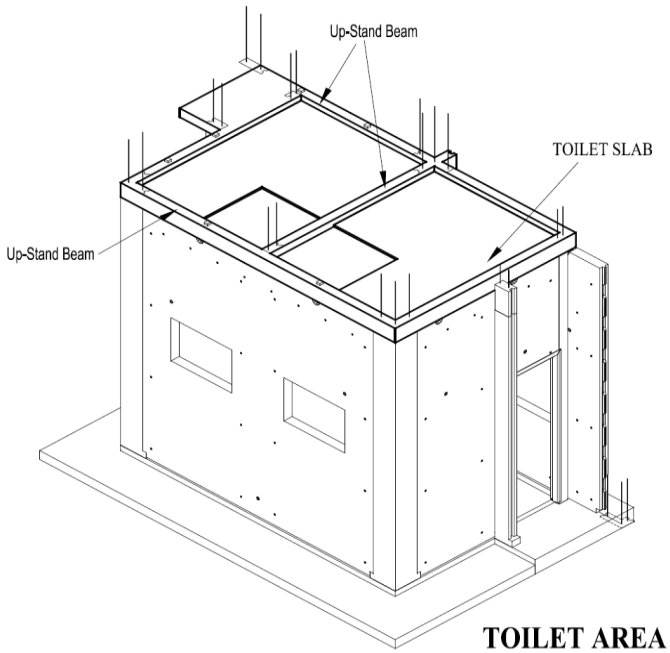
4.c SYSTEM PROVIDER : Double Storey
- i.6) C&S : Panel List, Structural detail & Layout with numbering



4.c SYSTEM PROVIDER : IBS / MANUFACTURER :
- Half Slab & System Formwork detail







TOILET AREA : CAST INSITU SLAB (System FormWork)

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
41200 Klang, Selangor D.E. Tel:03-3323 5999 Fax:03-3323 8993
e-mail:enquiry@hcprecast.com.my, Http:www.hcprecast.com.my

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas,
41200 Klang, Selangor D.E.
Tel:03-3323 7999 Fax:03-3323 8993

DRAWN :	ZUL
DATE :	JAN 2015
CHECKED :	LEE
EXAM'D :	MNG
APPR'D :	MNG
SCALE :	NTS

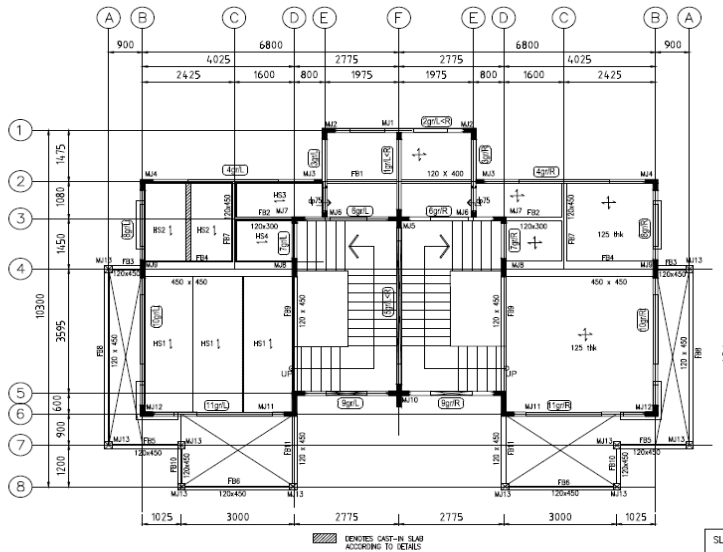
DRAWING TITLE : Example 5

DRAWING NO : – REV : –

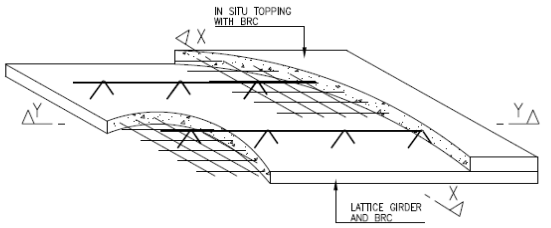
SYSTEM : – REV : –

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

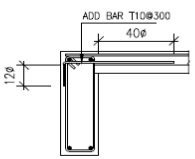
- In-situ Toilet & Up Stand Beam by System Formwork



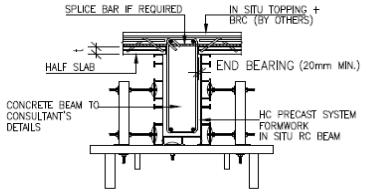
FIRST FLOOR LAYOUT PLAN



3D VIEW OF HALF SLAB SYSTEM
N.T.S.

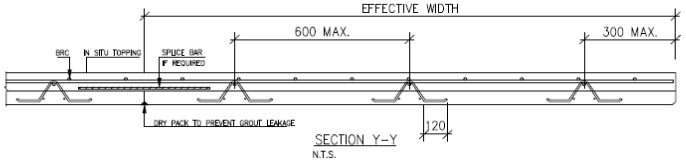


TYPICAL DETAIL AT END SUPPORT
N.T.S.

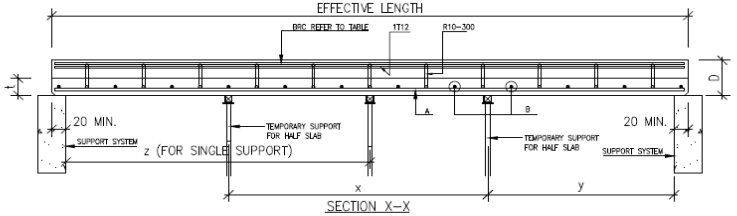


TYPICAL DETAIL AT INTERMEDIATE BEAM
N.T.S.

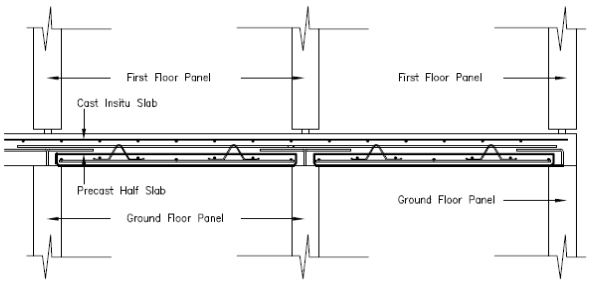
SLAB MARK	PRECAST UNIT THICKNESS (t) mm	OVERALL THICKNESS (D) mm	EFFECTIVE WIDTH (mm)	EFFECTIVE LENGTH (mm)	BOTTOM REINFORCEMENT (A)	BOTTOM REINFORCEMENT (B)	x (mm)	y (mm)	z (mm)
HS1	65	175	1300	3960	T10-200	T10-300	1500	1150	
HS2	55	150	1100	2295	T10-300	T10-300	850	723	
HS3	55	150	1010	2330	T10-300	T10-300	850	740	
HS4	55	150	1215	1530	T10-300	T10-300			765



SECTION Y-Y
N.T.S.



SECTION X-X
N.T.S.



Half Slab With In-situ Beam / Precast Beam

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 5999 Fax:03-3323 8993
e-mail.enquiry@hcprecast.com.my, Http:www.hcprecast.com.my

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E.
Tel:03-3323 7999 Fax:03-3323 8993

DRAWN :	ZUL
DATE :	JAN 2015
CHECKED :	LEE
EXAM'D :	MNG
APPR'D :	MNG
SCALE :	NTS

DRAWING TITLE : Example 4

DRAWING NO : – REV : –

SYSTEM : – REV : –

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Half Slab Installation

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Half Slab Installation

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Half Slab & Cantilever Corridor Mould by System Formwork

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Half Slab & Cantilever Corridor Mould by System Formwork

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Half Slab & External Mould by System Formwork

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Conduit Laying before BRC & Casting

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- BRC Laying

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- 1St Floor Slab Casting & Level Checking

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Finishing Product RC Flat Roof (Clean, Quality & Environment)

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Up Stand Beam by System Formwork

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Plumbing Ducting

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Plumbing installation

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Toilet in-situ by System Formwork

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Temporary plumbing ducting laying

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

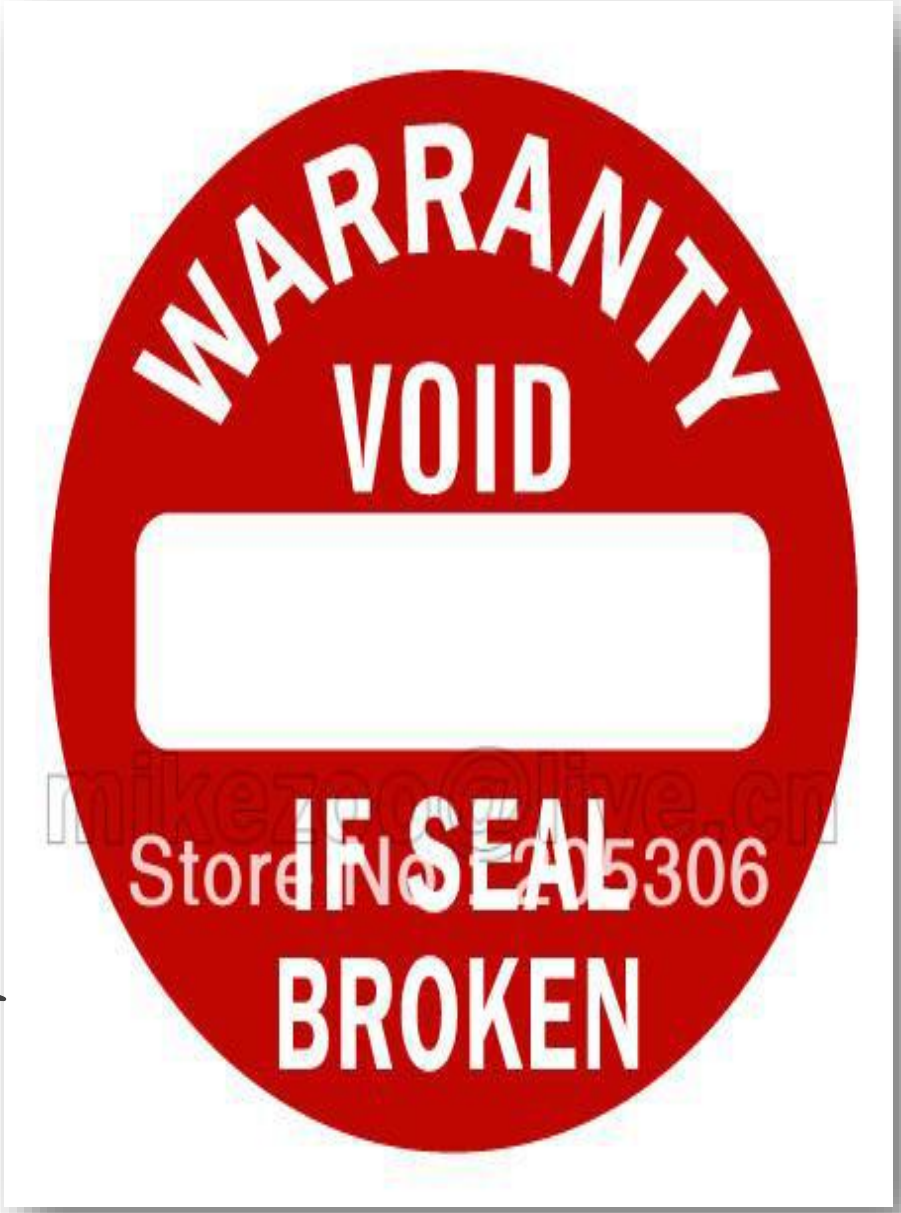
- Conduit laying before casting

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :
- Recommended Installation

Manufacturer and system supplier of the element is the BEST and MOST EXPERIENCED installer of the provided building precast element.

The same concept applies when we buy computer and hardware

Eliminate improper handling installation by 3rd party contractors

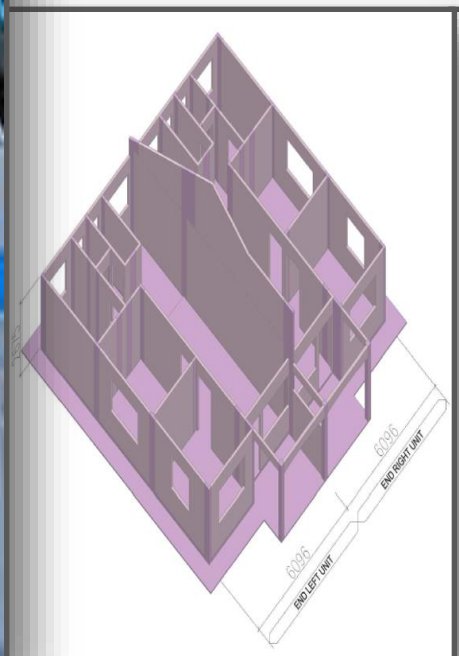


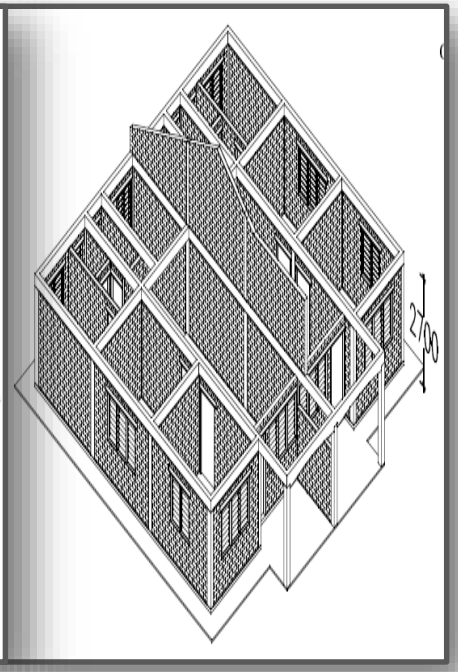
4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- No Variation Order (VO) : 3D Superstructure drawing

Absolutely no Variation Order (V.O) due to :-

- **No material wastage (minimal concreting at site)**
- **Accurate estimation by 3D drawing of building precast elements (wall, beam, staircase & partition) compared to bricks, reinforcement work and concreting at site.**





4.c SYSTEM PROVIDER : IBS / MANUFACTURER :

- Cork Joint for Split Level & Specification 1

CORKJOINT
THE FORCE IN JOINTING SOLUTIONS

SUPERSWELL 47B

HYDROPHILIC BUTYL RUBBER WATERSTOP

PRODUCT DESCRIPTION

CORKJOINT Superswell 47B Waterstop is a unique sealing compound which expands in a controlled fashion when exposed to moisture, forming a compression seal in concrete joints. Superswell 47B waterstop is ideal for use in horizontal and vertical construction joints for cast in-situ concrete structures.

Superswell 47B Waterstop is manufactured utilising a specialised mixing process which encapsulates hydrophilic materials into a rubber base creating a controlled, moisture-activated seal. This product has the structural integrity of a rubber-based sealant, the features of a butyl sealant, as well as the ability to expand to create a SELF-HEALING JOINT MATERIAL.

Unlike many of the traditional clay-based products, Superswell 47B Waterstop, bring hydrophilic polymer based, will not expand to a point that the hydration process itself leads to the possible "disintegration" of the waterstop.

This can be an important issue when engineers are looking for a seal in vertical construction joints where the joint could open up due to excessive shrinkage in the concrete. In-field experience has proven that products which continually expand, may lose their structural integrity and begin to wash away from the joint when subjected to a constant flow of water.

Total Days of Exposure in Potable Water	
7 Days	*118% movement*
14 Days	*131% expansion*
28 Days	*142% expansion*
56 Days	*177% expansion*

**Note: 100% indicates original size*

The material does not expand prematurely, does not absorb water from the fresh concrete poured against it, and helps minimize any pre-expansion if the joint becomes ponded with water.

Superswell 47B Waterstop has been tested to withstand a 60 metre head of water pressure and because of its butyl rubber properties it may actually bond to both concrete surfaces, creating a gasket seal when used in conjunction with Superswell CJ-100 adhesive.

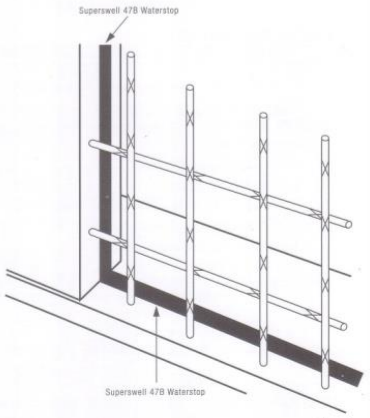


Figure 1

1/4
2/4

ADVANTAGES

- Excellent for application to rough concrete surfaces
- Limited loss of integrity of waterstop
- Allows concrete to gain strength before expansion
- For use in horizontal and vertical construction joints
- Excellent adhesion to CJ-100 Adhesive
- Can be bedded into wet concrete
- No compaction or displacement problems
- Unaffected by repeated wet and dry cycles
- Has the ability to bond to both concrete surfaces
- No on-site welding required as with PVC Waterstops
- Very easy to handle and install
- No split forming required
- Non toxic and requires no special handling

AREAS OF APPLICATION

Typical applications for Superswell 47B Waterstop includes:

- Tunnels
- Pits
- Retaining walls
- Manholes
- Basements
- Underground structures
- Box culverts
- New to old concrete
- Poured in-situ construction joints
- Above & below grade precast panels

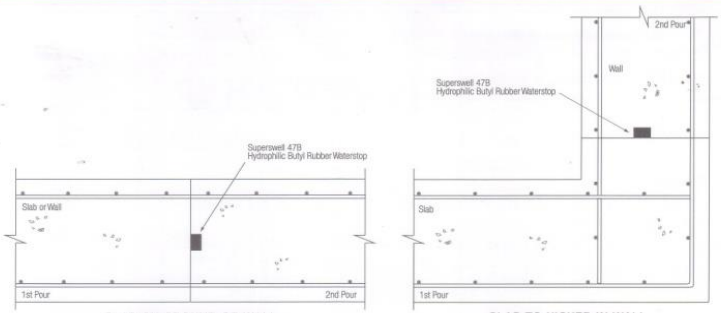
NOTE: Areas of application should be verified and approved by the consulting engineer who is satisfied with the suitability of the product for its intended use.

PHYSICAL PROPERTIES

DESCRIPTION	TEST METHOD	RESULT
Colour		Black
Size (mm)		25 x 19
Specific Gravity	ASTM D-71	1.40 / 1.45
Hydrocarbon Content (%)	ASTM D-297	47 min.
Volatile Matter (%)	ASTM D-6	1 max.
Penetration, cone @ 77F, 150gm, 5 sec	ASTM D-217	40±5
Head Pressure		Tested to 60m
Application Temperature (°C)		-22 to +52
Service Temperature Range (°C)		-34 to +82

4.c SYSTEM PROVIDER : IBS / MANUFACTURER :
- Cork Joint for Split Level & Specification 2

TYPICAL APPLICATION



WRITTEN SPECIFICATION

Waterstops where shown on the drawings shall be Superswell 47B controlled expansion waterstop as supplied by CORKJOINT. The waterstop is to have a built-in delay system to minimise any pre-expansion prior to the second pour taking place. The waterstop is to be placed in accordance with the manufacturer's installation guidelines, and design engineers specification.

INSTALLATION PROCEDURES

Superswell 47B is to be adhered to the 1st pour of concrete with CJ 100 Adhesive. A clean/dry surface, free from dust, debris etc. is required.

Use neat firm butt joins to join Superswell 47B together and then knead the ends together to form a continuous uninterrupted gasket. This type of join is used for continuous placement of Superswell 47B and for any intersection joins.

Superswell 47B requires a minimum of 50mm cover of concrete from the outside edge.

1. Brush off any dust or debris from the surface where the Superswell 47B is to be applied. Brush a coat of CJ 100 Adhesive 30mm wide onto the concrete surface and one coat to the surface of the Superswell 47B. Wait for both surfaces to be touch dry before applying the Superswell 47B into position.
2. With the use of your thumb/fingers or the heel of your hand, firmly press a continuous bead of Superswell 47B into position, making sure you get full contact with the adhesive on the concrete surface. Do not stretch the Superswell 47B when applying it into position.
3. Check to see that Superswell 47B has totally adhered to the concrete surface. If the surface is rough or irregular, you may need to use a firmer thumb/finger pressure to make sure that the Superswell 47B has full contact with the surface. There must be no visible gaps under the Superswell 47B.
4. The protective paper layer cover on the Superswell 47B can be removed anytime prior to the second pour of concrete taking place.
5. Placement of the second pour of concrete can be applied once the CJ 100 Adhesive has dried. Upon pouring, make sure that the concrete is purely compacted and vibrated around the Superswell 47B.
6. If Superswell 47B has been exposed to water/moisture prior to the second pour taking place, check for pre-expansion. If the product has pre-expanded then remove that section and replace with a new length of Superswell 47B.
7. For vertical joins and overhead applications, it may be necessary to also secure the Superswell 47B with concrete nails prior to the CJ 100 Adhesive drying completely.

PACKAGING

• Dimensions of Superswell 47B	25mm x 19mm x 5m rolls (6 rolls per carton)
• CJ 100 Adhesive	1ℓ cans & 3.6ℓ cans
• CJ 100 Adhesive coverage (approx)	20-30m per 1ℓ

LIMITATIONS

Due to expansive forces, Superswell 47B Waterstop should be both detailed and installed with a minimum 50 mm clear cover to the face of the concrete.

Expansion rate can vary in salt and contaminated water.

Increase cover when using light weight, low strength concrete.

Not for use where excessive shrinkage of the concrete may occur at the joint faces.

HEALTH AND SAFETY INFORMATION

For further information or advice on health and safety precautions, safe handling, storage and correct disposal of products, please refer to the most recent product Material Safety Data Sheet (MSDS), which is available upon request.

Effective Date: 01 June 2011

CORKJOINT (MALAYSIA) SDN BHD 383102-H
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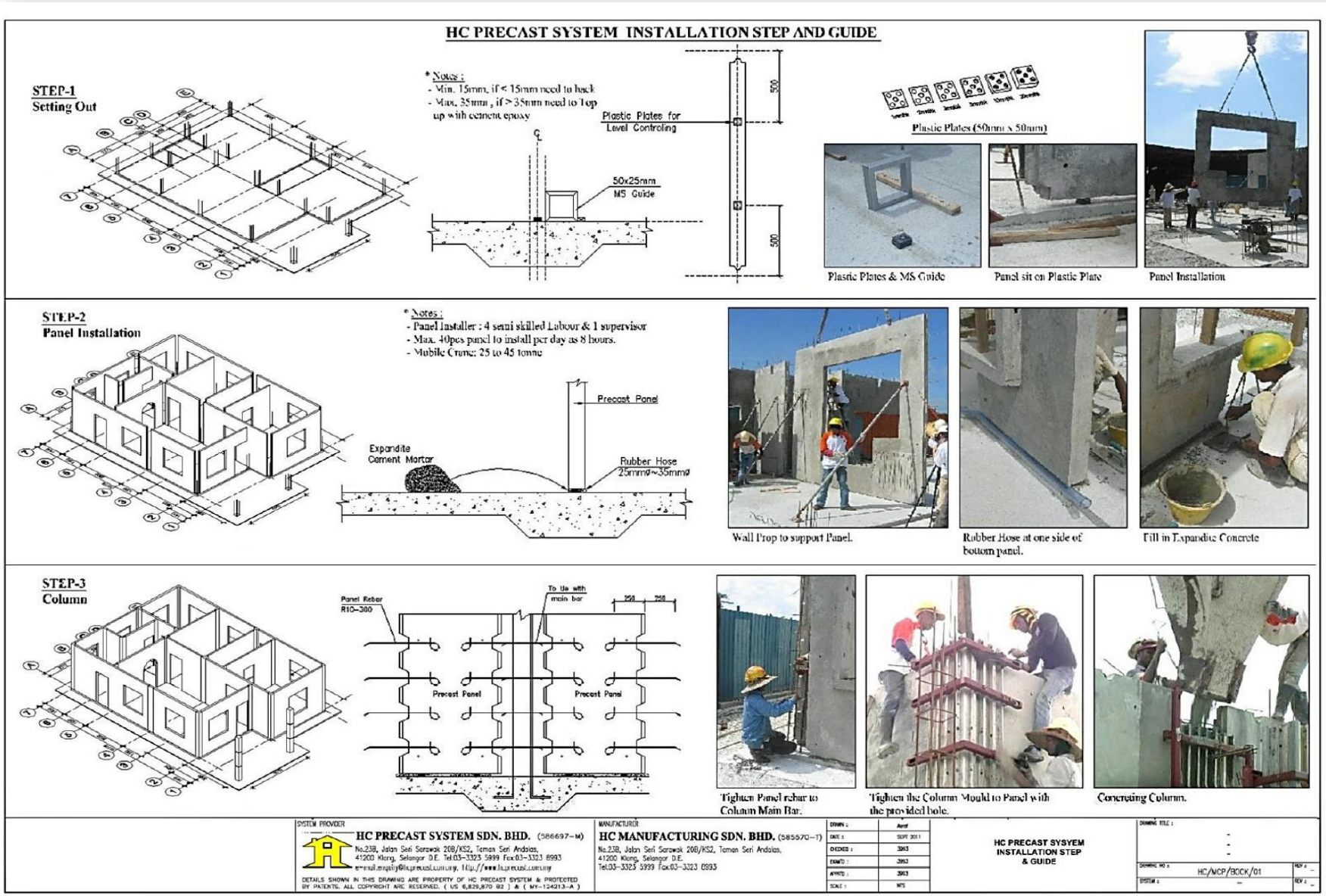
Fax +603 6250 9650

CORKJOINT (SINGAPORE) PTE LTD 200716724-K
50 Tagore Lane #03-11, Entrepreneur Centre
Singapore 787494
Tel +65 6455 9331
Fax +65 6250 9650

info@corkjoint.com
www.corkjoint.com

5. CONSTRUCTION METHOD SEQUENCE :

- I) Construction Method



5. CONSTRUCTION METHOD SEQUENCE :

- ii) Setting Out

5. CONSTRUCTION METHOD SEQUENCE :

- iii) Leveling Check list

SETTING OUT AND LEVEL CHECK LIST

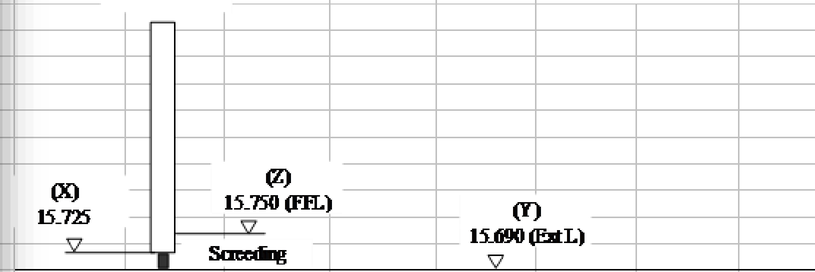
Panel	FFLevel	Existing Level		Proposed Plastic pad Level	Proposed FFL	Plastic Pad Height (min =15mm, Max= 35mm)	

SETTING OUT AND LEVEL CHECK LIST

Panel	FFLevel	Existing Level		Proposed Plastic pad Level	Proposed FFL	Plastic Pad Height (min =15mm, Max= 35mm)	
* 56 Lgr	15.750	15.692	15.704	15.725	15.750	0.033	0.021
57 Lgr	15.750	15.699	15.690	15.725	15.750	0.026	0.035
58 Lgr	15.750	15.690	15.692	15.725	15.750	0.035	0.033
59 Lgr	15.750	15.691	15.690	15.725	15.750	0.034	0.035
60 Lgr	15.750	15.688	15.697	15.725	15.750	0.037	0.028
61 Lgr	15.750	15.688	15.695	15.725	15.750	0.037	0.030
62 Lgr	15.750	15.706	15.702	15.725	15.750	0.019	0.023
63 Lgr	15.750	15.701	15.693	15.725	15.750	0.024	0.032
64 Lgr	15.750	15.690	15.700	15.725	15.750	0.035	0.025
65 Lgr	15.750	15.709	15.706	15.725	15.750	0.016	0.019
66 Lgr	15.750	15.694	15.691	15.725	15.750	0.031	0.034
67 Lgr	15.750	15.709	15.698	15.725	15.750	0.016	0.027
68 Lgr	15.750	15.697	15.694	15.725	15.750	0.028	0.031
69 Lgr	15.750	15.689	15.707	15.725	15.750	0.036	0.018
70 Lgr	15.750	15.673	15.678	15.725	15.750	0.052	0.047
71 Lgr	15.750	15.697	15.705	15.725	15.750	0.028	0.020
72 Lgr	15.750	15.710	15.711	15.725	15.750	0.015	0.014
73 Lgr	15.750	15.673	15.668	15.725	15.750	0.052	0.057
74 Lgr	15.750	15.683	15.685	15.725	15.750	0.042	0.040
75 Lgr	15.750	15.675	15.682	15.725	15.750	0.050	0.043

The level are not as specification.
Needed to be top up / hacked

* Panel 56 Lgr



Z = Y + (X - Y) + 25mm

15.750 = 15.692 + (15.725 - 15.692) + 0.025

5. CONSTRUCTION METHOD SEQUENCE :

- iv) Expanding Cement Motar

FOSROC

constructive solutions

Cebex 100

Plasticized Expanding Grout Admixture

Uses

Cebex 100 is an admixture for cementitous grouts where a reduced water/cement ratio and positive expansion is required. Applications include bed grouting, duct grouting, non-shrink infilling and jointing.

Advantages

- Gaseous expansion system compensates for plastic shrinkage and settlement in properly designed cementitous grout.
- Reduced water/cement ratio mixes in the grout mix ensures low permeability and long term durability in service.
- Gives high grout fluidity with low water/cement ratio, thus making placement or injection of the grout easy.
- No metallic iron content to corrode and cause staining or deterioration due to rust expansion in the grout.
- Composition allows high early strength development in grouts, without the use of chlorides.

Standards Compliance

Cebex 100 is a suitable pre-stressing grout admixture when complying with BS 8110 Part 1, 1985, section 8.9.4.6.

Description

Cebex 100 is supplied as a powder admixture. The material is a combination of a plasticizing agent and a gas producing expansion medium. The plasticizing agent allows the use of a reduced water/cement ratio with consequent increased strengths and durability. The expansive medium counteracts the natural settlement and plastic shrinkage of the grout and aids stability and cohesion.

Sufficient restrained expansion is developed to ensure a high degree of interfacial contact.

Specification

Performance Specification

All grouting (specify details and areas of application) must be carried out with a cement based grout incorporating a plasticized, expanding powder admixture. The admixture must be iron-free and chloride-free and shall be added to the grout in the proportions 225 g of admixture per 50 kg of cement. The admixture shall provide an expansion of up to 4% in the plastic grout, by means of a gaseous system.

Supplier Specification

All grouting (specify details and areas of application) must be carried out using a cement based grout, incorporating Cebex 100 manufactured by Fosroc and applied strictly in accordance with the manufacturer's technical data sheet.

Properties

Chloride content	Nil to BS5075
Compressive strength	The plasticizing action of Cebex 100 allows reduction of the water/cement ratio of grouts while maintaining flow properties. This gives improvement strength and long term durability when cured under restraint
Setting times	Cebex 100 does not significantly affect the setting times of cement based grouts
Expansion characteristics	The controlled positive expansion in unset grouts incorporating Cebex 100 overcomes plastic settlement when measured in accordance with ASTM C827. An unrestrained expansion of 4% is typical.
Time for Expansion	15 mins – 2 hrs @ 20°C
Compatibility	Cebex 100 is compatible with all types of Portland cement. Cebex 100 may be used in mixes containing certain other Fosroc Admixtures

Cebex 100

Instructions for Use

Mixing

For best results Fosroc MR3 mixer must be used. For quantities up to 50 kg a slow speed drill fitted with a high shear paddle is suitable. Larger quantities will require a high shear vane mixer.

It is essential that machine mixing capacity and labour availability is adequate to enable the grouting operation to be carried out continuously. This may require the use of a holding tank with provision for gentle agitation to maintain fluidity.

The selected water content should be accurately measured into the mixer. Slowly add the cement (and sand if required) and Cebex 100. Mix continuously for 5 minutes, making sure that a smooth even consistency is obtained.

Application

Areas to be grouted should be prepared to ensure substrates are clean, sound, and then pre-wetted. The unrestrained surface area of the grout must be kept to a minimum. Place the grout within 20 minutes of mixing to gain the full benefit of the expansion process. Adopt usual placing or pumping procedures ensuring a continuous operation.

Curing

On completion of the grouting operation, any exposed areas which are not to be cut back should be thoroughly cured by means of water application. Concure curing membrane or wet hessian.

Cleaning

Grouts mixed with Cebex 100 should be removed from tools and equipment with clean water immediately after use. Remove cured material mechanically or with Fosroc Acid Etch.

Limitations

Cebex 100 is not compatible with High Alumina Cement.

Estimating

Supply

Cebex 100	:	227g sachets or 20 kg drum

Dosage

OPC	Concreting Sand	Water	Cebex 100	Approx. Yield
50 kg	-	20-22 ltrs	225g	36 ltrs
50 kg	50 kg	22-24 ltrs	225g	57 ltrs

Note: For grout, mortar or concrete mixes with an aggregate/ cement ratio more than 1, use 4 x 227g units or 900g of Cebex 100 per 100 kg of cement.

Effects of overdosing

Overdosing of Cebex 100 increases expansion and may cause frothing.

Shelf Life

Cebex 100 has a shelf life of 12 months if kept in a dry store in its original packaging. High temperature and humidity storage may reduce this period.

Precautions

Health and Safety

Cebex 100 is of low hazard.

Contact with the skin and eyes, or inhalation of dust should be avoided. Wear suitable protective clothing, gloves, eye/ face protection and dust mask. After contact with skin, wash off with clean water. In case of contact with eyes, rinse immediately with plenty of water and seek medical attention.

For further information see Product Material Safety Data sheet.

FOSROC

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10400 Penang, Malaysia.
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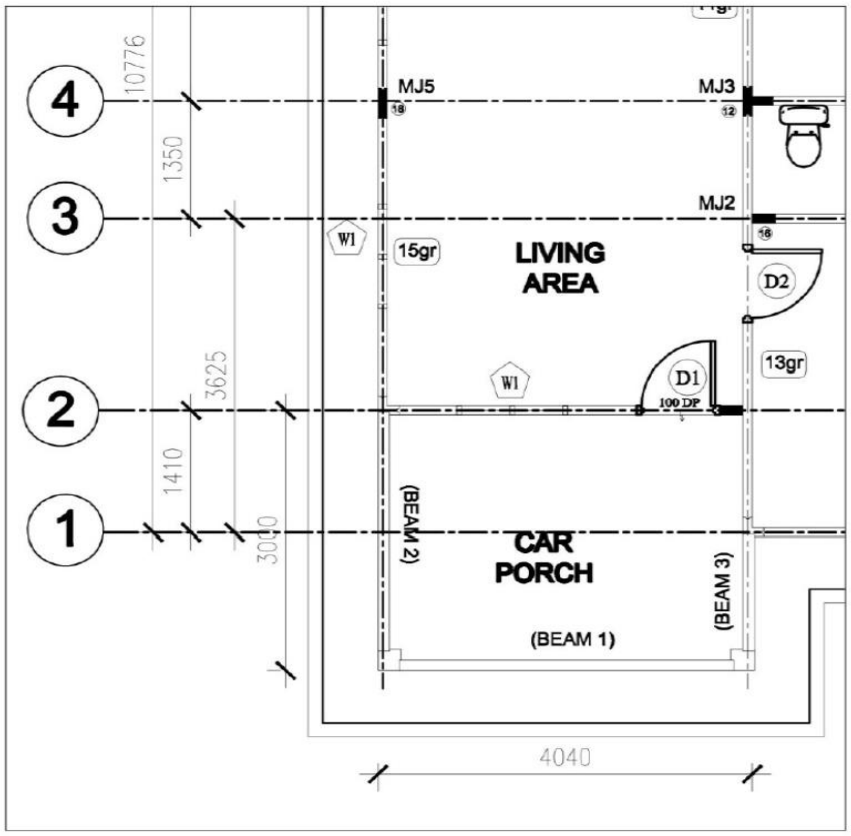
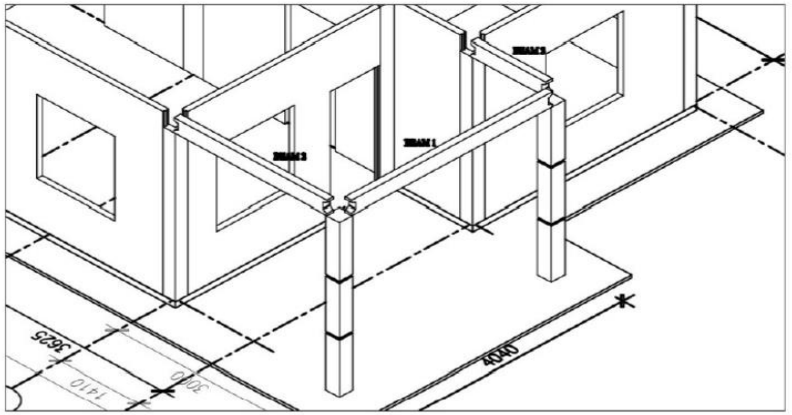
MAL/0401/05/A

5. CONSTRUCTION METHOD SEQUENCE :

- v) In-Situ Column with Precast Beam Installation

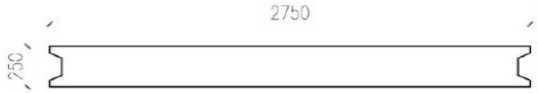
HC PRECAST SYSTEM INSTALLATION STEP & GUIDE





BEAM 1

BEAM 2



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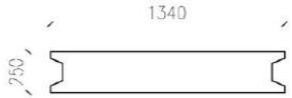

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 5999 Fax:03-3323 8993
e-mail:enquiry@hcprecast.com.my, Http:www.hcprecast.com.my

MANUFACTURER
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Tel:03-3323 7999 Fax:03-3323 8993

DRAWN :	nkcan
DATE :	OCT 2011
CHECKED :	3863
APPVD :	3863
SCALE :	NTS

HC PRECAST SYSTEM INSTALLATION STEP & GUIDE

DRAWING TITLE : - - -
DRAWING NO : HC/MUP/BOOK/02 REV : -
SYSTEM : - REV : -

6. PRODUCTION & DELIVERY SEQUENCE

6.1 -Logistic Option : Before Production

6.2 -Panel Casting

6.3 -Panel Lifting

6.4 -Bay Yard Storage

6.5 -Panel Storage Yard

6.6 -External Transport

6.7 -Project Site Storage Yard

6.8 -Project Site Internal Transport

6.9 -Project Site Block Storage

6.1 LOGISTIC OPTION (BEFORE PRODUCTION)

i) Option 1 :-

- Bay yard (factory) to block yard (project site)

ii) Option 2 :-

- Bay yard (factory) to site yard (project site)

iii) Option 3 :-

- Storage yard (factory) to block yard (project site)

iv) Option 4 :-

- Storage yard (factory) to site yard (project site)

Notes :

a) Client / Consultant / Main Contractor need to choose which option to be used before production.

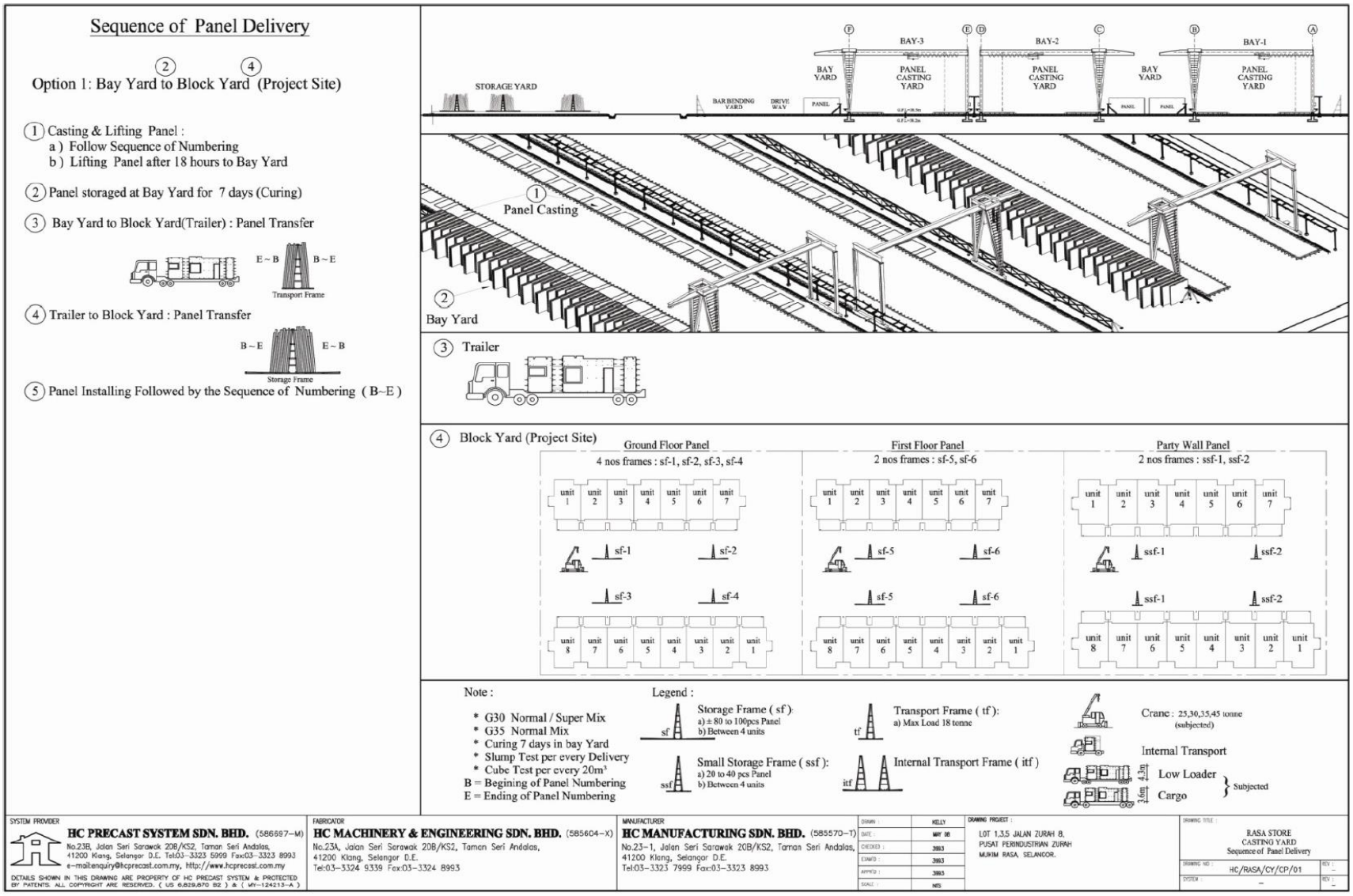
b) Rate for RM 900 / m3 includes for option 1 & 3.

c) An additional of RM 30 / m3 to be charged for option 2 & 4.

d) Crusher run base to be provided at site yard for option 1- 4.

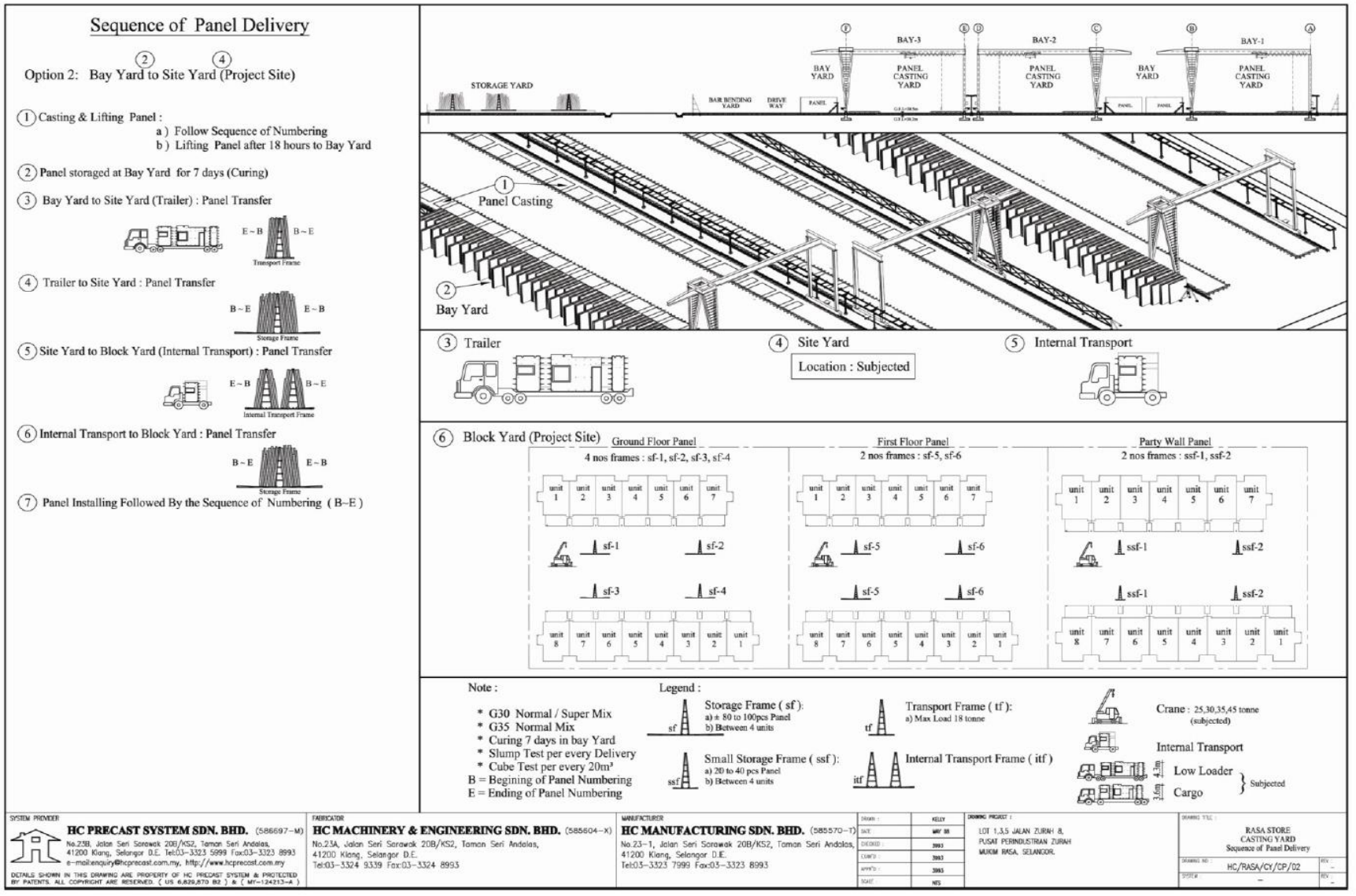
6.1 OPTION 1 :

- BAY YARD (FACTORY) TO BLOCK YARD (PROJECT SITE)



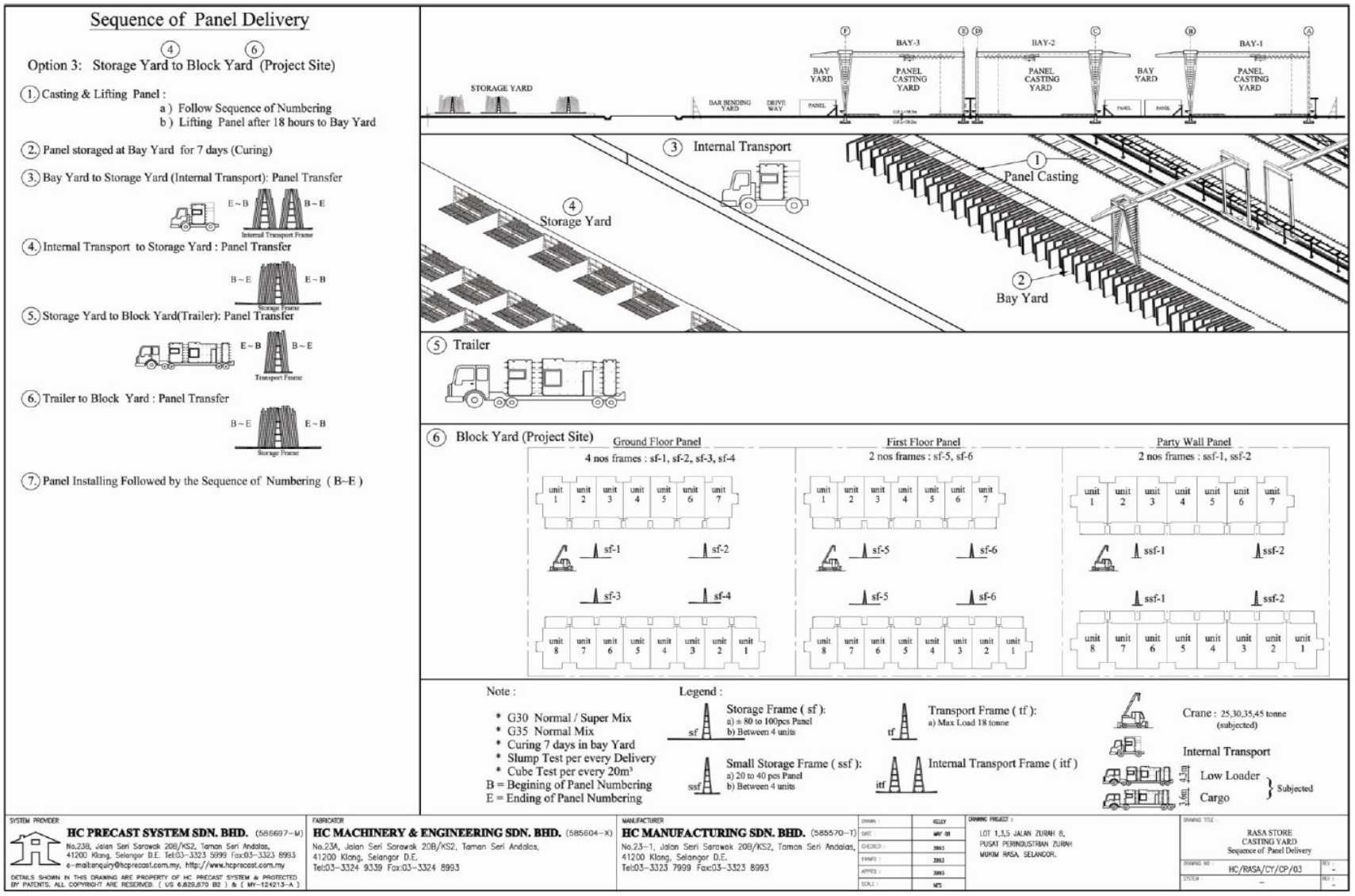
6.1 OPTION 2 :

- BAY YARD (FACTORY) TO SITE YARD (PROJECT SITE)



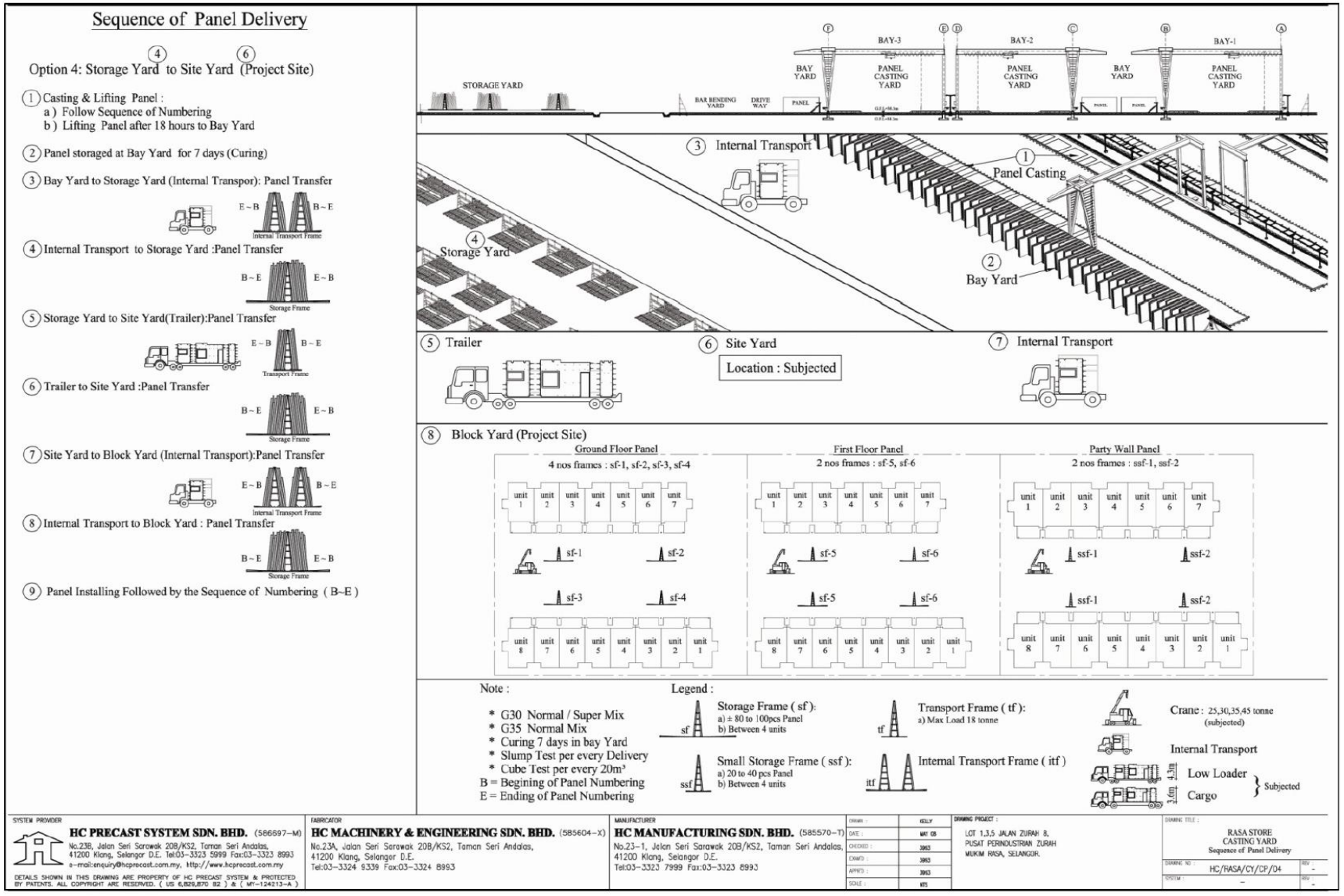
6.1 OPTION 3 :

- STORAGE YARD (FACTORY) TO BLOCK YARD (PROJECT SITE)



6.1 OPTION 4 :

- STORAGE YARD (FACTORY) TO SITE YARD (PROJECT SITE)



6.2 PANEL CASTING

6.3 PANEL LIFITING

6.4 BAY YARD STORAGE

6.5 PANEL STORAGE YARD

6.6 EXTERNAL TRANSPORT

6.7 PROJECT SITE STORAGE YARD

6.8 PROJECT INTERNAL TRANSPORT

7. QUALITY CONTROL & ASSURANCE

Ready Mixed Concrete : Concrete Grade to comply Engineer's requirements.

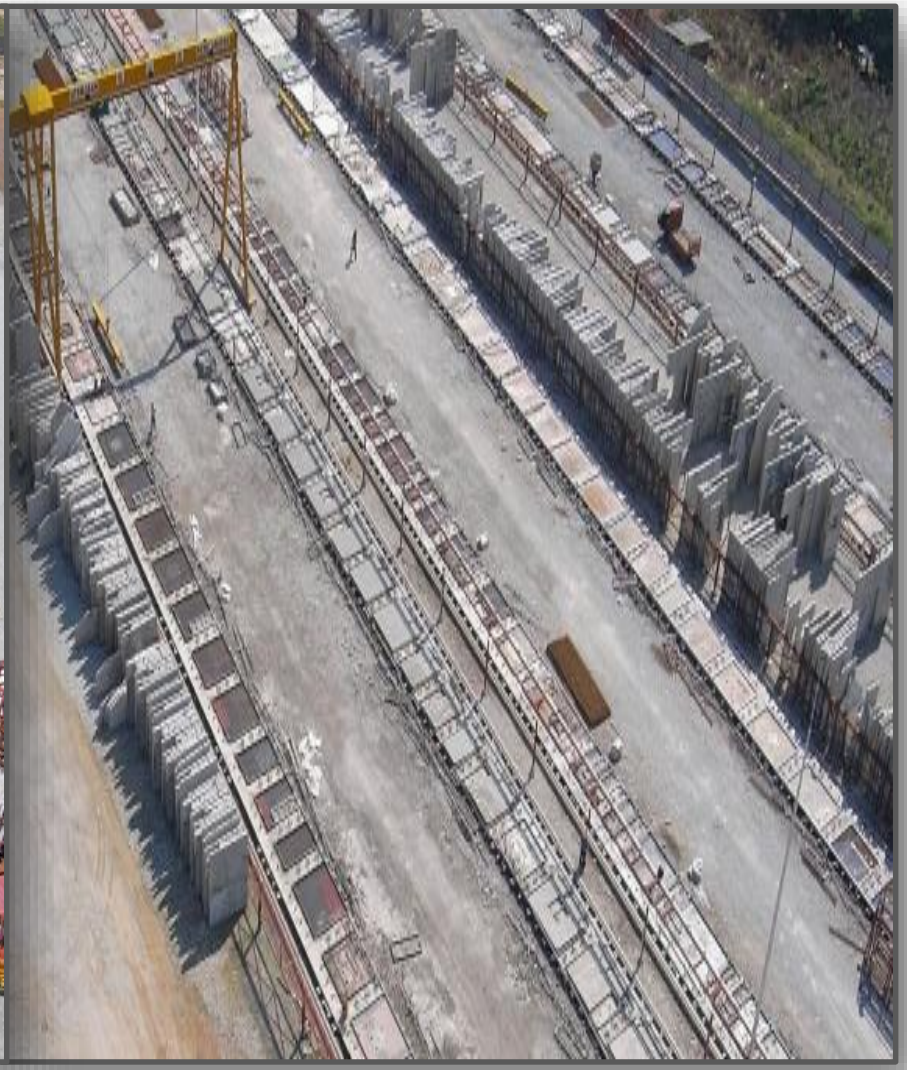
- Slump Test carried out on every delivery.

- Cube Test taken for every 20m3.

Rebound Hammer test carried out daily & on selected Panel

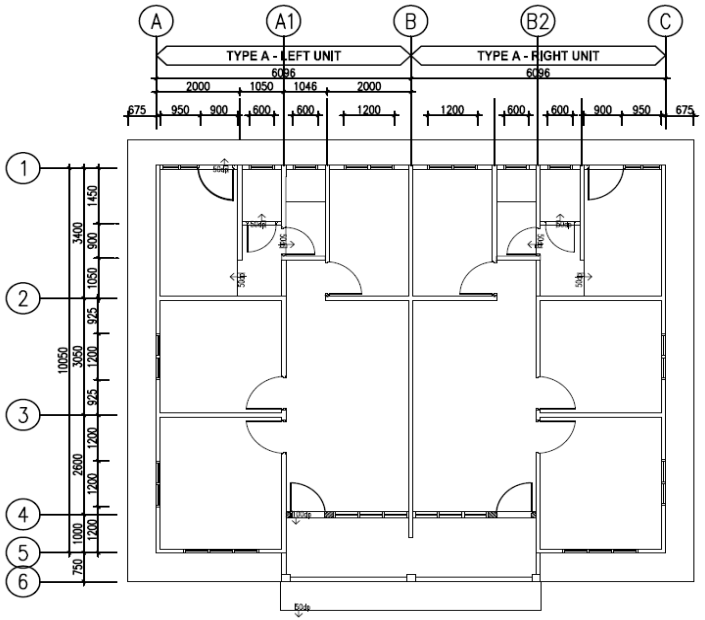
7.1 QUALITY CONTROL & ASSURANCE

- Lifting Of Panel only after minimum 18 hours or as specified by Engineer.
- Panel stored at stock yard for 7 days or as specified by Engineer curing before delivery to site.
- Panel stack individually as apposed to one on top another to prevent cracks



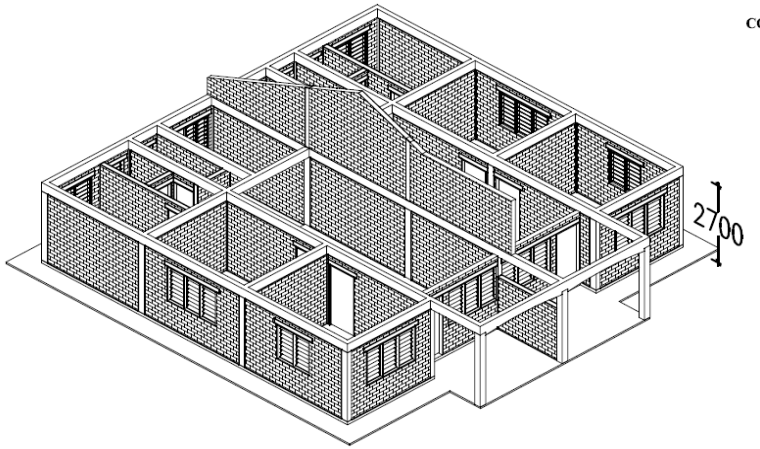
8. COST COMPARISON / FAST & EASY :
- CONVENTIONAL vs HC PRECAST SYSTEM

Comparison of Superstructure Frame & Wall :
Conventional vs HC Precast System

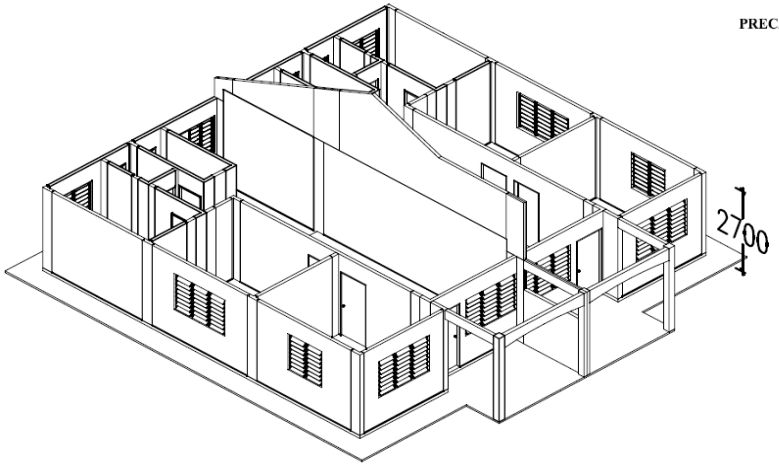


LAYOUT PLAN

CONVENTIONAL



PRECAST SYSTEM



9

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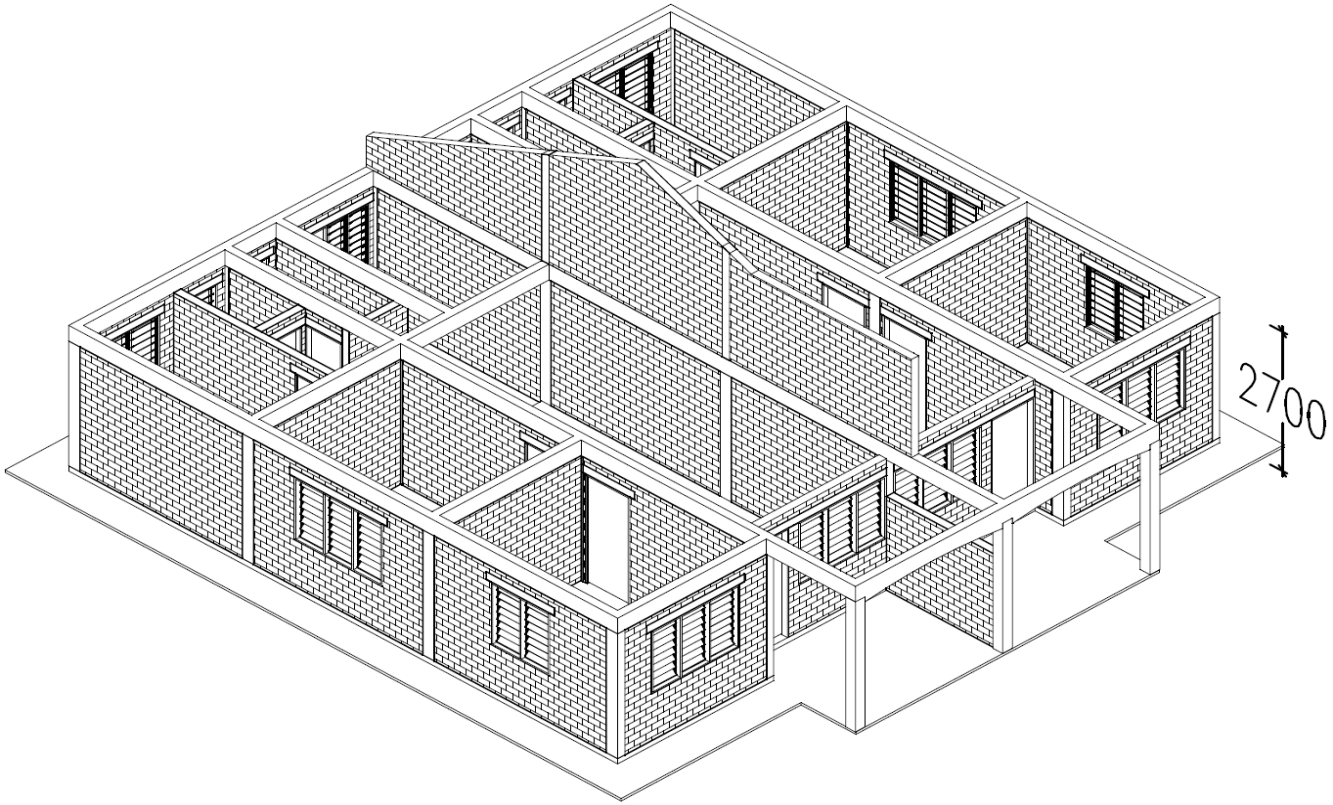
41200 Klang, Selangor D.E.
Tel:03-3323 7999 Fax:03-3323 8993

DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	3993
ENAMD :	3993
APPRD :	3993
SCALE :	NTS

Single Storey Semi-D House
Bukit Botak

DRAWING TITLE :
DRAWING NO : – REV : –
SYSTEM : – REV : –

8.1 COST COMPARISON / FAST & EASY :
- CONVENTIONAL Vs HC PRECAST SYSTEM



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Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	LEE
EXAMD :	WNG
APPVD :	WNG
SCALE :	NTS

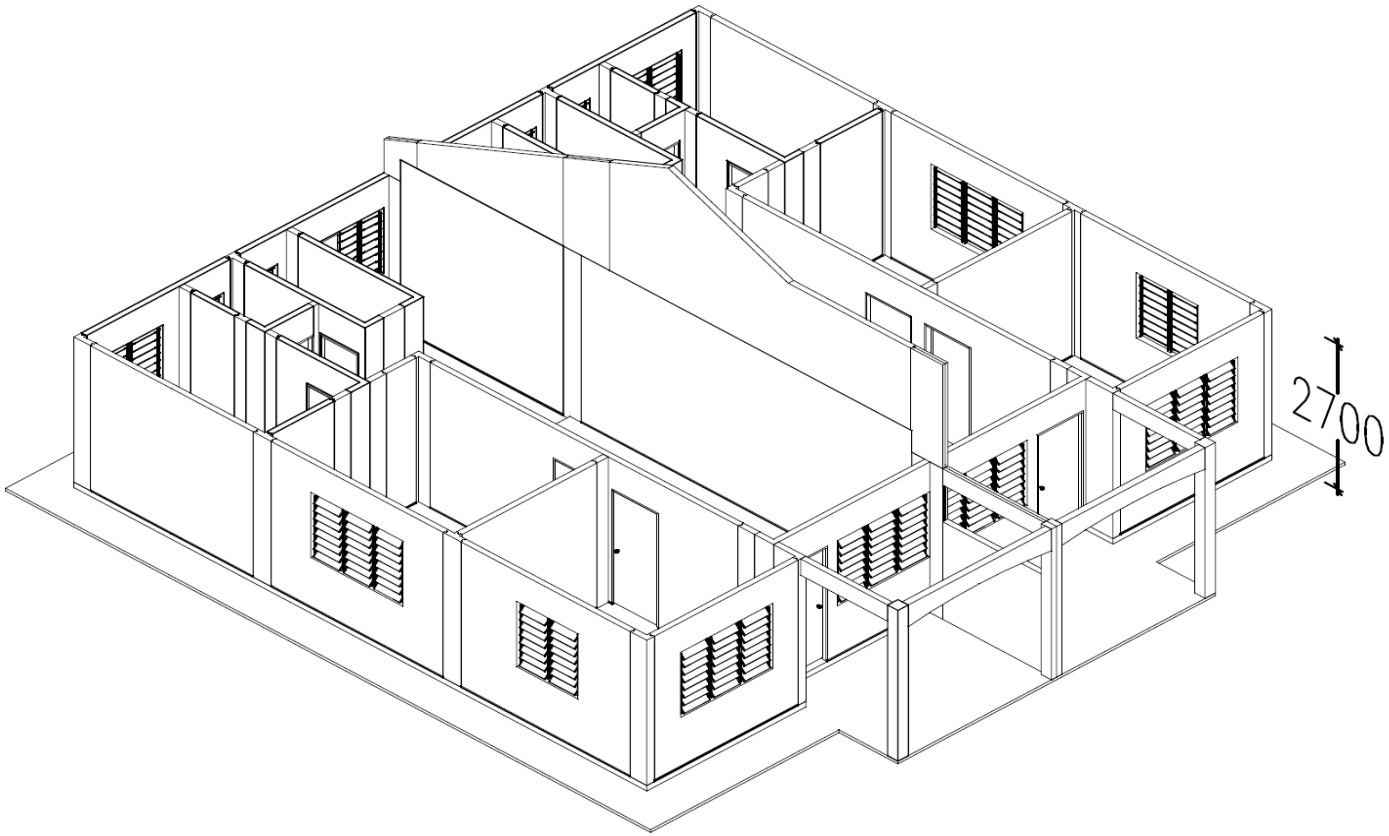
Single Storey Semi-D House
Bukit Botak

DRAWING TITLE :

DRAWING NO : HC/WP REV : --

SYSTEM : -- REV : --

8.2 COST COMPARISON / FAST & EASY :
- CONVENTIONAL Vs HC PRECAST SYSTEM



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Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	JUNE 2015
CHECKED :	LEE
EXAM'D :	MNG
APPR'D :	MNG
SCALE :	NTS

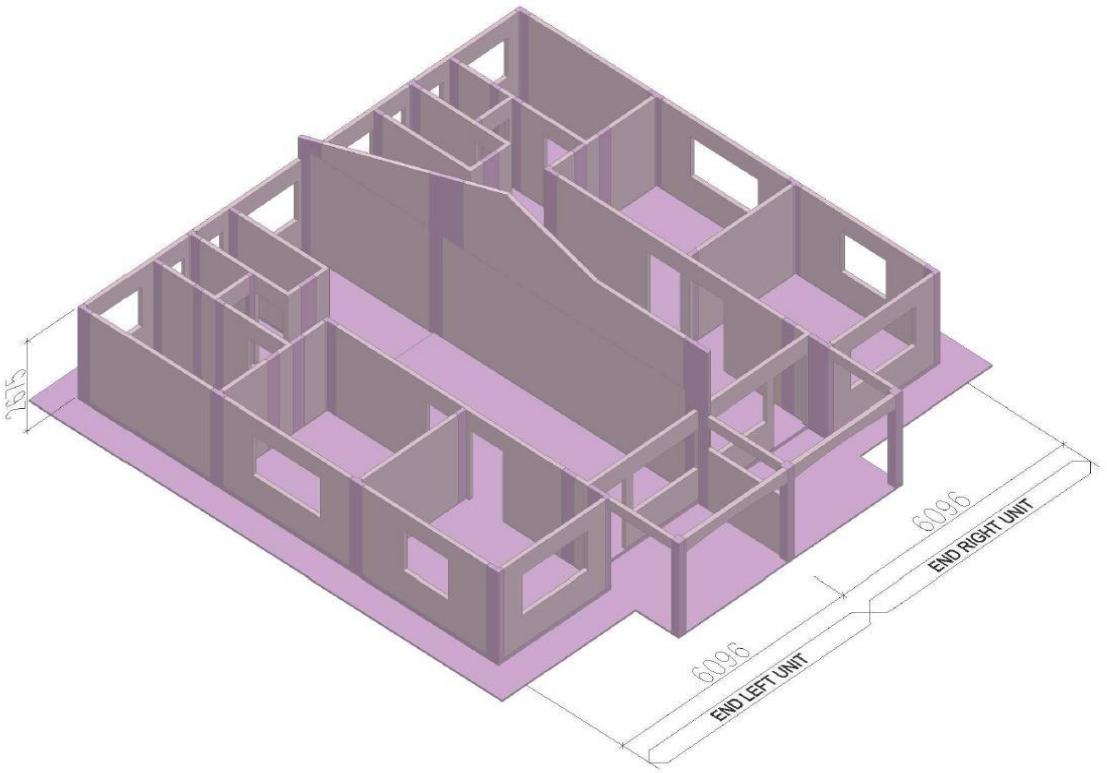
Single Storey Semi-D House
Bukit Botak

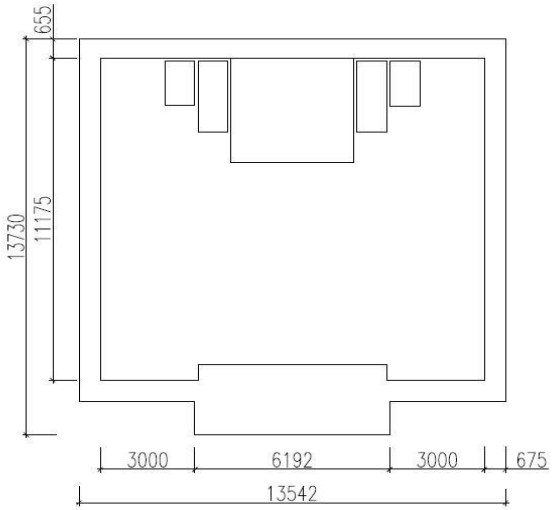
DRAWING TITLE :

DRAWING NO : HC/WP REV : -

SYSTEM : - REV : -

8.3 COST COMPARISON / FAST & EASY :
- CONVENTIONAL Vs HC PRECAST SYSTEM





Ground Floor

Precast Element

In-Situ Work

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41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	MAY 2015
CHECKED :	LEE
DWG'D :	MNG
APPR'D :	MNG
SCALE :	NTS

Single Storey Semi D
End Left & Right Unit
836 Sqft

DRAWING TITLE : 1
DRAWING NO : – REV : –
SYSTEM : – REV : –

8.4 COST COMPARISON / FAST & EASY :
- CONVENTIONAL Vs HC PRECAST SYSTEM

Semi-D House : Single Storey (Superstructure / Frame & Wall)

Conventional : Original Design		HC Precast System
(Current Rate – July 2014)		(Current Rate – July 2014)
RM 127.43 / m2	**Vs**	**RM 90.00 / m2**

RATE CAN BE CHECKED & CHANGE BY YOU

Microsoft Excel
97-2003 Workshee

8.5 COST COMPARISON/FAST & EASY :

- COMPARE OUR SYSTEM PRICE : Superstructure (frame & wall)

Easy & Fast to Compare Our System Superstructure Price

(Cost Comparison : Single Storey House)

Item	Conventional					Item	HC Precast System				
	Description	Unit	Qty	Rate	Amount		Description	Unit	Qty	Rate	Amount
1	**Ground Floor Column**					1	**Ground Floor Column**				
	a) Concrete	m3					a) Concrete	m3			
	b) Formwork	m2					b) Formwork (included)				
	c) Rebar	kg					c) Rebar (included)				
2	**Roof Beam & Party Wall Column**					2	**Roof Beam**				
	a) Concrete	m3					a) Concrete	m3			
	b) Formwork	m2					b) Formwork (included)				
	c) Rebar	kg					c) Rebar (included)				
3	**Wall**					3	**Wall - 100mm thick**				
	(Internal,external & party)						**(Internal,external & party)**				
	a) Bricks	m2					a) Concrete	m3			
	b) Plaster	m2					= .....m2 x 0.10m				
	c) Coping	m									
	d) Lintol	m									
	Total Amount :						**Total Amount :**				

Easy & Fast to Compare Our System Superstructure Price

(Cost Comparison : Double Storey House)

Item	Conventional					Item	HC Precast System				
	Description	Unit	Qty	Rate	Amount		Description	Unit	Qty	Rate	Amount
1	**Ground Floor Column**					1	**Ground Floor Column**				
	a) Concrete	m3					a) Concrete	m3			
	b) Formwork	m2					b) Formwork (included)				
	c) Rebar	kg					c) Rebar (included)				
2	**1st Floor Beam**					2	**1st Floor Beam**				
	a) Concrete	m3					a) Concrete	m3			
	b) Formwork	m2					b) Formwork (included)				
	c) Rebar	kg					c) Rebar (included)				
3	**Staircase**					3	**Staircase**				
	a) Concrete	m3					a) Concrete	m3			
	b) Formwork	m2					b) Formwork (included)				
	c) Rebar	kg					c) Rebar (included)				
4	**1st Floor Slab**					4	**1st Floor Slab**				
	a) Concrete	m3					a) Concrete	m3			
	b) Formwork	m2					b) Formwork (included)				
	c) Rebar	kg					c) Rebar (included)				
5	**1st Floor Column**					5	**1st Floor Column**				
	a) Concrete	m3					a) Concrete	m3			
	b) Formwork	m2					b) Formwork (included)				
	c) Rebar	kg					c) Rebar (included)				
6	**Roof Beam & Party Wall Column**					6	**Roof Beam**				
	a) Concrete	m3					a) Concrete	m3			
	b) Formwork	m2					b) Formwork (included)				
	c) Rebar	kg					c) Rebar (included)				
7	**Wall**					7	**Wall - 120mm thick**				
	(Internal,external & party)						**(Internal,external & party)**				
	a) Bricks	m2					a) Concrete	m3			
	b) Plaster	m2					= .....m2 x 0.12m				
	c) Coping	m									
	d) Lintol	m									
	Total Amount :						**Total Amount :**				

8.6 COST COMPARISON/FAST & EASY :

- COMPARE OUR SYSTEM PRICE : Superstructure (frame & wall)

Payment Terms (Supply & Install + Logistic)

Rate (RM / m3)	Qty / Unit (m3)	Total Unit (no)	Total Contract Sum (RM)	Advance (Design Fee) 5% (RM)	Balance of Contract Sum (RM)	Precast Element - 80% (RM)	Installation & Insitu Work - 20% (RM)	Down Payment of Precast Element (Negotiable Subject to Production Period) (RM)	% of Down Payment	Amount (RM)

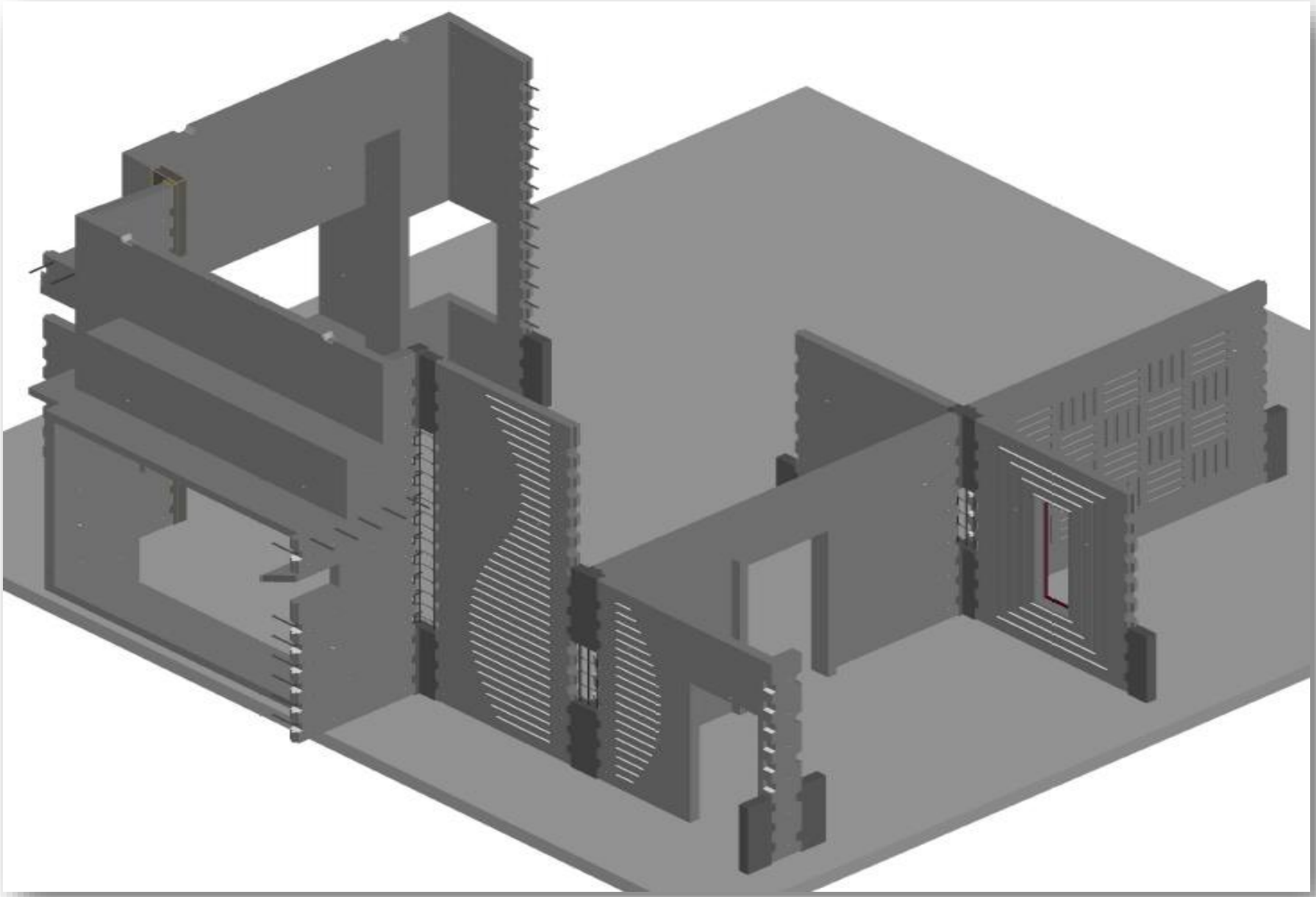
Completion Period (Month) 1-12	Work Done (RM / Month)	Work Done (RM / Day)	Work Done (m3 / Day)	Work Done (RM / Week)	Monthly + 1 Week Workdone over Down Payment (RM / Week)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Total					

Microsoft Excel
)7-2003 Workshee

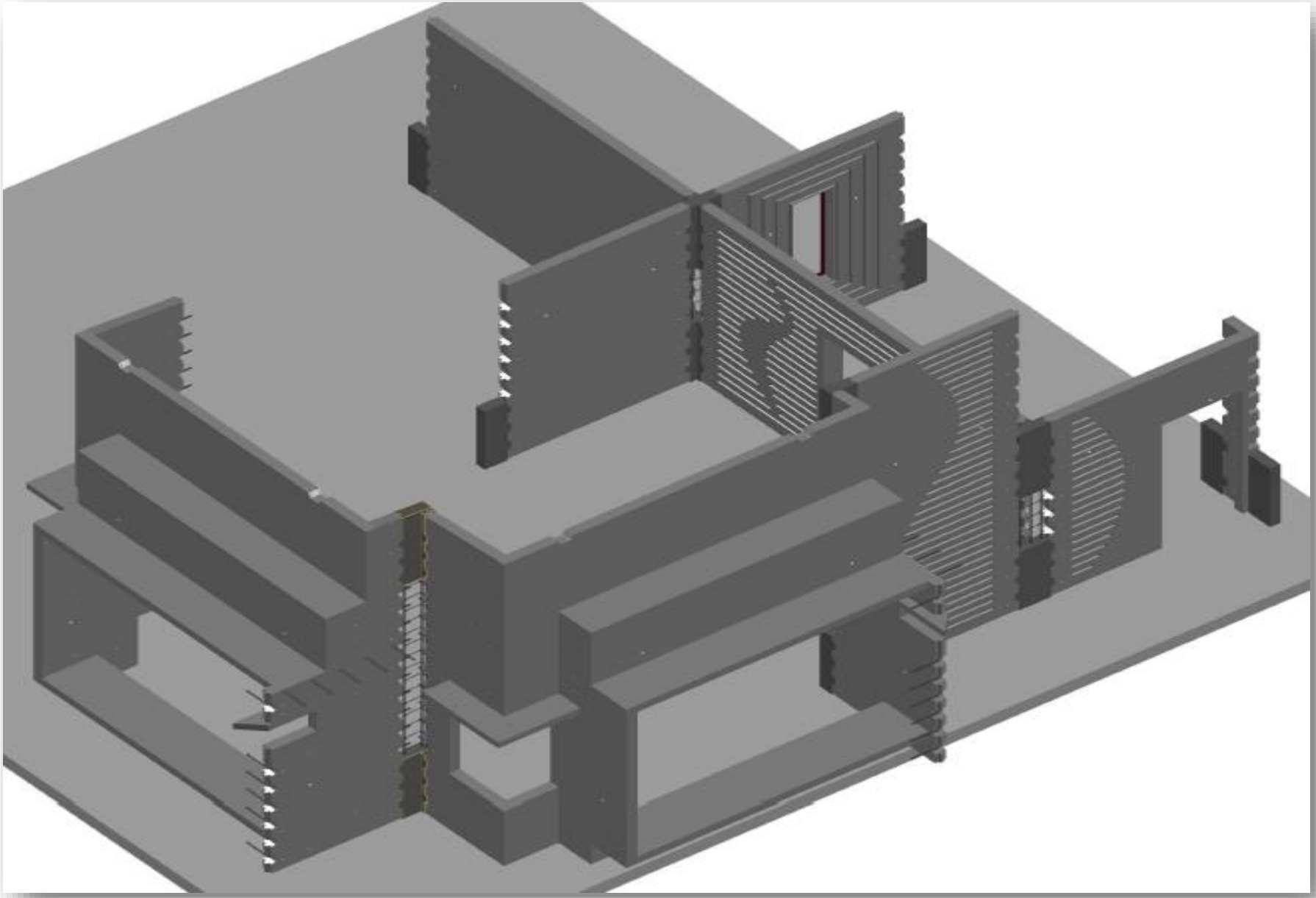
* 24 working days per month

Note : Payment pay within 1 week from submission date.

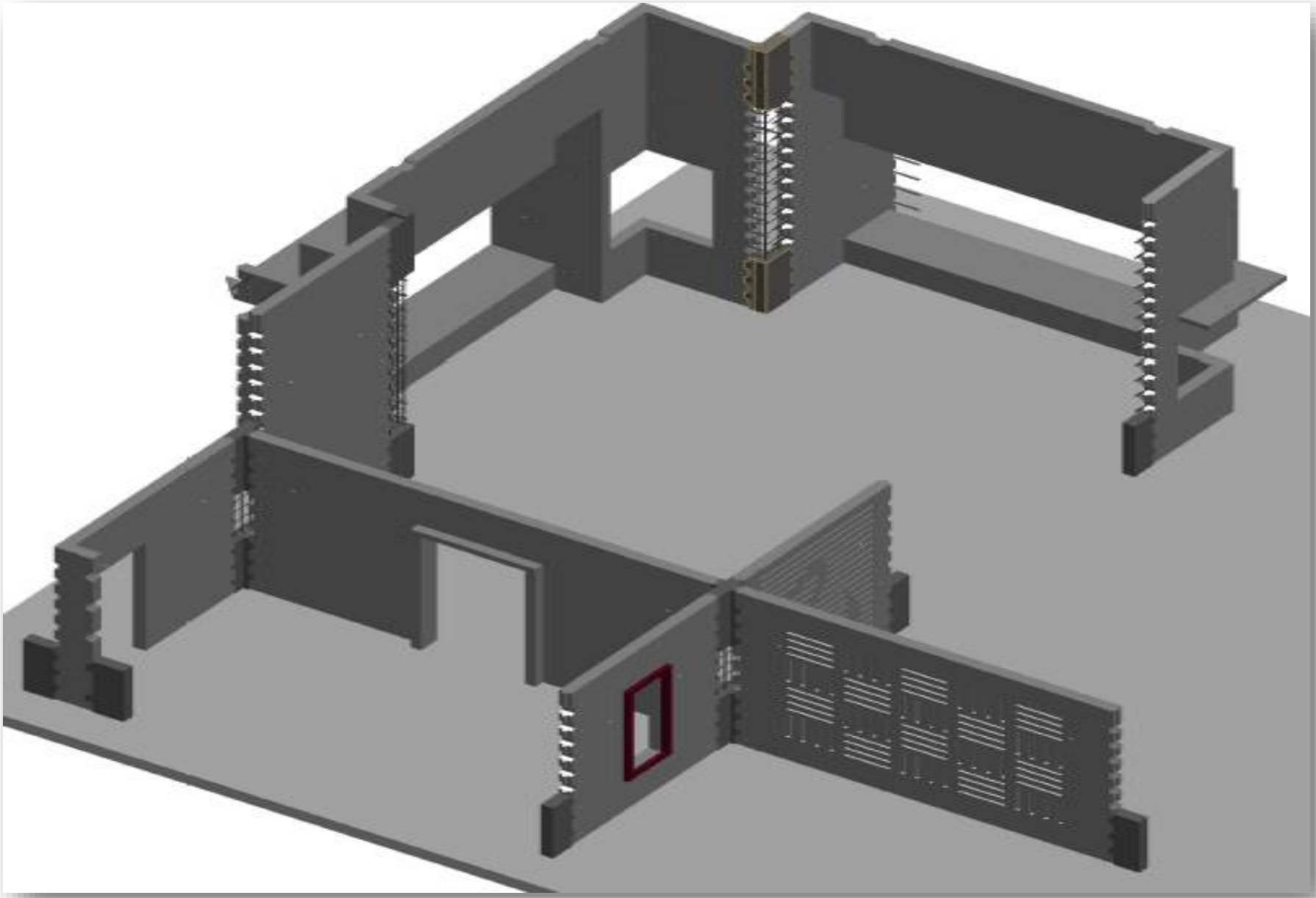
9. DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM



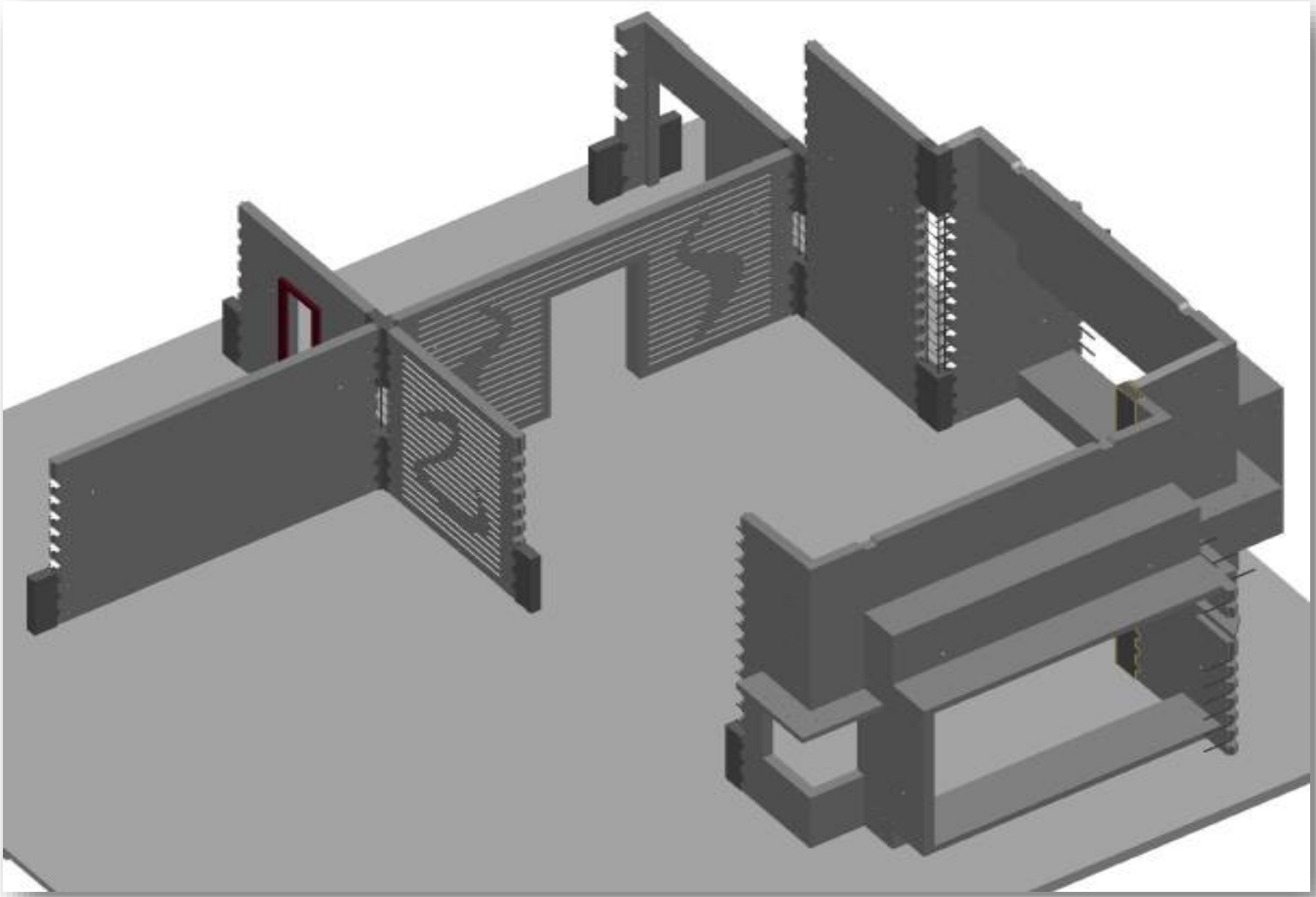
9.1 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM



9.2 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM



9.3 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM



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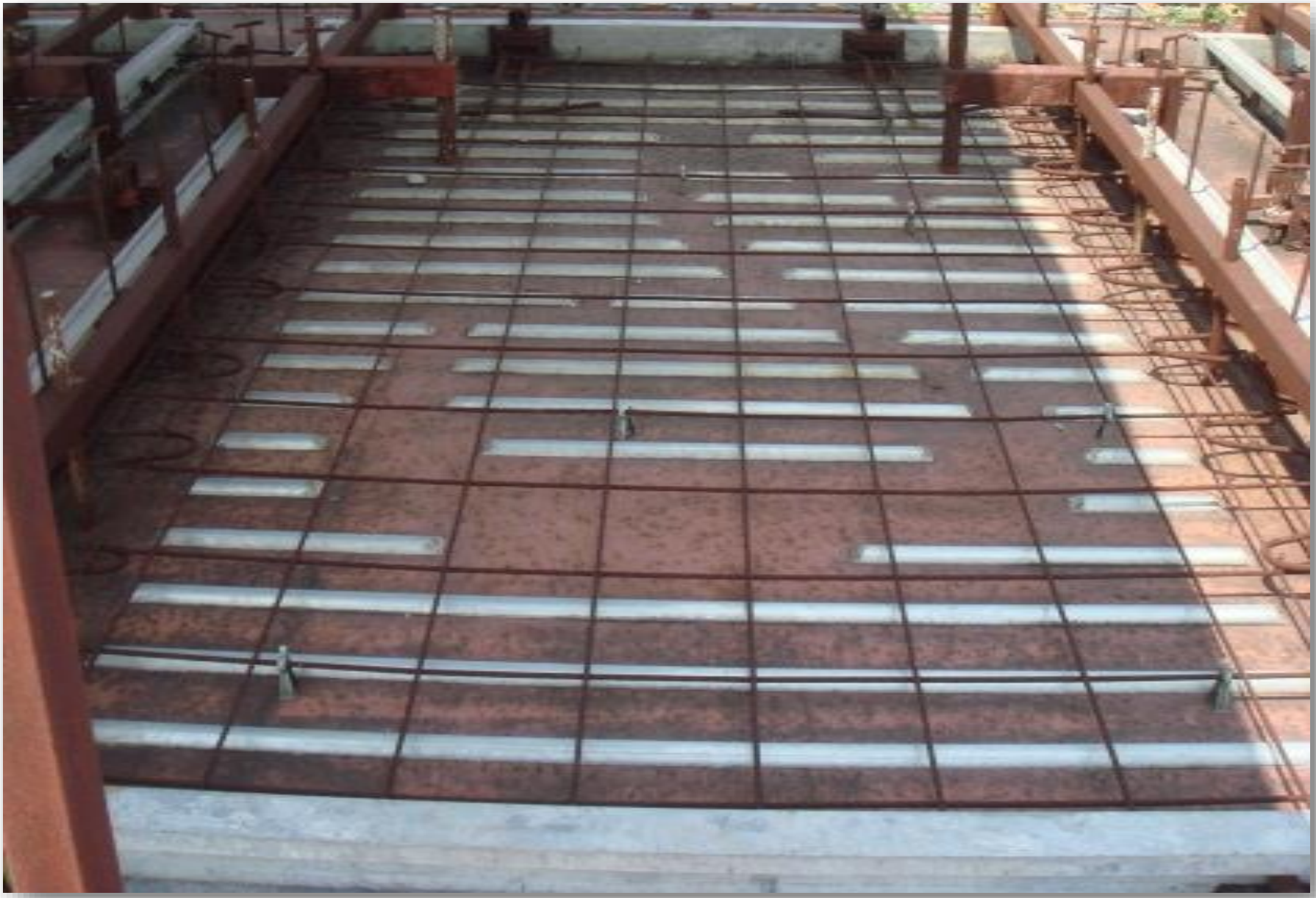


9.5 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM

9.6 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM

9.7 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM

9.8 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM

9.9 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM

9.10 DESIGNED BY YOU PRODUCED BY HC PRECAST SYSTEM

DESIGNED BY YOU
PRODUCED BY
HC PRECAST SYSTEM

THANK YOU

PART 1

10. SYSTEMATIC PRODUCTION, DELIVERY & WORK PROGRAM

300 UNITS SINGLE STOREY SEMI-D

PRODUCTION, DELIVERY, WORK PROGRAM

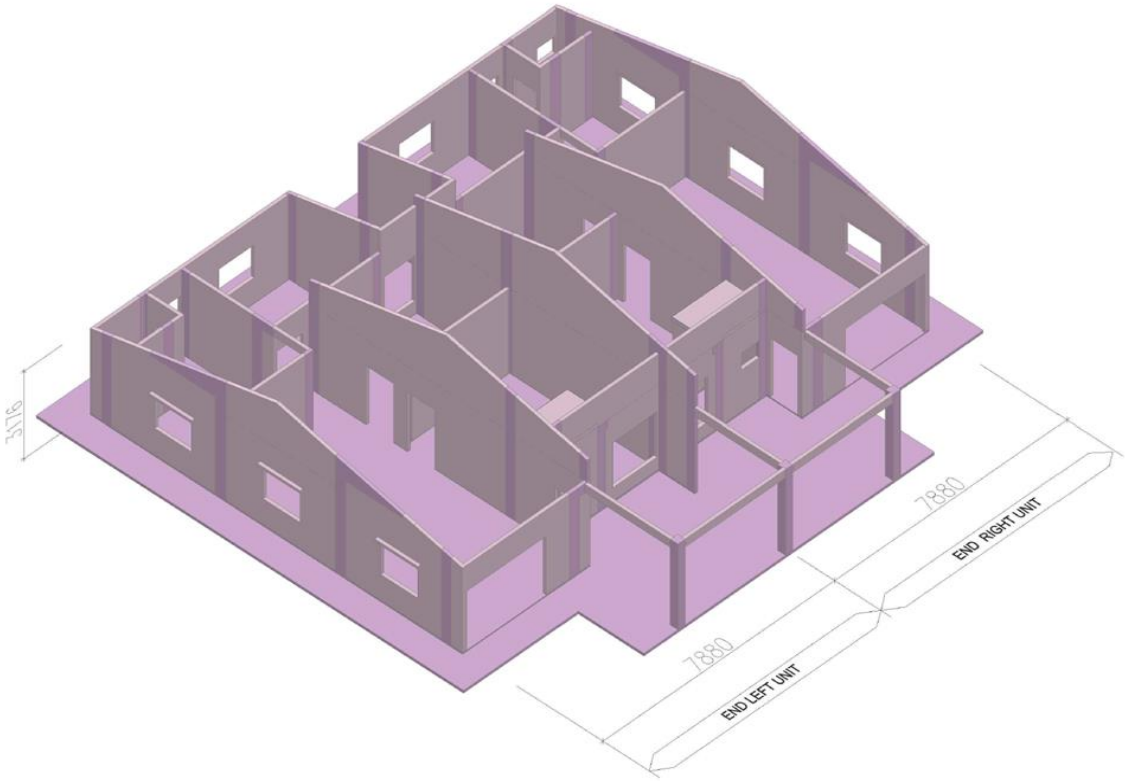
&

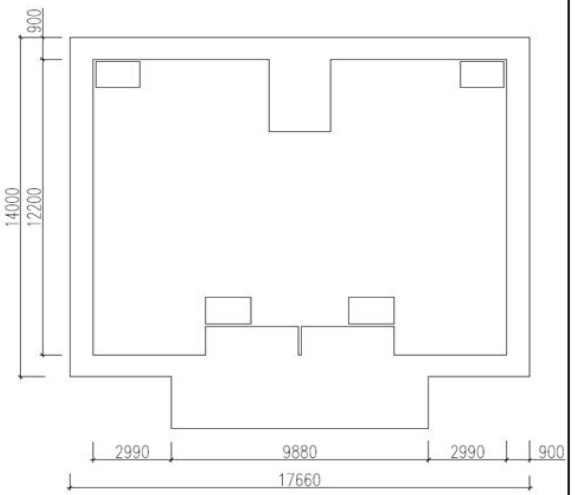
INSTALLATION SCHEDULE

Microsoft Excel
97-2003 Workshee

11. PERCENTAGE ON SITE & OFF SITE WORK

11.1 PERCENTAGE ON SITE & OFF SITE WORK





Ground Floor

Precast Element

In-Situ Work

SYSTEM PROVIDER

HC PRECAST SYSTEM SDN. BHD. (586697-M)

No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993 e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER

HC MANUFACTURING SDN. BHD. (585570-T)

No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	MAY 2015
CHECKED :	LEE
EXAM'D :	WNG
APPR'D :	WNG
SCALE :	NTS

Single Storey Semi D
End Left & Right Unit

DRAWING TITLE : 2

DRAWING NO : –

REV : –

SYSTEM : –

REV : –

11.2 PERCENTAGE ON SITE & OFF SITE WORK

Summary

Item	Description	Unit	End Left Unit		End Right Unit	
			Precast	In-situ	Precast	In-situ
1)	Ground Floor					
a.	Panel	m^3	17.801	-	17.801	-
b.	Wet Joint	m^3	-	2.906	-	2.906
c.	Precast Beam	m^3	0.262	-	0.262	-
d.	Slab Water Tank	m^3	0.353	-	0.353	-
	Sub Total	m^3	18.416	2.906	18.416	2.906
	Total	m^3	21.322		21.322	
	Percentage	%	86.37	13.63	86.37	13.63
	GFA	m^2	104.786		104.786	

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mail:enquiry@hcprecast.com, www.hcprecast.com

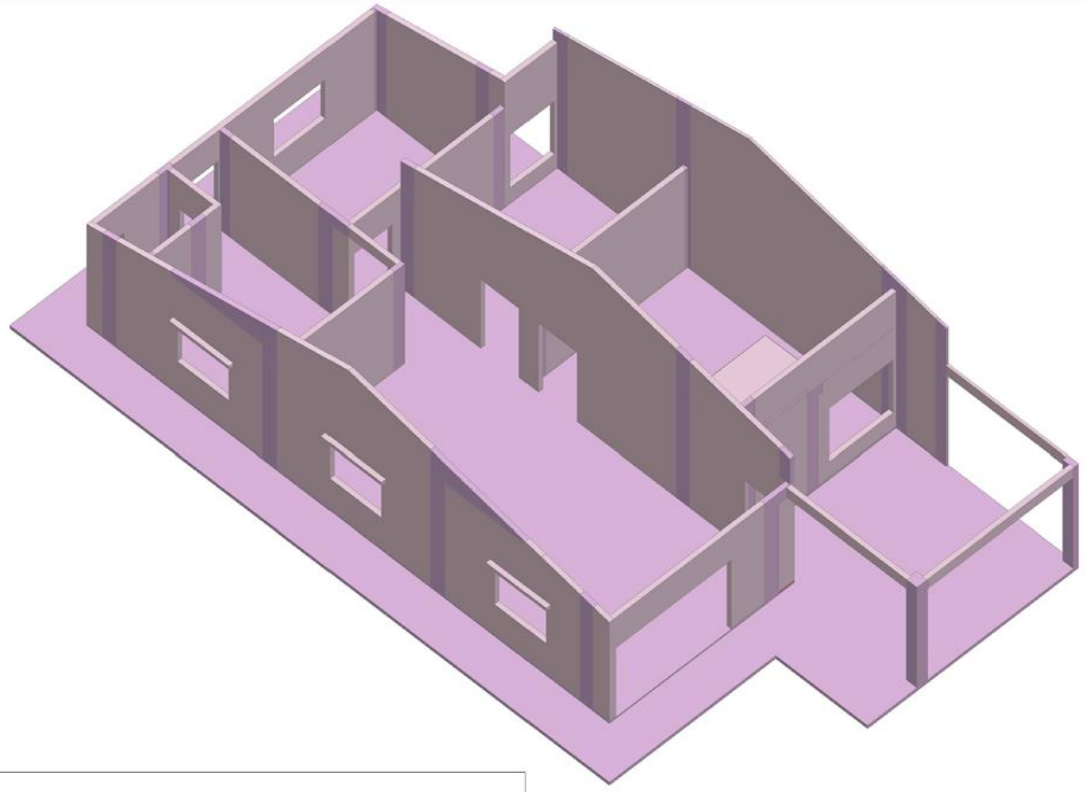
MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	MAY 2015
CHECKED :	LEE
EXAM'D :	MNG
APPR'D :	MNG
SCALE :	NTS

Single Storey Semi D
End Left & Right Unit

DRAWING TITLE : 3
DRAWING NO : – REV : –
SYSTEM : – REV : –

11.3 PERCENTAGE ON SITE & OFF SITE WORK



Ground Floor

Precast Element

In-Situ Work

Single Storey Semi-D - End Left Unit : RM 19,189.80

86% Precast Element at Factory
14% Wet work on Site (by system formwork)

Item	Description	Unit	End Left Unit	
			Precast	In-situ
1)	Ground Floor			
a.	Panel	m³	17.801	-
b.	Wet Joint	m³	-	2.906
c.	Precast Beam	m³	0.262	-
d.	Slab Water Tank	m³	0.353	-
	Sub Total	m³	18.416	2.906
	Total	m³	21.322	
	Rate / m³	RM	900.00	
	Total Amount	RM	19,189.80	
	GFA	m²	104.79	
	Rate / m² GFA	RM	183.13	
	Rate / ft² GFA	RM	17.01	
	Percentage	%	86.37	13.63

SYSTEM PROVIDER:
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.23B, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mailenquiry@hcprecast.com, www.hcprecast.com

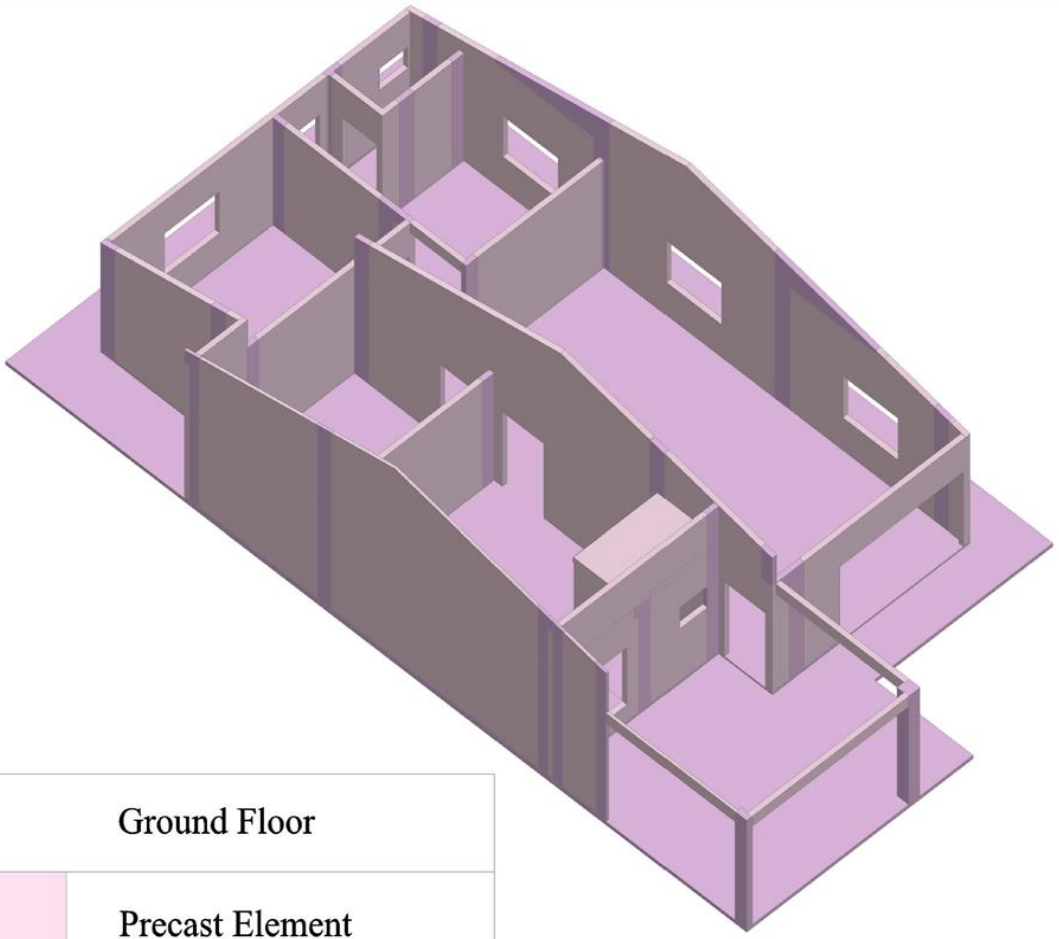
MANUFACTURER:
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	MAY 2015
CHECKED :	LEE
EXAM'D :	MNG
APP'D :	MNG
SCALE :	NTS

Single Storey Semi D
End Left Unit

DRAWING TITLE : 4
DRAWING NO : -
REV : -
SYSTEM : -
REV : -

11.4 PERCENTAGE ON SITE & OFF SITE WORK



Ground Floor

Precast Element

In-Situ Work

Single Storey Semi-D - End Right Unit : RM 19,189.80

86% Precast Element at Factory
14% Wet work on Site (by system formwork)

Item	Description	Unit	Intermediate Right Unit	
			Precast	In-situ
1)	Ground Floor			
a.	Panel	m³	17.801	-
b.	Wet Joint	m³	-	2.906
c.	Precast Beam	m³	0.262	-
d.	Slab Water Tank	m³	0.353	-
	Sub Total	m³	18.416	2.906
	Total	m³	21.322	
	Rate / m³	RM	900.00	
	Total Amount	RM	19,189.80	
	GFA	m²	104.79	
	Rate / m² GFA	RM	183.13	
	Rate / ft² GFA	RM	17.01	
	Percentage	%	86.37	13.63

SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586697-M)
No.238, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Seri Sarawak 20B/KS2, Taman Seri Andalas, 41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	ZUL
DATE :	MAY 2015
CHECKED :	LEE
EQWD :	MNG
APPVD :	MNG
SCALE :	NTS

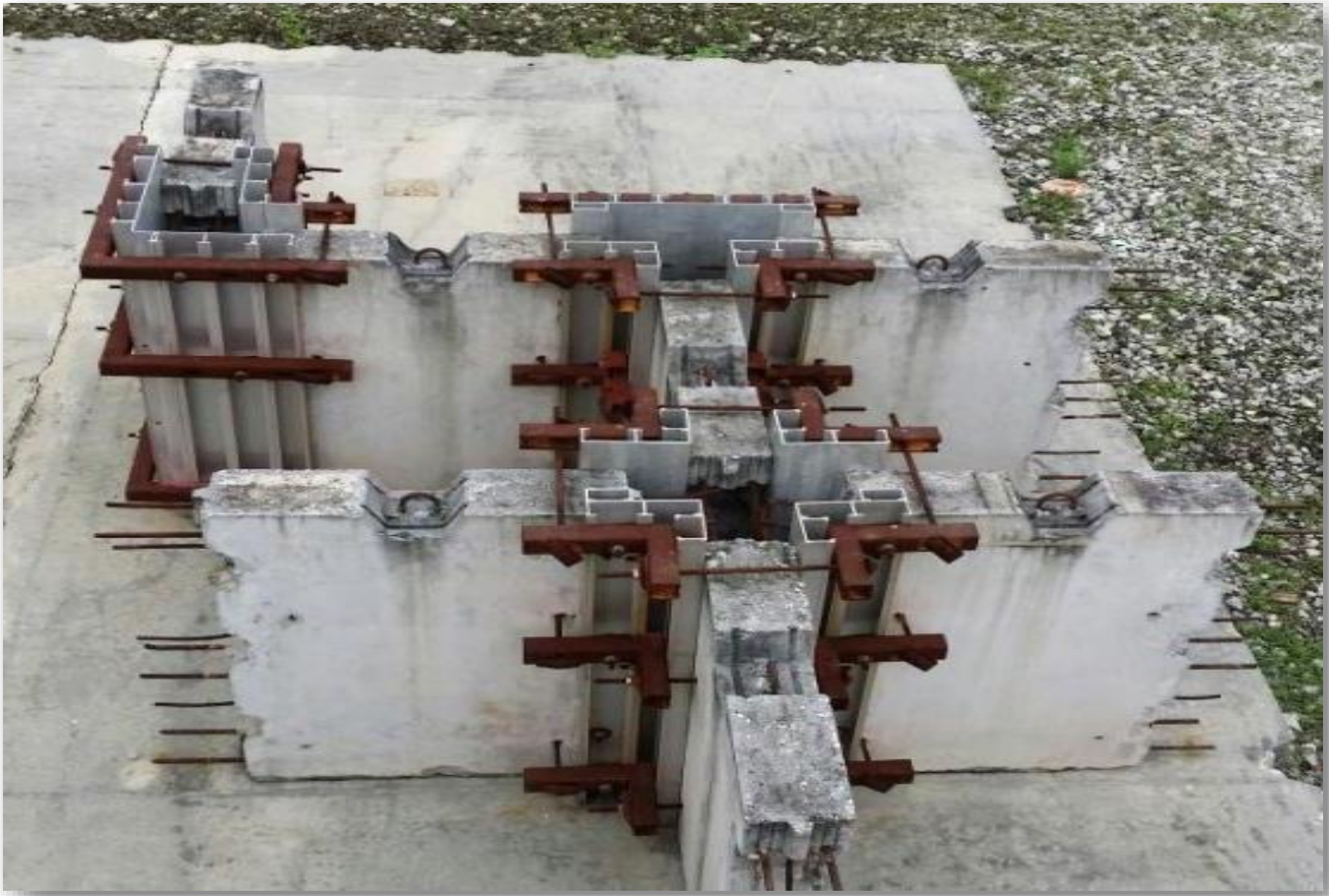
Single Storey Semi D
End Right Unit

DRAWING TITLE : 5

DRAWING NO : - REV : -

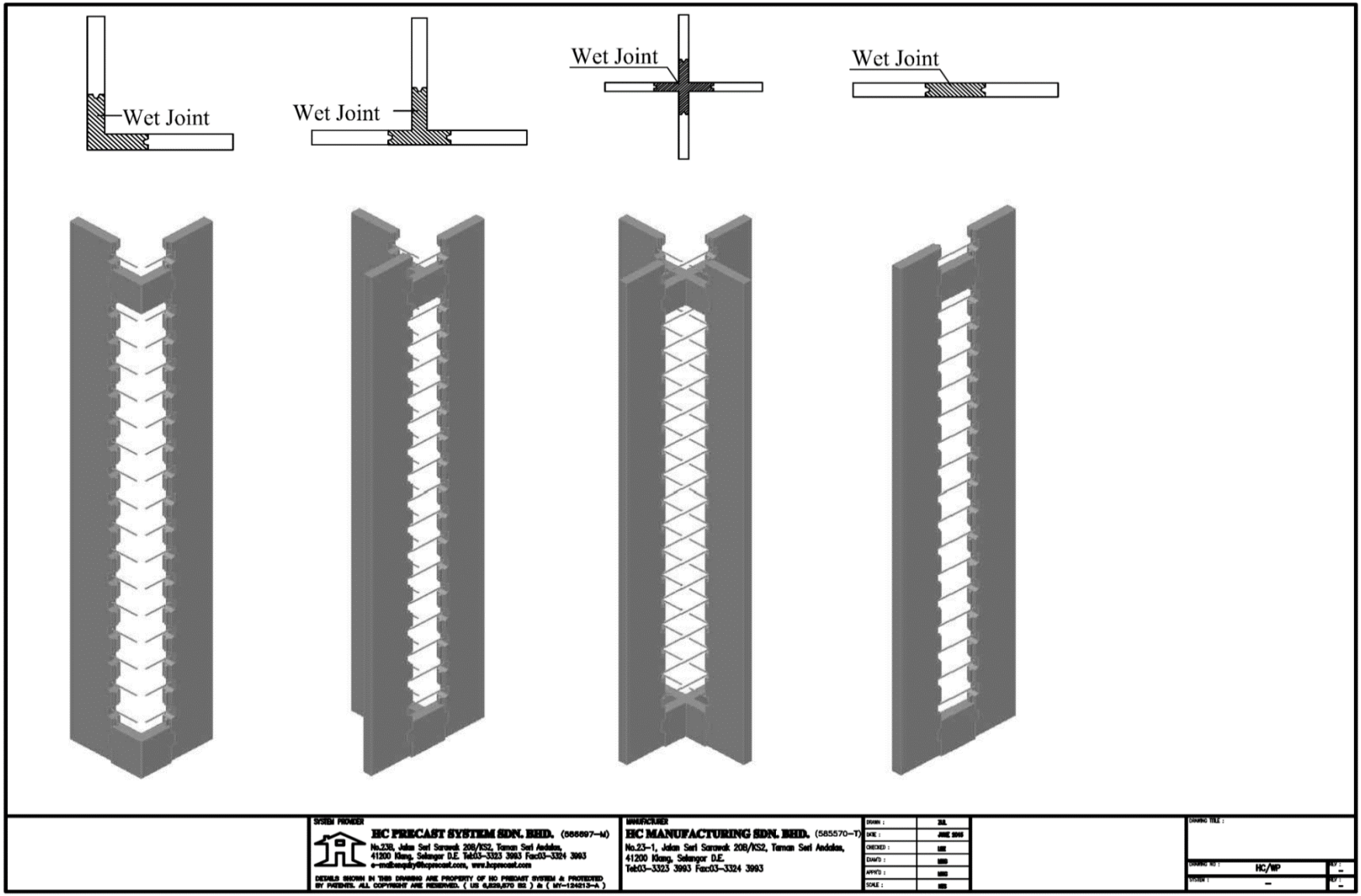
SYSTEM : - REV : -

12. FLEXIBILITY SUIT ARCHITECT DEMANDS
- MODULAR MOULD & SHEAR KEYS



12.1 FLEXIBILITY SUIT ARCHITECT DEMANDS
- MODULAR MOULD

12.2 FLEXIBILITY SUIT ARCHITECT DEMANDS
- MODULAR SHEAR KEYS



13. PRECAST ELEMENT

13.1 WALL PANEL : CUSTO MIZED

13.2 COLUMN SHEAR KEYS WET JOINT

13.2a PRECAST PANEL SHEAR KEYS WET JOINT

13.3 IN-SITU COLUMN/PRECAST BEAM WITH SHEAR KEYS

13.4 HALF SLAB

13.4a HALF SLAB CASTING

13.5 PRECAST STAIRCASE 1

13.5a PRECAST STAIRCASE 2

13.6 BAY WINDOW

13.6a PRECAST PANEL WITH GROVE LINE

13.7 ARCH 1

13.7a ARCH 2

13.7b ARCH 3

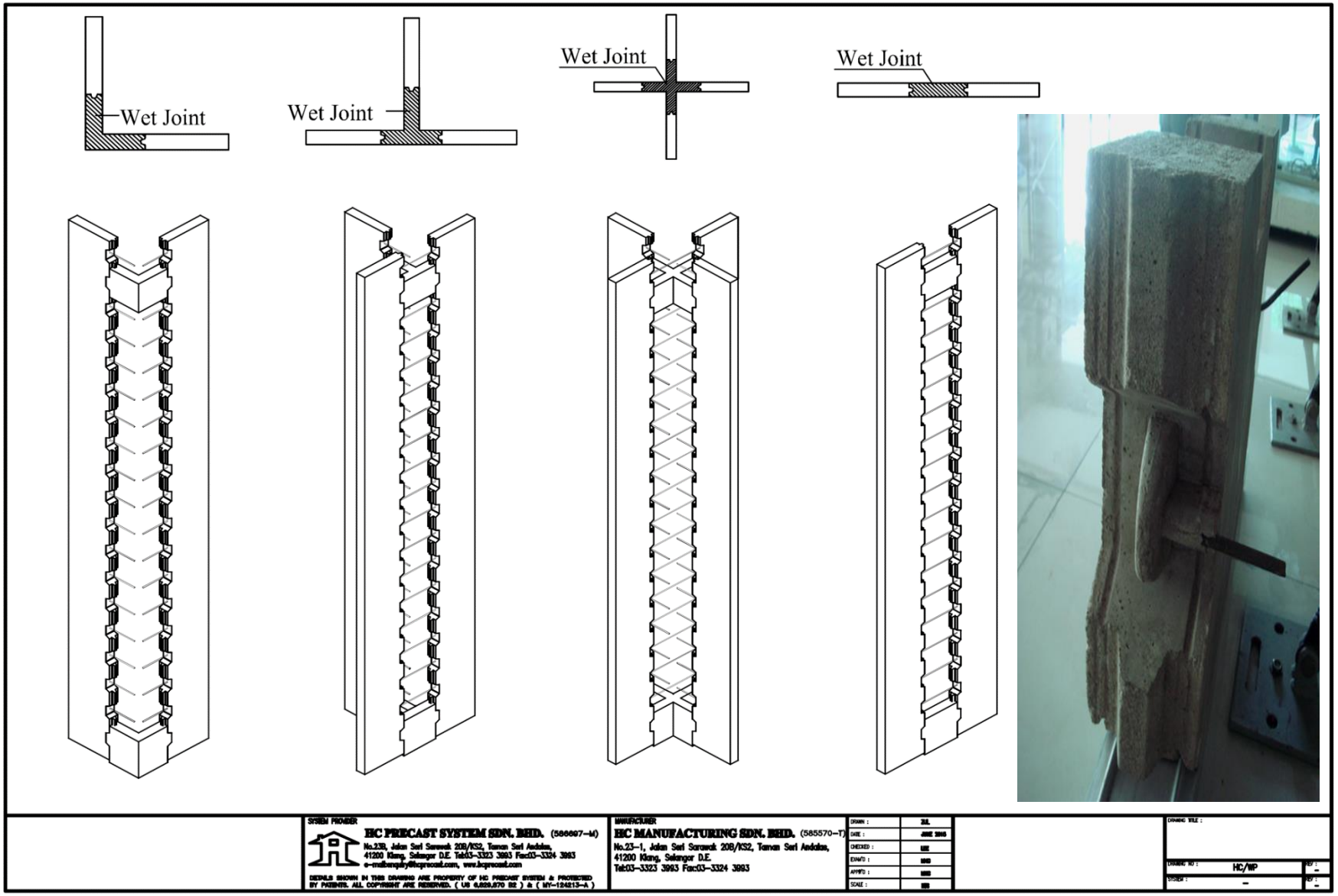
13.1 WALL PANEL : CUSTOMIZED

Item	Panel Wall Thickness (mm)	Panel Wall Height (m)
1	100	3 – 4
2	120	4 – 4.5
3	150/160	4.5 – 5.5
Note : Thickness and height can be varied to suit requirements Item 3 JKR requirement		

13.2 COLUMN SHEAR KEYS WET JOINT

13.2a COLUMN SHEAR KEYS WET JOINT

13.2a COLUMN SHEAR KEYS WET JOINT



SYSTEM PROVIDER
HC PRECAST SYSTEM SDN. BHD. (586097-M)
No.23B, Jalan Sari Saroweik 20B/KS2, Taman Sari Andalas,
41200 Klang, Selangor D.E. Tel:03-3323 3993 Fax:03-3324 3993
e-mail:enquiry@hcprecast.com, www.hcprecast.com

MANUFACTURER
HC MANUFACTURING SDN. BHD. (585570-T)
No.23-1, Jalan Sari Saroweik 20B/KS2, Taman Sari Andalas,
41200 Klang, Selangor D.E.
Tel:03-3323 3993 Fax:03-3324 3993

DRAWN :	JUL
DATE :	JUNE 2015
CHECKED :	HJC
APPVD :	HJC
APPVD :	HJC
SCALE :	NTS

DRAWING TITLE :

DRAWING NO : HC/WP REF : --

SYSTEM : -- REF : --

13.2b PRECAST PANEL SHEAR KEYS WET JOINT

13.3 IN-SITU COLUMN / PRECAST BEAM WITH SHEAR KEYS

13.4 HALF SLAB

13.4a HALF SLAB CASTING

13.5 STAIRCASE 1

13.5a STAIRCASE 2 (in-situ landing slab support)

13.6 BAY WINDOW

13.6a PRECAST PANEL WITH GROVE LINE

13.7 ARCH 1

13.7a ARCH 2

13.7b ARCH 3

14. FACTORY CAPACITY : 21 ACRES

Future development 13 acres : 2,500 to 3,500 units of single storey (1000 ft2) per year

Existing production 8 acres : 1,800 to 2,500 units of single storey (1000 ft2) per year

15. COMPLETED PROJECTS

15.1 - 42 units 3&5 Storey Shop Office at Andalas Klang
15.2 - 156 units Single Storey Terrace House at Kota Puteri
15.3 - 7 units Single Storey Shop Lots at Kota Puteri
15.4 - 10 units Exco Bungalows Selangor at Shah Alam
15.5 - 112 units Single Storey Terrace at Kota Puteri
15.6 - 119 units Double Storey Terrace House at Shah Alam
15.7 - 88 units Semi Detached Low at Bukit Botak
15.8 - 119 units Single Storey Terrace at Bernam Jaya
15.9 - 34 units Semi Detached House at Shah Alam
15.10 - 118 units Double Storey Terrace House at Kota Puteri
15.11 - Show Unit Single Storey House at Rasa Factory
15.12 - Training Unit Double Storey at Rasa Factory

15.1 - 42 units 3&5 Storey Shop Office at Andalas Klang

15.2 - 156 units Single Storey Terrace House at Kota Puteri

15.3 - 7 units Single Storey Shop Lots at Kota Puteri

15.4a - 10 units Exco Bungalows Selangor at Shah Alam

15.4b - 10 units Exco Bungalows Selangor at Shah Alam

15.4c - 10 units Exco Bungalows Selangor at Shah Alam

15.4d - 10 units Exco Bungalows Selangor at Shah Alam

15.5 - 112 units Single Storey Terrace at Kota Puteri

15.5a - 112 units Single Storey Terrace at Kota Puteri

15.6 - 119 units Double Storey Terrace House at Shah Alam

15.7 - 88 units Semi Detached Low at Bukit Botak

15.7a - 88 units Semi Detached Low at Bukit Botak

15.7b - 88 units Semi Detached Low at Bukit Botak

15.8 - 119 units Single Storey Terrace at Bernam Jaya

15.9 - 34 units Semi Detached House at Shah Alam

15.9a - 34 units Semi Detached House at Shah Alam

15.9b - 34 units Semi Detached House at Shah Alam

15.10 - 118 Units Double Storey Terrace House at Kota Puteri

15.10a - 118 Units Double Storey Terrace House at Kota Puteri

15.10b - 118 Units Double Storey Terrace House at Kota Puteri

15.11 - Show Unit Single Storey House at Rasa Factory

15.11a - Show Unit Single Storey House at Rasa Factory

15.11b - Show Unit Single Storey House at Rasa Factory

15.11c - Show Unit Single Storey House at Rasa Factory

15.12 - Training Unit Double Storey House at Rasa Factory

16. PATENTED IN UNITED STATE : US 6.819.870B2

The United States of America

The Director of the United States Patent and Trademark Office

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.

If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to any statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extensions.

Jon W. Dudas

Director of the United States Patent and Trademark Office

US006829870B2

(12) **United States Patent**
Hur

(10) **Patent No.: US 6,829,870 B2**
(45) **Date of Patent: Dec. 14, 2004**

(54) **BUILDING METHODS**

(75) Inventor: **Teow Beng Hur**, Selangor Darul Ehasn (MY)

(73) Assignee: **HC Precast System SDN. BHD.**, Selangor Darul Ehasn (MY)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 16 days.

(21) Appl. No.: **10/285,548**

(22) Filed: **Nov. 1, 2002**

(65) **Prior Publication Data**

US 2004/0016199 A1 Jan. 29, 2004

(51) **Int. Cl.**[7] **E04C 2/38**

(52) **U.S. Cl.** **52/656.1**; 52/563; 52/631; 249/47; 249/191

(58) **Field of Search** 249/19, 22, 26, 249/27, 47, 191; 52/426, 562, 563, 275, 656.1, 631

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,939,500	A *	6/1960	Grant	269/102
3,288,427	A *	11/1966	Pluckebaum	249/192
5,078,360	A *	1/1992	Spera	249/26
5,102,092	A *	4/1992	Salas	249/192
5,553,430	A *	9/1996	Majnaric et al.	52/236.8
5,740,648	A *	4/1998	Piccone	52/426

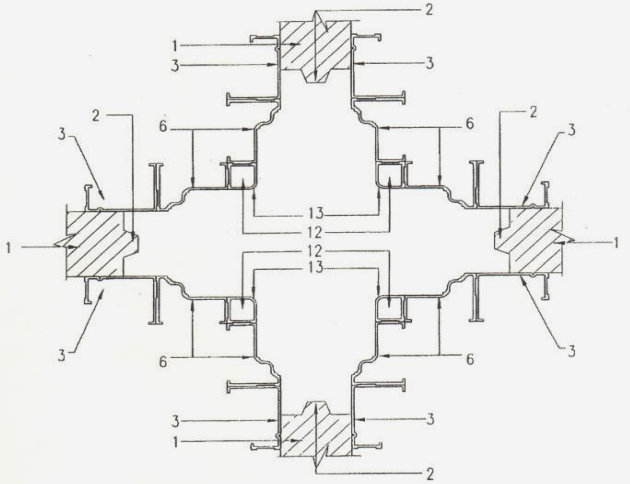
* cited by examiner

Primary Examiner—Korie Chan
(74) *Attorney, Agent, or Firm*—Nath & Associates PLLC; Harold L. Novick

(57) **ABSTRACT**

A building is erected using pre-cast wall panels, preferably load-bearing wall panels having a shear key on each vertical edge and starter bars on each horizontal edge, by first erecting the wall panels, and then casting a concrete column around the vertical edges of adjacent or intersecting wall panels using movable formwork made up from a set of standard modules that can be assembled to form different configurations and sizes of column for different panel arrangements. The moulding surfaces of the modules may be shaped to provide decorative features to the columns and/or the column/wall intersections.

3 Claims, 5 Drawing Sheets



16.1 PATENTED IN MALAYSIA : MY - 124213-A IN 2006
MY - 139712-A IN 2009

MALAYSIA

CERTIFICATE OF GRANT OF A PATENT

In accordance with Section 31 (2) of the Patents Act 1983 a patent for an invention having grant number MY - 139712 - A has been granted to HC PRECAST SYSTEM SDN. BHD. in respect of an invention having the following particulars :

TITLE	:	PANEL FORMWORK SYSTEM
FILING DATE	:	27 MAY 2003
PRIORITY DATE	:	NONE
NAME OF INVENTOR	:	TEOW BENG HUR
PATENT OWNER	:	HC PRECAST SYSTEM SDN. BHD. NO. 1, (GRD. FLOOR) JALAN SINGA 20/E SEKSYEN 20 40000 SHAH ALAM SELANGOR DARUL EHSAN MALAYSIA
DATE OF GRANT	:	30 OCTOBER 2009

Dated this 30 day of OCTOBER 2009

(SHAMSIAH BINTI KAMARUDDIN)
for Registrar of Patents
MALAYSIA

MALAYSIA

CERTIFICATE OF GRANT OF A PATENT

In accordance with Section 31(2) of the Patents Act 1983 a patent for an invention having grant number MY - 124213 - A has been granted to HC PRECAST SYSTEM SDN BHD in respect of an invention having the following particulars :

TITLE	:	IMPROVEMENTS IN BUILDING METHODS.
FILING DATE	:	25 JULY 2002
PRIORITY DATE	:	NONE
NAME OF INVENTOR	:	TEOW BENG HUR.
PATENT OWNER	:	HC PRECAST SYSTEM SDN BHD NO. 1, JALAN SINGA 20/E, SEKSYEN 20, 40000 SHAH ALAM, SELANGOR DARUL EHSAN, MALAYSIA.
DATE OF GRANT	:	30 JUNE 2006

Dated this 30 day of JUNE 2006

(MOHD. AMRAN BIN ABAS)
for Registrar of Patents
MALAYSIA

17. INTERNATIONAL PUBLICATIONS

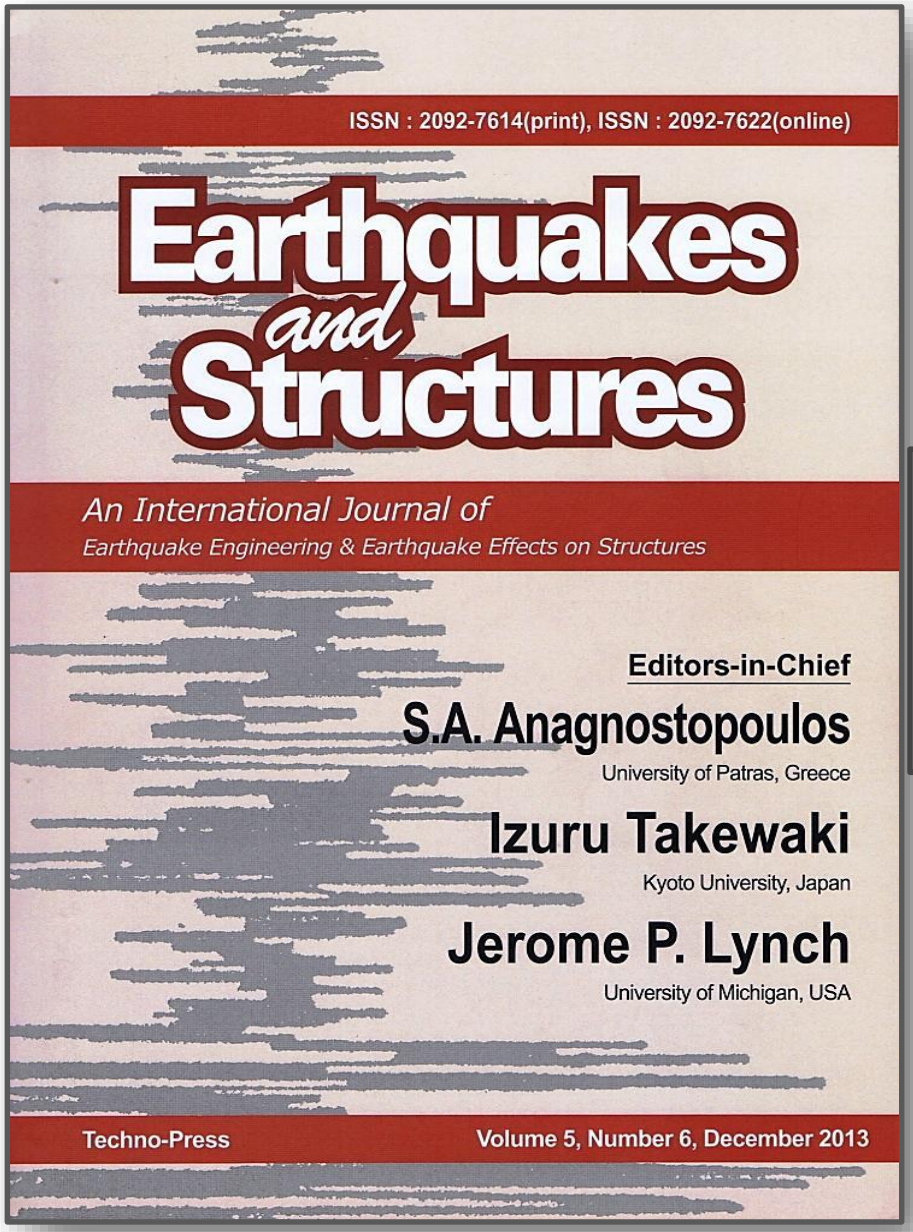
17.1 EARTHQUAKES AND STRUCTURES : 2013

17.2 <u>PORTUGAL</u> :-
- 15th World Conference : 2012

17.3 <u>GERMANY</u> :-
- CPI : 2011

17.4 <u>MALAYSIA</u> :-
- EARTHQUAKE
RESISTANCE TEST UTM : 2011

17.1 INTERNATIONAL MAGAZINE - 2013



“ Earthquakes and Structures “
(Impact Factor 2012 = 1.381,
One of the highest among other structural earthquake engineering journals, indexed by
Journal Citations Reports®, ISI Thomson Reuters)

17.2 PORTUGAL : 15TH WORLD CONFERENCE - 2012

17.2a PORTUGAL : 15TH WORLD CONFERENCE - 2012

Ductility Factor of RC Building Frames with Different Infill Wall Configurations under Low Intensity Far Field Earthquake Effects

A. Adnan, PhD, P.L.Y. Tiong, PhD Student, A.B.A. Rahman, PhD, A.K. Mirasa, PhD, N.H.A. Hamid, PhD
Engineering Seismology & Earthquake Engineering Research, Universiti Teknologi Malaysia, Skudai

INTRODUCTION

- It is not a well accepted practice for engineers to incorporate seismic analysis & design in Malaysian building industry.
- Introducing structural ductility-based design criteria into structural plan is less favored by practitioners.
- The main reason is the relatively awkward geographical location of Malaysia in low to moderate seismicity region.
- Therefore, it becomes important to understand the behavior of non-earthquake-resistance-design structure under such seismic threats.

STUDY AIMS

1. The country is moving towards precast concrete construction due to strong encouragement from local government.
2. This study investigates the ductility behavior of an industry-innovated precast wall system (namely HCPS – HC Precast Wall System) under local soil demand spectrums.
3. Parameters studied: Effect of different wall location and vertical load onto HCPS ductility.

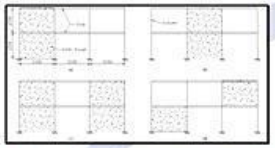
Background

Structural Model (HCPS)

METHODOLOGY

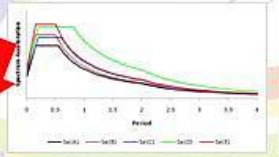
Wall Location

Four different wall locations were studied for two-storey, three-bay building system



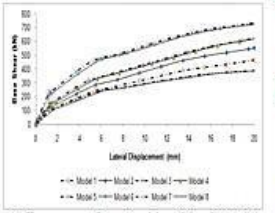
Loading Condition

- Two types of vertical loading:
  - Serviceability limit state (SLS)
    Represented by odd numbers (Model 1, 3, 5 & 7)
  - Ultimate limit state (ULS)
    Represented by even numbers (Model 2, 4, 6 & 8)
- Demand spectrums (Local)



RESULTS

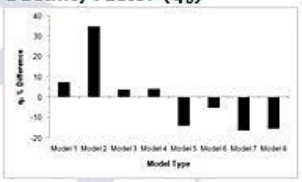
Pushover Analysis



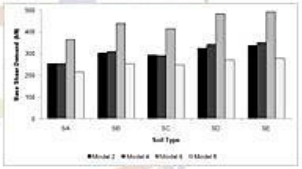
Difference of vertical loading (SLS & ULS) was only observed to affect ductility response of Model 1 & 2

RESULTS CONT'D

Ductility Factor (q_0)



Base Shear Demand



CONCLUSIONS

- Location & configuration of HCPS very much affected the global ductility response of the system.
- However, effect of SLS & ULS vertical loading was insignificant.
- Ductility concept underestimates DCL structure in resisting low to moderate seismic intensity.

CONTACT US

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Faculty of Civil Engineering, Universiti Teknologi Malaysia
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NUMBER OF ACCEPTED PAPERS – THE SUCCESS PATH CONTINUES

> 3600 accepted papers

> 7700 authors

> 4000 registered authors

16 simultaneous sessions

1250 oral presentations

1500 poster presentations

900 e-poster presentations

17.3 GERMANY : CPI - 2011

Malaysia IBS Company Article Appear In CPI Worldwide Journal In 8 Different Languages (Based In GERMANY) :

1. US
2. UK
3. Germany
4. French
5. Italian
6. Spanish
7. Portuguese
8. Indian

17.3a GERMANY : CPI - 2011

17.4 BUILDING & INVESTMENT - 2011

Earthquake resistance test of HC Precast System by shake table

(Contributed by UTM Faculty of Civil Engineering, please see full credit listing at end of article)

The government of Malaysia has been strongly encouraging the construction industry to actively utilise the so-called Industrialised Building System (IBS) in major construction projects. Among the benefits of IBS are: relatively faster, cleaner, safer and cost-effective construction as compared to conventional methods. Precast concrete is one of more popular method amongst other types of IBS such as structural steel, prefabricated cold-formed steel formwork system, masonry or timber techniques.

In response to the government's call, HC Precast System Sdn. Bhd. has been innovating a system that is able to suit not only various architectural demands, but which is also economical, efficient and most importantly compliant to the humid and wet tropical climate of the country. To the authors' knowledge, there is not much precast panel system available in the contemporary market which is able to fulfill every forms of architectural demand. In fact, most architectural concepts have to be compromised with the limitation of the majority precast systems.

As a result, the HC Precast System was invented and patented. Rather than only producing individual precast concrete structural component, the HC Precast System serves as a whole scheme that complements each component to form a complete construction system. The system consists of precast wall panel and half-slab, which are then jointed to cast-in-situ column joint by a series of modular moulds. This high degree of flexibility enhances the HC Precast System's uniqueness in meeting all sorts of architectural layout. In addition, water-proofing test which exposes the whole building system to outdoor weather for a period of 4 years reveals no water leakage.

Now, the HC Precast System is ready to be tested to its crucial structural limit by holding onto the key question "How will it behave under earthquake threats?" The main goal of this earthquake resistance test is to produce an economic precast concrete system that is able to withstand certain degree of earthquake forces without adding much to the construction cost. Adapting structural design to international earthquake regulations may result in rather expensive building cost and hinders optimisation of structural elements particularly for construction in less severe earthquake regions. This will be the first earthquake resistance

Figure 1

Venue for 6 units' model preparation and casting at HC Precast System Sdn. Bhd.'s precast factory in Rasa, Rawang.

Figure 2

Figure 3

Figure 4

Figure 2 - HC Precast System – base panel (foundation).
Figure 3 - HC Precast System - installation of ground floor wall panels.
Figure 4 - Completed 6 units of model for earthquake resistance test.

EARTHQUAKE RESISTANCE TEST OF SCALED DOWN DOUBLE STOREY BUILDING BY HC PRECAST SYSTEM IN COLLABORATION WITH UTM, JOHOR BASED ON 8 MAJOR EARTHQUAKES, IN THE WORLD

17.4a BUILDING & INVESTMENT - 2011

Figure 5

Grand arrival of test models at main gate of Universiti Teknologi Malaysia, Skudai, Johor.

Figure 6

Test model installed on shake table; armed with monitoring sensors ready for earthquake resistance test.

test of its kind ever carried out in Malaysia.

To simulate earthquake ground movements, the HC Precast System needs to be securely seated on top of an earthquake simulator, called the shake table. The test is to be carried out at the Structural and Materials Laboratory of Shake Table Testing at the Faculty of Civil Engineering, Universiti Teknologi Malaysia. The sophisticated computer-operative shake table is under the management of the Engineering Seismology and Earthquake Engineering Research Group (e-SEER). The research is headed by Professor Dr Azlan Adnan, who is also the Head Researcher of e-SEER.

"In order to simulate the real earthquake behavior of the full-scale model, the scaling- down process of the one-third-sized model adheres to cautiously calculated geometric, dynamic and kinematic similarity between the real prototype and smaller model," said Patrick Tiong Liq Yee, who is the main researcher for the whole testing program. "The tested system is also not designed for any sorts of earthquake loading. In engineering term it is considered a non-ductile system," he added. Fabrication of the test model was carried out under his supervision starting from 4 July 2011 at the 20-acre precast manufacturing factory of HC Precast System Sdn. Bhd. in Rasa, Rawang (Figure 1). Upon full installation of the system (Figure 2 – Figure 4), the model is transported to UTM on 16 August by land transport (Figure 5). On 18 August, delegates and representatives from various government bodies, agencies as well as academic institutions were invited to witness the earthquake resistance test of the model.

The model (Figure 6) was tested under 8 series of real earthquake loadings from all over the world (1940 El-Centro California, 1978 Tabas Iran, 1980 Irpinia Italy, 1995 Kobe Japan, 1987 New Zealand, 1983 Taiwan, 1999 Duzce Turkey, and artificially generated Malaysia's earthquake), with magnitude ranging from M5.6 to M7.4. The highest ground acceleration value tested was up to 1.035g. The ground acceleration, or in laymen term the ground movement values was made larger in the test to compensate for the smaller size of the test model. Witnessing the test were representatives from various government bodies that includes delegates from the Construction Research Institute of Malaysia (CREAM) of Construction Industry Development Board (CIDB), Malaysian Rubber Board (LGB/MRB), Public Works Department (JKR/PWD) and other universities such as Universiti Teknologi MARA (UiTM).

Distinguished guests witnessing the success of the earthquake resistance test.

The HC Precast System passed the earthquake test on all 8 different kinds of seismic loading without failure. The test reveals that the HC Precast System behaved within its elastic (or linear) limit state throughout the earthquakes where no visible cracks were observed. A certificate of success was issued by Head Researcher Professor Dr Azlan Adnan to mark the noteworthy seismic performance of the HC Precast System.

More information and videos of the shake table test are available on YouTube (*www.youtube.com/user/MrPatrickyl*). The company's profile and facebook updates are available at *www.hcprecast.com.my* and *www.facebook.com/hcprecast.*

UTM

Earthquake Resistance Test of Scaled-Down Double Storey Building of
HC Precast System Sdn. Bhd.
Under 8 different real earthquake time histories over the world as follows:

Earthquake	Year	Scaled PGA (g)	Magnitude	Result
El Centro, California	1940	0.04	7.1	✓
Tabas, Iran	1978	0.150	7.4	✓
Irpinia, Italy	1980	0.400	6.5	✓
Kobe, Japan	1995	1.035	6.9	✓
New Zealand	1987	0.180	5.8	✓
Taiwan (SHARTS)	1983	0.117	6.6	✓
Duzce, Turkey	1999	0.371	7.1	✓
Malaysia Artificial	–	0.800	–	✓

The **HC Precast System** *performed extremely well throughout all the earthquake tests without any visible cracks or damage.*

Dr Azlan Adnan
Professor of Structural Earthquake Engineering
Faculty of Civil Engineering, Universiti Teknologi Malaysia

Certification issued by Professor Dr Azlan Adnan.

Fadzil Ahmad is the Managing Director of HC Precast System Sdn. Bhd. and is also one of the system owners. He holds a Diploma in Quantity Surveying from Universiti Teknologi Malaysia and a Master Degree in Business Administration (MBA) from Keele University, United Kingdom. His foremost vision is to promote and enhance awareness of the construction industry regarding precast concrete utilisation.
(fadzil@hcprecast.com.my)

Patrick Tiong Liq Yee, a graduate in Civil Engineering, has years of structural design and field experience in earthquake as well as construction monitoring industry. Currently, he is a PhD Student and Researcher in Engineering Seismology & Earthquake Engineering Research (e-SEER) Group at Universiti Teknologi Malaysia, whose main research area includes seismic performance of precast concrete structures. Tiong has published more than 10 papers during his postgraduate study in the past 2 years.
(tiong.patrick@ymail.com)

Professor Dr Azlan Adnan is one of the pioneer professors in structural earthquake engineering and has published more than 100 papers. He is currently the Research Head of Engineering Seismology & Earthquake Engineering Research (e-SEER) Group in Universiti Teknologi Malaysia. Besides serving as an academician, he has also been involved in many prestigious consultancy works such as seismic hazard and evaluation of Bakun Dam, the first and second Penang Bridge, and Petronas-Shell Offshore project.
(azelan_fka_utm@yahoo.com)

Professor Ir Dr Abdul Karim Mirasa has numerous professional involvments in the industry besides his academic service that include his six different international collaboration partners such as the World Bank. He is a qualified independent checker for civil, structural and infrastructure works and has published eight books, more than 60 papers and 12 consultancy reports. Currently, he is a committee member on CIDB's Technical Assessment Main Committee for Products, Construction Materials and Technology and the Technical Opinion Program.
(abdkarim@ic.utm.my)

Associate Professor Dr Ahmad Baharuddin Abd. Rahman obtained his PhD in structural engineering from the University of Sheffield, UK in 1999. Before joining Universiti Teknologi Malaysia, he was a site engineer at Pernas Engineering Sdn Bhd involved in the construction of transmission line towers. His research interests are structural stability and non-linear numerical methods related to multi-storey steel structures, transmission towers and precast concrete structures. Currently, he is conducting research on the performance of hybrid beam-to-column connections for precast concrete frames as well as on the performance of precast concrete wall panels under variable loads.
(baharfka@utm.my)

18. COLLABORATION WITH AGENCIES

18.1 - UTM

18.1a - UTM / CERTIFICATE

18.2 - UITM

18.3 - CREAM / CIDB

18.1 COLLABORATION WITH AGENCIES

UTM Universiti Teknologi Malaysia
Fakulti Kejuruteraan Awam

Fakulti Kejuruteraan Awam
Universiti Teknologi Malaysia
81310 UTM Skudai
Johor Darul Ta'zim
Malaysia

Tel: +(6)07-5531581 Faks: +(6)07-5566157 http://www.utm.my Emel: dekan@fka.utm.my

RUJUKAN KAMI: UTM.e-SEER.others/HCPre/07-1
RUJUKAN TUAN:

Tarikh: 26th July 2010

Mr.Fadzil Bin Ahmad
Managing Director,
HC Precast System Sdn Bhd,
No.23B, Jalan Seri Sarawak 20B/KS2,
Taman Seri Andalas, 41200 Klang,
Selangor Darul Ehsan, Malaysia.

Sir,

RESEARCH COLLABORATION ON SEISMIC RESISTANCE STUDY OF PRECAST WALL STRUCTURAL SYSTEM

With reference to our previous meetings and the above captioned, we are pleased to confirm our agreement regarding the research collaboration efforts between HC Precast System and Engineering Seismology & Earthquake Engineering Research (E-Seer) Group from Universiti Teknologi Malaysia (UTM) on the seismic resistance study of precast wall structural system.

2. A precast wall structural system normally comprises of reinforced concrete pre-cast wall panels, which introduce gap in between the wall panels that provides connection among them by means of a wet joint. The wet joints then act as columns of a building structure. The construction of this type of pre-cast wall panels consisting of a plurality of recess and recess key projections together with the reinforcing members, serve to provide structural stability and robustness to the building structure. In the case of earthquakes which place a sideway load on a building, the precast wall panels can be tied to the floor, roof and foundations into rigid box to resist the loads. Further investigation in terms of laboratory testing need to be done, in order for the system to fulfill the requirement as an earthquake resistant design structure.

3. Laboratory experimental tests of the precast wall system will be conducted in two different stages, with 1st stage at CREAM's laboratory for lateral cyclic loading (or better known as pseudo-dynamic test). The 2nd phase of the experimental test will be laboratory shake table testing under real earthquake excitation by E-Seer, at UTM Skudai. These tests will then lead to development of mathematical modeling or finite element analysis for identical structural system.

4. This collaboration between E-Seer and HC Precast also includes further extended study on the application of locally produced base isolation system onto hospital structures. This piece of research will lead to better understanding and innovation of seismic resistance products suitable for highly important structure especially hospitals, federal administration offices, etc.

We believe the above listed research collaboration will benefit the construction industry of precast wall structural system in improving thus enhancing the sustainability of the construction products in terms of seismicity resistance.

Thank you.

Yours sincerely,

PROF DR AZLAN ADNAN
azelan_fka_utm@yahoo.com
Reserch Head,
Engineering Seismologi and Earthquake Engineering Research (e-SEER)
Faculty of Civil Engineering, Universiti Teknologi Malaysia
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s.k 1. fail

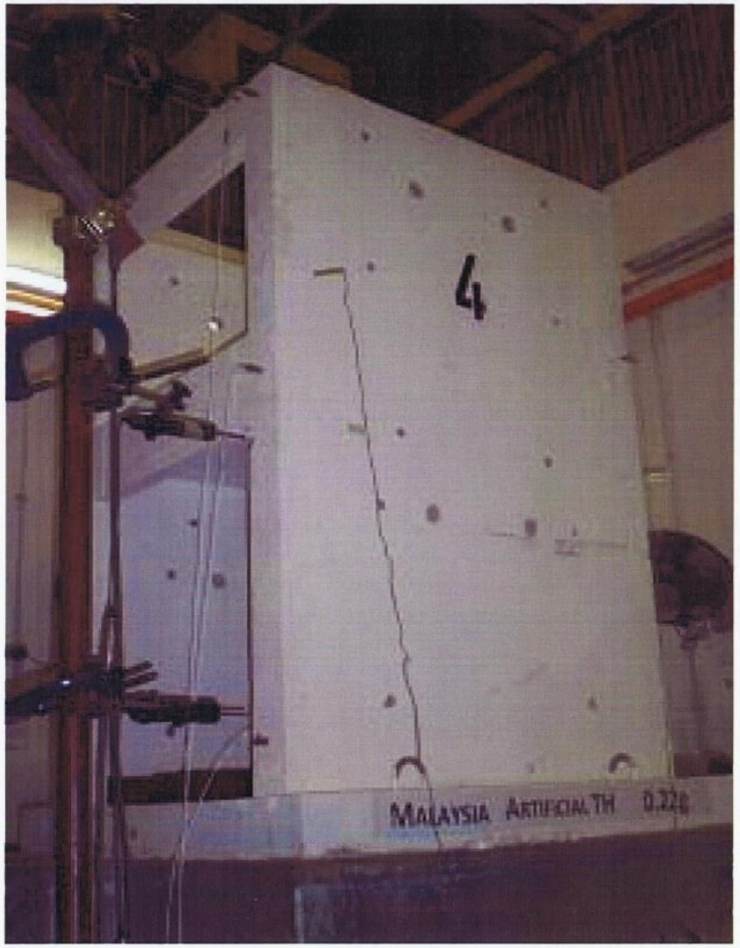
18.1a COLLABORATION WITH AGENCIES

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

e-SEER
Engineering Seismology and
Earthquake Engineering Research

HC PRECAST SYSTEM SDN. BHD.

Earthquake Resistance System
Tested on
18 August 2011
@ Laboratory of Shake Table Testing
Faculty of Civil Engineering
Universiti Teknologi Malaysia
81310 Skudai, Johor



Earthquake Resistance Test of Scaled-Down Double Storey Building of
HC PRECAST SYSTEM SDN. BHD.

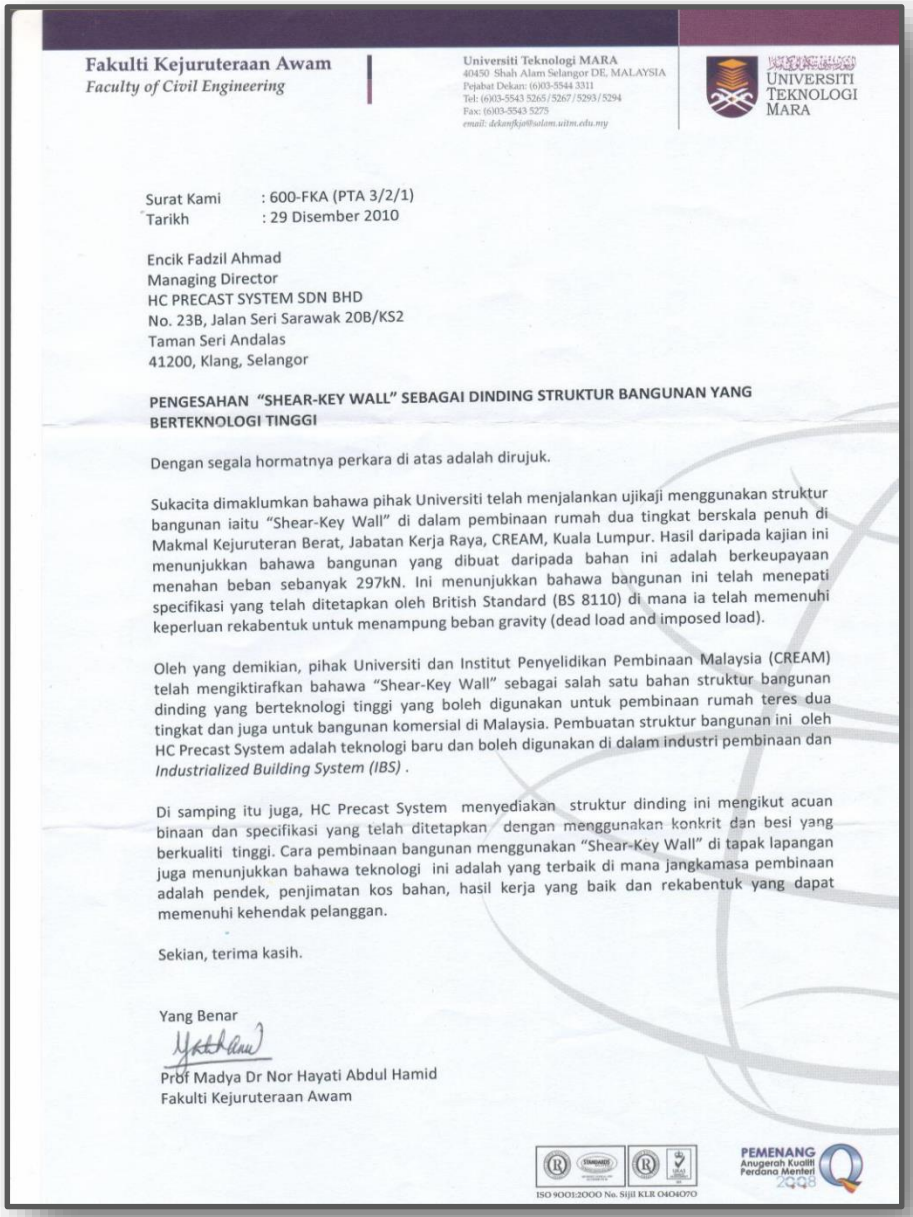
Under 8 different real earthquake time histories over the world as follow:

Earthquake	Year	Scaled PGA (g)	Magnitude	Result
El-Centro, California	1940	0.96	7.1	✓
Tabas, Iran	1978	0.114	7.4	✓
Irpinia, Italy	1980	0.606	6.5	✓
Kobe, Japan	1995	1.035	6.9	✓
New Zealand	1987	0.165	5.6	✓
Taiwan SMART1	1983	0.117	6.8	✓
Duzce, Turkey	1999	0.075	7.1	✓
Malaysia Artificial	-	0.606	-	✓

The **HC PRECAST SYSTEM** *performed extremely well throughout all the earthquake tests without any visible cracks or damages*

Dr Azlan Adnan
Professor of Structural Earthquake Engineering
Faculty of Civil Engineering, Universiti Teknologi Malaysia

18.2 COLLABORATION WITH AGENCIES



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UNIVERSITI TEKNOLOGI MARA

Surat Kami : 600-FKA (PTA 3/2/1)
Tarikh : 29 Disember 2010

Encik Fadzil Ahmad
Managing Director
HC PRECAST SYSTEM SDN BHD
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Taman Seri Andalas
41200, Klang, Selangor

PENGESAHAN "SHEAR-KEY WALL" SEBAGAI DINDING STRUKTUR BANGUNAN YANG BERTEKNOLOGI TINGGI

Dengan segala hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa pihak Universiti telah menjalankan ujikaji menggunakan struktur bangunan iaitu "Shear-Key Wall" di dalam pembinaan rumah dua tingkat berskala penuh di Makmal Kejuruteran Berat, Jabatan Kerja Raya, CREAM, Kuala Lumpur. Hasil daripada kajian ini menunjukkan bahawa bangunan yang dibuat daripada bahan ini adalah berkeupayaan menahan beban sebanyak 297kN. Ini menunjukkan bahawa bangunan ini telah menepati specifikasi yang telah ditetapkan oleh British Standard (BS 8110) di mana ia telah memenuhi keperluan rekabentuk untuk menampung beban gravity (dead load and imposed load).

Oleh yang demikian, pihak Universiti dan Institut Penyelidikan Pembinaan Malaysia (CREAM) telah mengiktirafkan bahawa "Shear-Key Wall" sebagai salah satu bahan struktur bangunan dinding yang berteknologi tinggi yang boleh digunakan untuk pembinaan rumah teres dua tingkat dan juga untuk bangunan komersial di Malaysia. Pembuatan struktur bangunan ini oleh HC Precast System adalah teknologi baru dan boleh digunakan di dalam industri pembinaan dan *Industrialized Building System (IBS)* .

Di samping itu juga, HC Precast System menyediakan struktur dinding ini mengikut acuan binaan dan specifikasi yang telah ditetapkan dengan menggunakan konkrit dan besi yang berkualiti tinggi. Cara pembinaan bangunan menggunakan "Shear-Key Wall" di tapak lapangan juga menunjukkan bahawa teknologi ini adalah yang terbaik di mana jangkamasa pembinaan adalah pendek, penjimatan kos bahan, hasil kerja yang baik dan rekabentuk yang dapat memenuhi kehendak pelanggan.

Sekian, terima kasih.

Yang Benar

Prof Madya Dr Nor Hayati Abdul Hamid
Fakulti Kejuruteraan Awam

ISO 9001:2000 No. Sijil KLR 0404070

PEMENANG Anugerah Kualiti Perdana Menteri 2008

18.3 COLLABORATION WITH AGENCIES

PRELIMINARY TECHNICAL REPORT

(Seismic Performance of Two-storey House Precast Wall-Panel Connection Under Quasi-Static Lateral Cyclic Loading)

This technical report focuses on the lateral static loading imposed on double-storey residential houses using precast shear wall panel together with castellated joints which had been constructed in Malaysia. This type of building is constructed using the current code of practice BS 8110 which did not have any provision for seismic loading. According to this current code of practice, the structure is only designed subjected to gravity load (combination of partial safety factors for dead load and imposed load only). A full-scale of double-storey house with HC precast wall, strip foundation, beams, cast in situ column as wet connection and cast in situ slab was constructed at Makmal Kerja Raya Malaysia, Jalan Chan Sow Lin, Cheras, Kuala Lumpur. This type of building was tested using two sets of double actuators attached at the top part of wall under in-plane quasi-static reversible lateral cyclic loading only.

Research centers, higher educational institution and organizations from government and private sectors are involved in this research as listed below:

i) Universiti Teknologi MARA, Shah Alam, Selangor
ii) Construction Research, Institute of Malaysia (CREAM)
iii) Jabatan Kerjaraya Malaysia(JKR)
iv) Construction Industry Development board(CIDB)
v) Universiti Teknologi Malaysia
vi) Lembaga Getah Malaysia
vii) Lembaga Lebuhraya Malaysia
viii) Institution of Engineers, Malaysia(IEM)
ix) HC Precast System Sdn. Bhd
x) Perunding ACE Sdn. Bhd

Two-storey of precast residential house with an overall height of 5.1m together with foundation base of 3.9mx4.5mx0.3m were constructed in the laboratory. Figure 1 shows design detailing, isometric and plan view of two-storey house which design in accordance with BS8110. Figure 2 shows the completed construction of full-scale of house together with the instrumentations such as LVDT located closely to in-plane wall panel and strain gauges were attached to the BRC-A7 at various locations on the wall panel. Figure 3 shows two locations of double actuators were fixed to the top part of the wall for measuring lateral loading and lateral displacements (drift), namely ACTUATOR 1 and ACTUATOR 2. Figure 4 shows the crack patterns on WALL 1 at 0.7% drift whereby a lot of cracks occurred at the castellated joints between HC precast wall panel and in-situ concrete column. Similar crack patterns were observed at WALL 2 as shown in Figure 5 after testing completed. The experimental works were conducted using displacement control and the load cells measured the amount of loading require to push or pull at the target displacement. The maximum loads for both actuators were recorded using data logger. The reversible lateral cyclic loadings with different amplitudes and directions were applied to the wall system and their behavior, strength capacity and displacement were recorded using the LVDT and strain gauges. The initial control displacement of 2.25mm (0.05% drift) was imposed to the structure. Then, an incremental of 4.5mm (0.1% drift) was imposed on the structure until 0.7% drift. Two cycles of loading were imposed on each drift until it's failed.

The experimental results for both actuators namely LOAD 1 and LOAD 2 were recorded and measured during experimental work. Figure 6 shows the experimental results obtained during experimental work for LOAD 1. The maximum strength capacity of the WALL 1 is 280.47kN with lateral displacement of 27mm. Based on theoretical values obtained from mathematical formulation which considered the elastic and nonlinear behaviour of the materials (concrete and reinforcement bars) for two-storey house. The theoretical values are marked as heavy dotted line and the experimental values with different colours are compared between them. The theoretical line shows a similar behaviour as with the experimental results. The theoretical values are also include the design load for WALL 1 and Wall 2. The strength capacity of this building is exceeding the design load based on the mathematical formulation and this type of structure is safe under gravity load as designed in accordance to BS8110. Figure 7 shows the experimental results

18.3a COLLABORATION WITH AGENCIES

and theoretical load for LOAD 2 and measured on WALL 2. Based on this data, the maximum strength capacity of the lateral load is 317.35kN with lateral displacement of 22.5mm. Hence, the actual strength capacity of WALL 2 is exceeding the design load of the structures. As the conclusion, this wall is safe under gravity load.

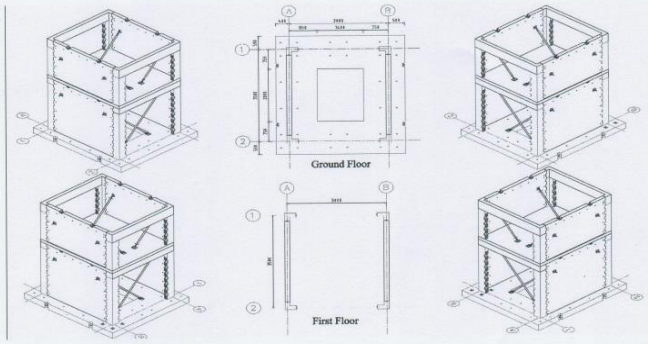

Figure 1 : Isometric and plan view of two-storey precast house

Figure 2 : Full scale of two-storey building with its instrumentation

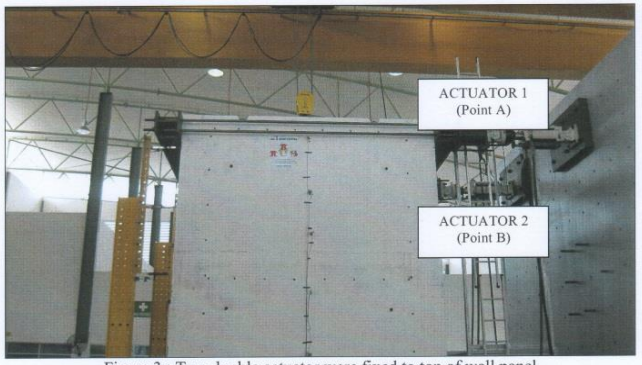

Figure 3 : Two double actuator were fixed to top of wall panel

18.4b COLLABORATION WITH AGENCIES

Figure 4: Cracks Pattern after testing at Wall 1

Figure 5: Cracks Patterns after testing at Wall 2

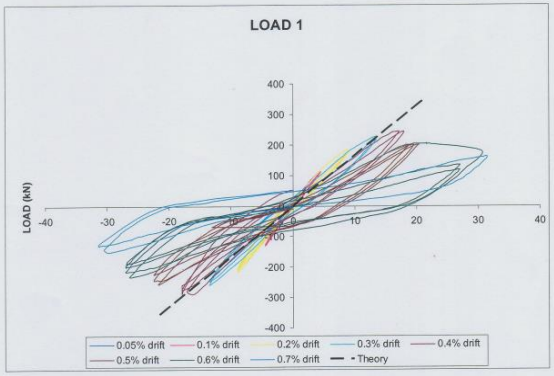

Figure 6 : Comparison between experimental results with theoretical value for LOAD 1 taken at Point A at distance 4.8 meter from ground surface

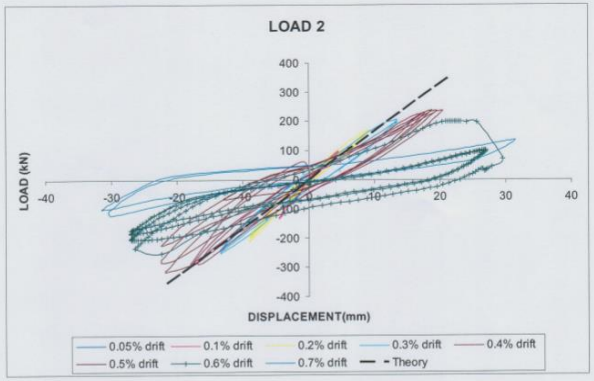

Figure 7 : Comparison between experimental results with theoretical value for LOAD 2 taken at Point B at distance 4.8 meter from ground surface

19. INDEPENDENT CHECKER – 1

Perunding PaduReka Sdn. Bhd.
Company No: 268016T
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Johor Bahru Branch : 24-A, (1st Floor), Jalan Layang 16, Taman Perling, 81200 Johor Bahru. Tel No: 607-2418907 Fax: 607-2418358
E-mail: ppr@streamyx.com, padureka@gmail.com

Cadangan Pembinaan Kompleks Bank Gen Biji Benih Pertanian Di Ibu Pejabat Mardi, Serdang, Selangor

Supplementary Independent Checker Engineer's Report No. 5-1 on Shear Key Joints For Precast R.C. Wall Panels

JURUTERA PROFESIONAL
AWAM
IR. HO THEY SEE
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Prepared By :
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18 January 2010

MUSA HJ. MD. YUNOS B.Sc (Hons.), CIVIL ENG. P.ENG. MIEM. ASEAN (Eng). CIDBM (Med).
ABDUL SHUKUR ALI B.E. (Hons.), P.ENG, MIEM.
HO THEY SEE B.E. (Hons.) MIEM. MICE. P.ENG.
KANG LIP TEIK B.E. (Hons.), MIEM. P.ENG.

19.1 INDEPENDENT CHECKER – 2 & 3

1) In ICE Report No.5, the special recess and protruding keys at both ends of precast r.c. wall panels was mentioned under Section (2) (g). However the shear capacity of the shear key joints was not dealt with because the detailed dimensions / configuration of the shear keys was not made available at that time. On January 13, 2010, Perunding ACE Sdn. Bhd. released the details of the key joints and hence this supplementary ICE's Report No. 5-1 is meant to deal with the shear capacity of the special joint.

2) Ultimate Shear Capacity of the Key Joints

a) By definition, the shear keys can be classified as "castellated" joints and according to the requirements of joints transmitting shear under Clause 5.3.7 (c) of BS 8110; Part 1, no shear reinforcement is required if the shear stress due to ultimate loads is less than 1.3 N/mm², calculated on the minimum root area of a castellated joint.

b) The shear keys rely on mechanical interlock and the development of a confined diagonal compressive strut across the shear plane. A taper is provided for the keys to facilitate removal of formwork. This also assists in confining the concrete in the cast insitu r.c. columns. The interfaces are prevented from moving apart by the R10-300 dowel bars (500mm long) spaced at every corresponding shear key position of 300 mm c/c. Current detailing indicates shorter anchorage length in the precast wall panels and longer into the cast insitu columns. Correct detailing should be of equal length of 250mm on both sides from the interface.

c) Based on the details of the castellated joint provided (see attached joint), the minimum roof area is 32,160 mm² (201mm x 160mm).

Hence, ultimate shear V = 32,160 x 1.3 / 10^3 = 41.8 kN per key.

Cadangan Pembinaan Kompleks Bank Gen Biji Benih Pertanian Di Ibu Pejabat Mardi, Serdang, Selangor
- **Supplementary Independent Checker Engineer's Report No. 5-1 on Shear Key Joints For Precast R.C. Wall Panels**

The compressive strut force, C is estimated at 47 kN while the force normal to the shear joint, N is about 22 kN. As such, the compressive stress in concrete, $f_c \approx 47 \times 10^3 / 160 \times 79 \approx 3.72$ N/mm² ($0.106 f_{cu}$) is satisfactory while normal force, N of 22 kN tends to separate the panel, which in turn resisted by the R10 dowel bars. However, If the dowel bar is of mild steel, the capacity of anchorage is only estimated at $\pi \times 10 \times 1.66 \times 250 / 10^3$ = 13 kN which is inadequate to resist 22 kN for maximum ultimate shear stress of 1.3 N/mm². Therefore, the shear capacity should be proportionately reduced to 41.8 kN x 13 / 22 ≒ 24.7 kN per key if the dowel shear is of mild steel.

Nevertheless, if the T10 dowel bars are used, the anchorage force is estimated at $\pi \times 10 \times 2.96 \times 250 / 3$ = 23 kN per key and the ultimate shear capacity can remain at 41.8 kN per key

d) Further enhancement of shear capacity can be achieved by calculating the dowel shear in accordance with Clause 3.3.7 (d) of BS 8110; Part 1.

The shear force, V should not exceed the value given by

$V = 0.6 F_b \tan\alpha f$

Where

F_b is $0.95 f_y A_s$; or the anchorage value of the reinforcement, whichever is lesser

F_b = 13 kN for f_y = 250 N/mm² ($f_b = 0.28 \sqrt{35}$ = 1.66 N/mm²)
and
F_b = 23 kN for f_y = 460 N/mm² ($f_b = 0.5 \sqrt{35}$ = 2.96 N/mm²)
based on 10 mm bar of anchorage length of 250 mm

19.2 INDEPENDENT CHECKER – 4 & 5

A_s is the minimum area of dowel reinforcement

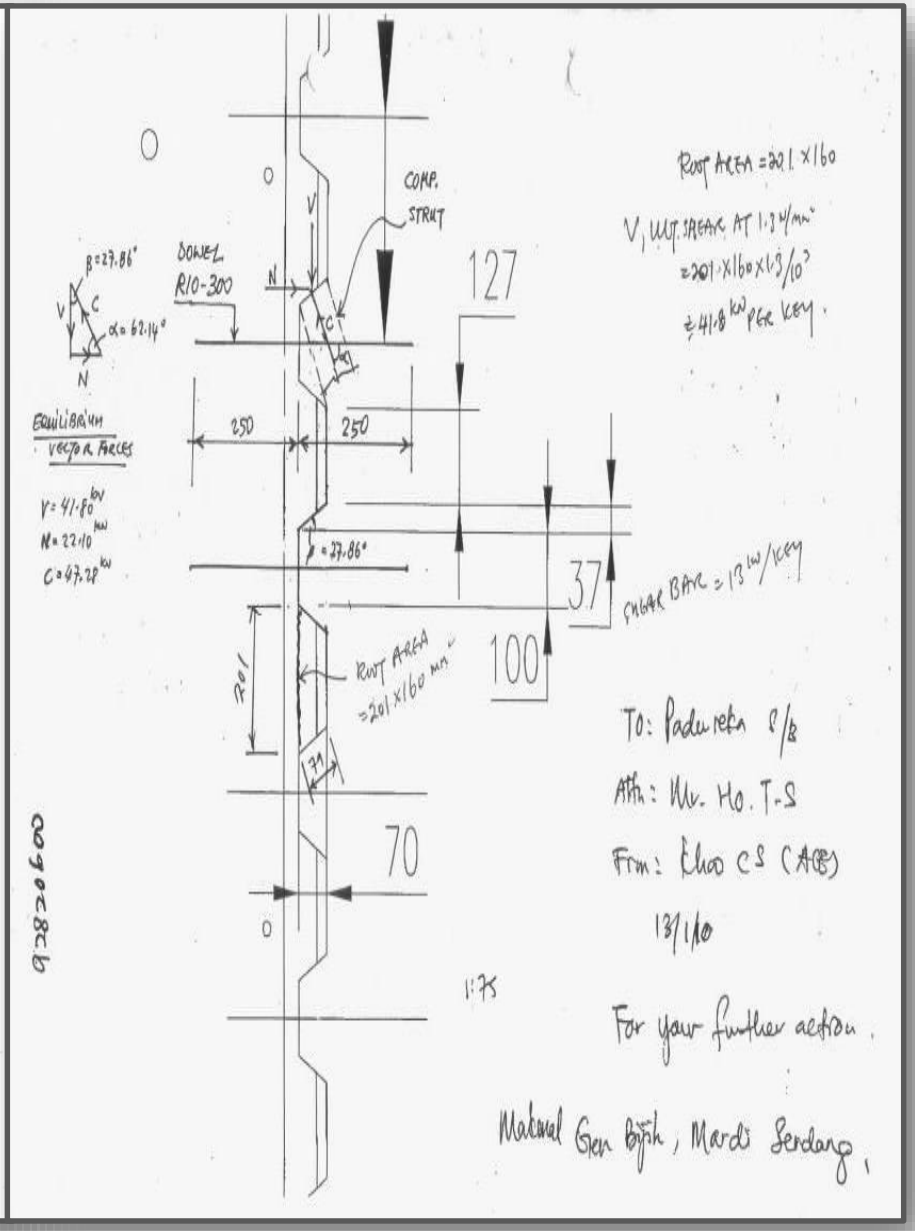
αf is the angle of internal friction between the faces of the joint. $\tan\alpha f$ is 1.7 from Table 5.3 of BS 8110 ; Part 1. However, this $\tan\alpha f$ is best determined by tests under Research and Development if possible.

It is interesting to note that $0.6 \tan\alpha f \div 1.0$ and $V \approx F_b$.

e) The total ultimate shear capacity of the shear key joint is assessed as follows :-

From (c) above, for R10 dowel, V_c	=	24.7 kN
From (d) above, for R10 dowel, V_d	=	13 kN
Total, V_t	=	37.7 kN per key

The number of effective keys times 37.7 kN shall determine the ultimate shear capacity of the shear key joint of a precast r.c. wall panel.



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THANK YOU

PART 2