TOPIK 3

- Penyeliaan projek hybrid / IBS/ Isu Kontrak
- *Quality assurance*
- *Construction Drawing/Shop Drawing*
- Elakkan pertukaran rekabentuk oleh PP
- Spesifikasi
- Penyelarasan dengan lukisan dan kerja M&E

Penyeliaan dan Isu Kontrak

- Spesifikasi Precast - huraian
- BQ
- Alternatif design dalam BQ
- Independent Checker
- Warranty
- Requirement for P.E

PROSEDUR PENYELIAAN TAPAK

(RISP/PROJEK KONVENSIONAL DAN HYBRID)

Kamaluddin Abdul Rashid
Cawangan Kejuruteraan Awam, Struktur dan Jambatan
Ibu Pejabat JKR Malaysia

Penyelian tapak

Pengawasan projek IBS yang dilaksanakan secara RISP memerlukan pendekatan pengawasan secara *hybrid* iaitu kombinasi pengawasan konvensional dan ‘reka dan bina’

Di peringkat penyeliaan projek, pendekatan *standing supervision* dilaksanakan bagi kerja *substructure* dan *construction audit* untuk kerja *superstructure*

Bagi komponen yang dilaksanakan secara RISP, pihak Kontraktor perlu menyediakan Pelan Kepastian Kualiti dan melaksanakan Kawalan Kualiti untuk diaudit oleh PPP JKR

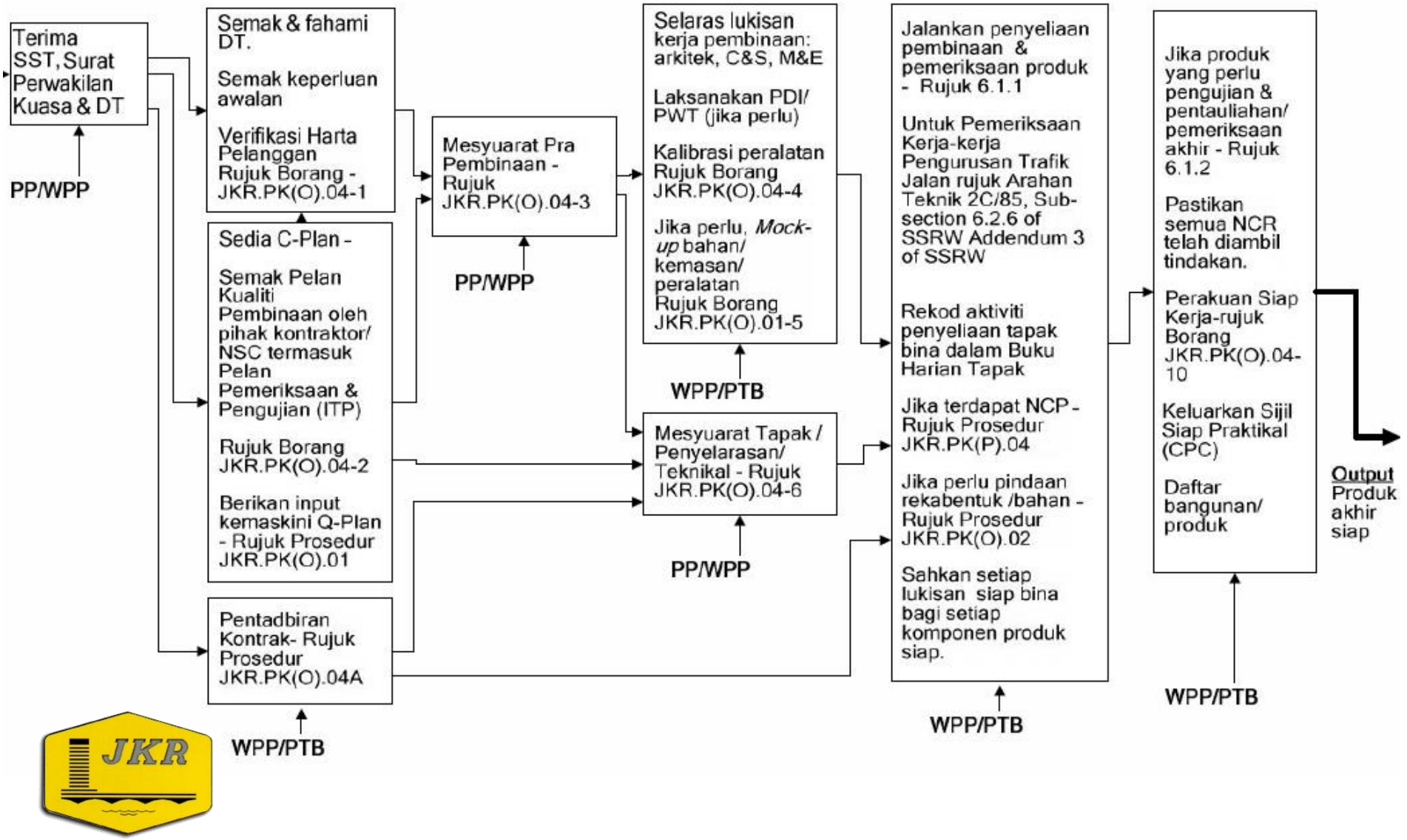
Penyelian tapak

- Underlying principles
- Construction supervision
- Construction audit
- Recommended approach
- Conclusion

Penyelian tapak

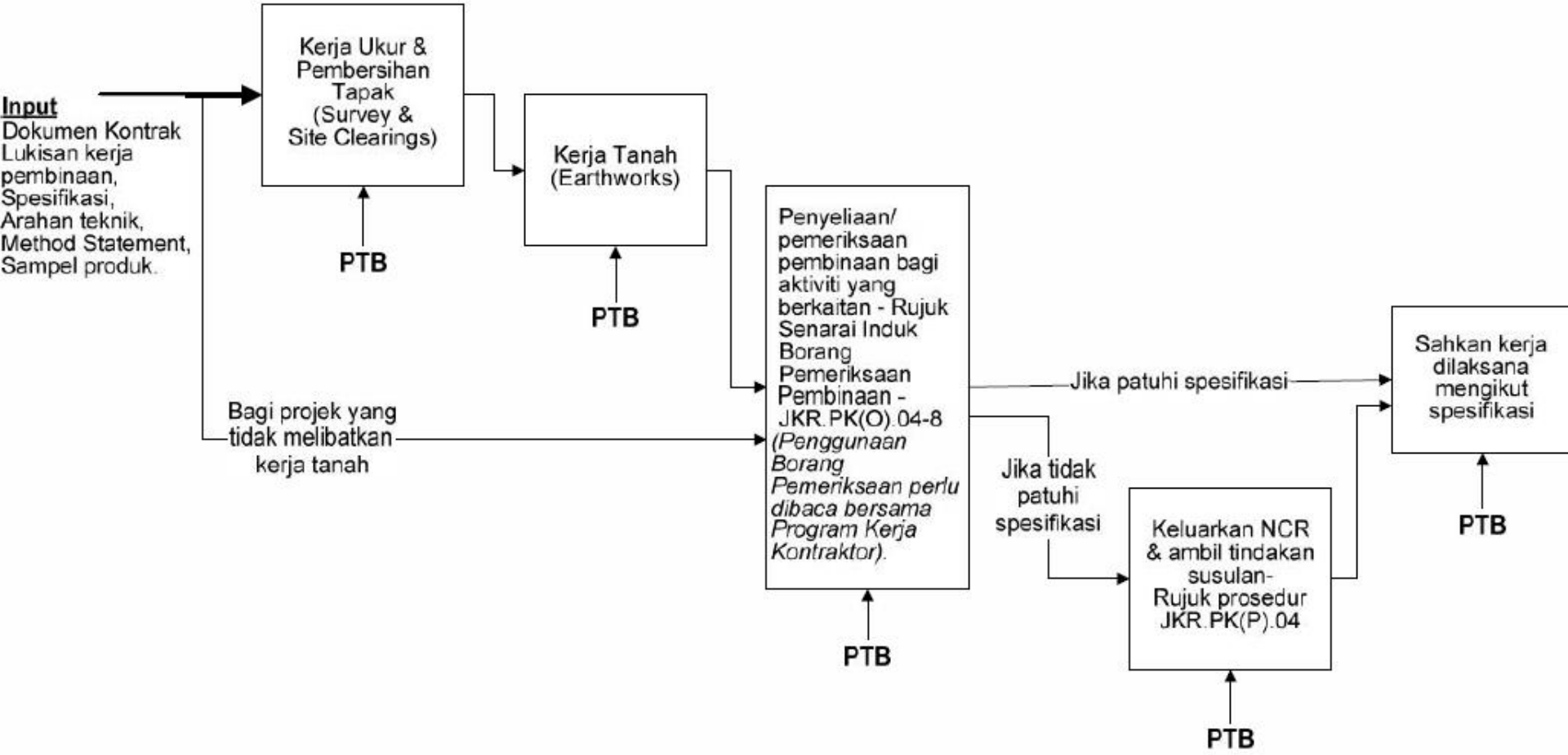
6.0 PROSES KERJA DAN TANGGUNGJAWAB

6.1 Proses Kerja Pembinaan & Penyeliaan Tapak Bina (Konvensional)



Penyelian tapak

6.1.1 Proses Kerja Pemeriksaan Pembinaan



Penyelian tapak

LAMPIRAN 8

SENARAI INDUK BORANG PEMERIKSAAN PEMBINAAN

Bidang	Tajuk	No. Rujukan Dokumen
1. AM	**Penyeliaan Projek Konvensional**	
	1.1 Kerja Awalan Projek Bangunan	JKR.PK(O).04-SKC.AM.1
	1.2 Kerja Awalan Projek Jalan	JKR.PK(O).04-SKC.AM.2
2. ASAS	**Penyeliaan Projek Konvensional**	
	2.1 Kerja Asas Penapak	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.AS.1A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.AS.1B
	• Produk Siap	JKR.PK(O).04-SKC.AS.1C
	2.2 Kerja Cerucuk Gerekan	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.AS.2A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.AS.2B
	• Produk Siap	JKR.PK(O).04-SKC.AS.2C
	2.3 Kerja Cerucuk (Konkrit Tetulang, Keluli 'H', Kayu)	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.AS.3A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.AS.3B
	• Produk Siap	JKR.PK(O).04-SKC.AS.3C
	2.4 Kerja Ujian Beban (Semua Jenis Cerucuk)	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.AS.4A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.AS.4B
	• Produk Siap	JKR.PK(O).04-SKC.AS.4C
3. STRUKTUR	**Penyeliaan Projek Konvensional**	
	3.1 Kerja Struktur Konkrit	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.ST.1A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.ST.1B
	• Produk Siap	JKR.PK(O).04-SKC.ST.1C
	3.2 Kerja Struktur Keluli	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.ST.2A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.ST.2B
	• Produk Siap	JKR.PK(O).04-SKC.ST.2C
	3.3 Kerja Struktur Kayu	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.ST.3A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.ST.3B
	• Produk Siap	JKR.PK(O).04-SKC.ST.3C

A JKR MALAYSIA

DOKUMEN TERKAWAL

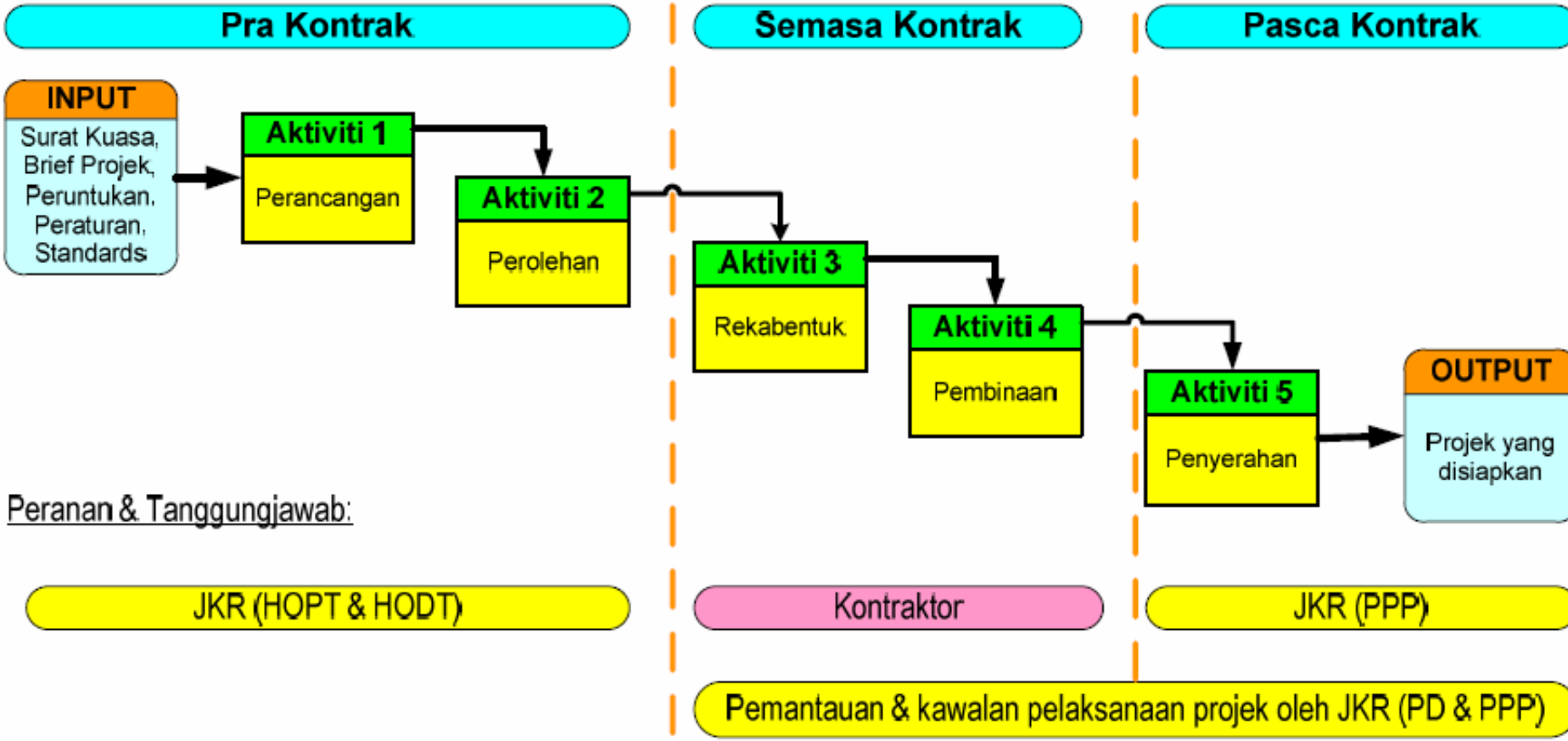
Bidang	Tajuk	No. Rujukan Dokumen
	3.4 Kerja Struktur Bata	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.ST.4A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.ST.4B
	• Produk Siap	JKR.PK(O).04-SKC.ST.4C
	3.5 Kerja Struktur Kekuda Pasang Siap	JKR.PK(O).04-SRC.ST.1
4. JALAN	**Penyeliaan Projek Konvensional**	
	4.1. Kerja Tanah	JKR.PK(O).04-SKC.JL.1
	4.2. Saliran	JKR.PK(O).04-SKC.JL.2
	4.3. Flexible Pavement	JKR.PK(O).04-SKC.JL.3
	4.4. Subgrade	JKR.PK(O).04-SKC.JL.4
	4.5. Perabot Jalan – Garisan Jalan	JKR.PK(O).04-SKC.JL.5
	4.6. Perabot Jalan – Papan Tanda	JKR.PK(O).04-SKC.JL.6
	4.7. Perabot Jalan – *Guard rail*	JKR.PK(O).04-SKC.JL.7
	4.8. Kerja-Kerja Pengurusan Trafik	JKR.PK(O).04-SKC.JL.8
5. JAMBATAN	**Penyeliaan Projek Konvensional**	
	5.1. Bering Jambatan	JKR.PK(O).04-SKC.JB.1
	5.2. Pra Tegasan (*Prestressing*)	JKR.PK(O).04-SKC.JB.2
	5.3. Sendi Renggang (*Expansion Joints*)	JKR.PK(O).04-SKC.JB.3
	5.4. Kerja Sementara (*Temporary works*)	JKR.PK(O).04-SKC.JB.4
6. MARITIM	**Penyeliaan Projek Konvensional**	
	6.1 Kerja Ukur	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.MT.1A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.MT.1B
	• Produk Siap	JKR.PK(O).04-SKC.MT.1C
	6.2 Tebusguna Tanah	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.MT.2A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.MT.2B
	• Produk Siap	JKR.PK(O).04-SKC.MT.2C
	6.3 Dredging	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.MT.3A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.MT.3B
	• Produk Siap	JKR.PK(O).04-SKC.MT.3C
	6.4 Konkrit Struktur Marin	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.MT.4A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.MT.4B
	• Produk Siap	JKR.PK(O).04-SKC.MT.4C
	6.5 Jetty & Approach Bridge	
	• Peringkat Penerimaan	JKR.PK(O).04-SKC.MT.5A
	• Semasa Pembinaan	JKR.PK(O).04-SKC.MT.5B
	• Produk Siap	JKR.PK(O).04-SKC.MT.5C

@ HAKCIPTA JKR MALAYSIA

DOKUMEN TERKAWAL

Isu Kontrak

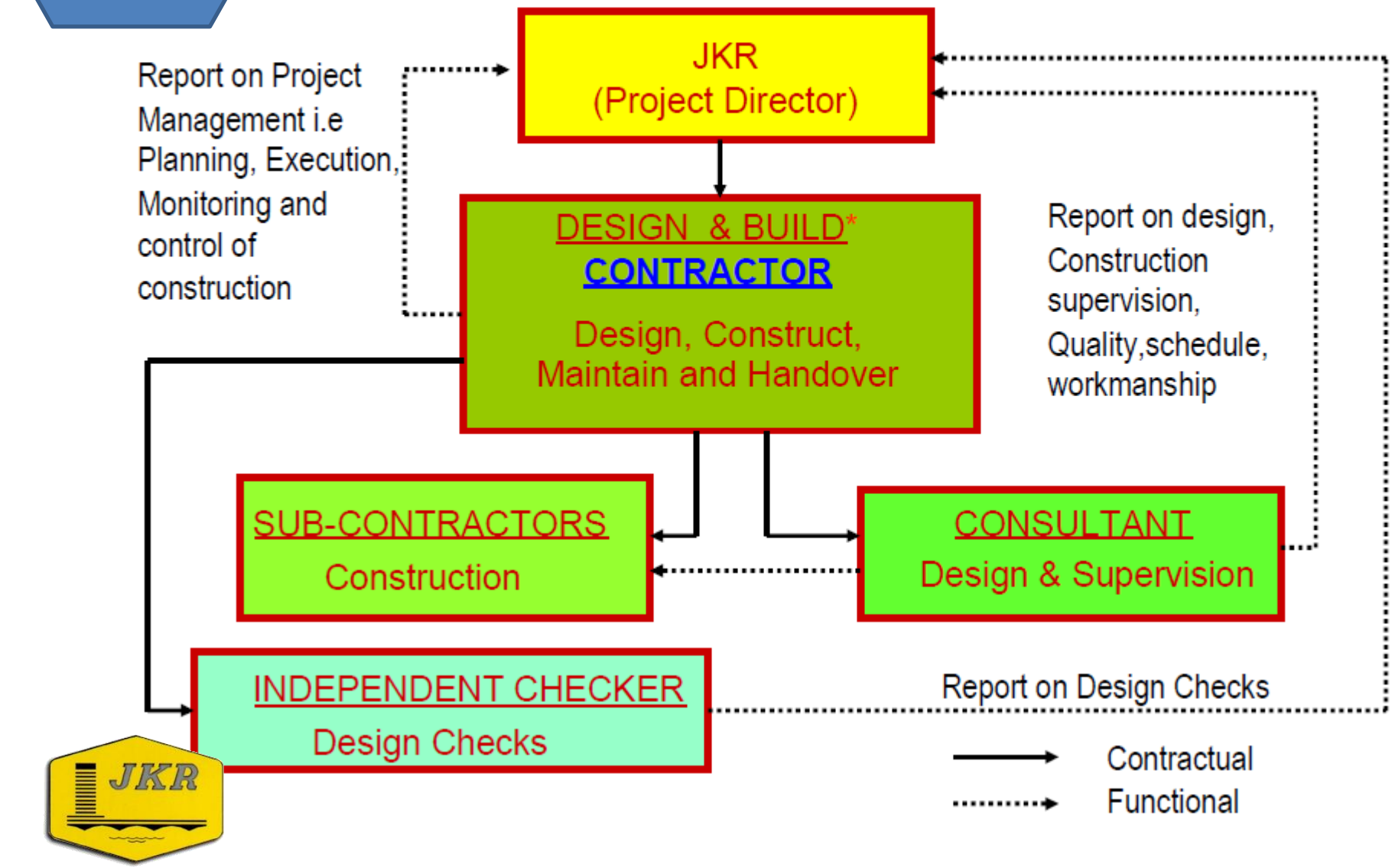
Rajah 1: Aktiviti Pelaksanaan Projek Reka & Bina JKR



Isu Kontrak

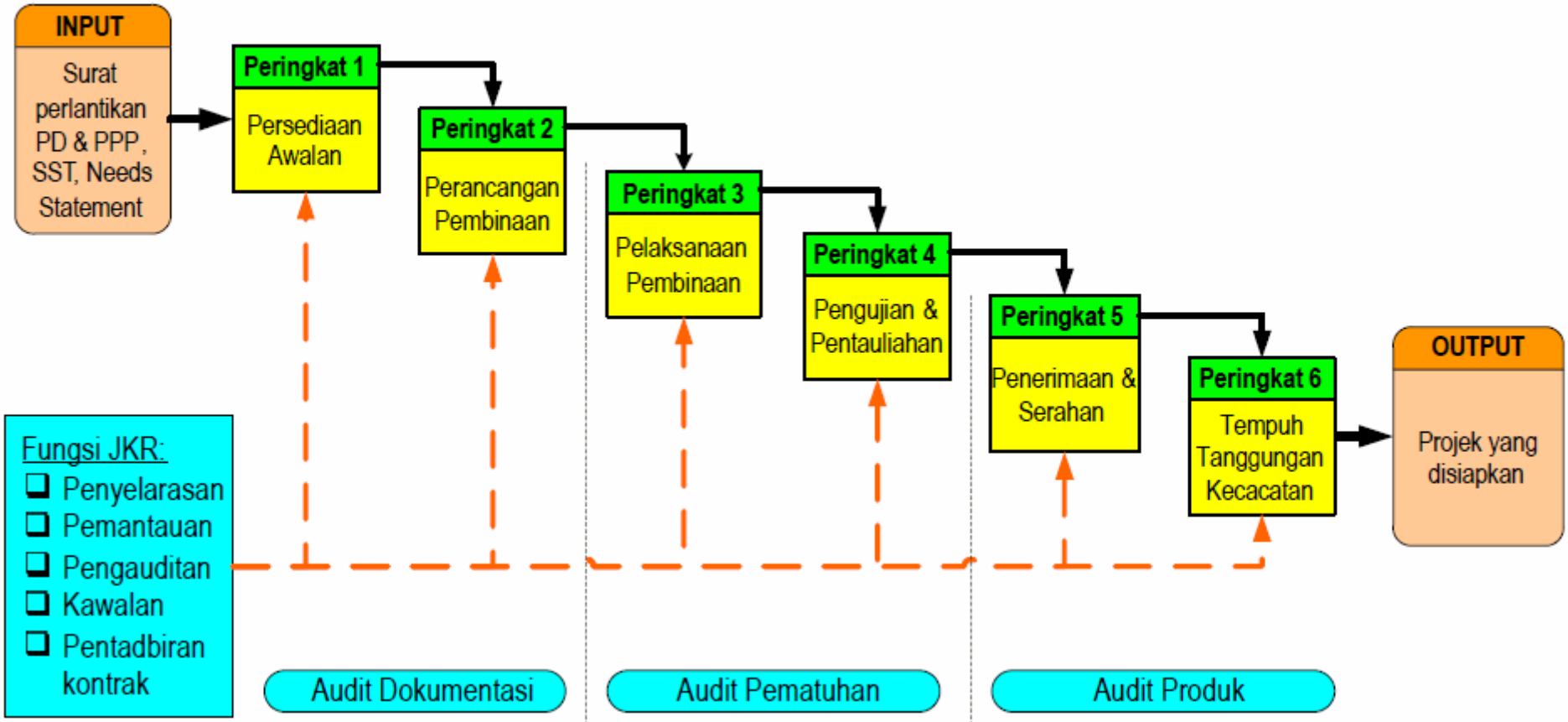
Rajah 2: Perkaitan fungsi & sistem penyampaian projek R&B

[DESIGN AND BUILD CONTRACT WITH
*PROJECT MANAGEMENT BY CONTRACTOR]



Pengurusan projek

Rajah 3: Aktiviti Pengurusan JKR Dalam Pelaksanaan Projek Reka & Bina

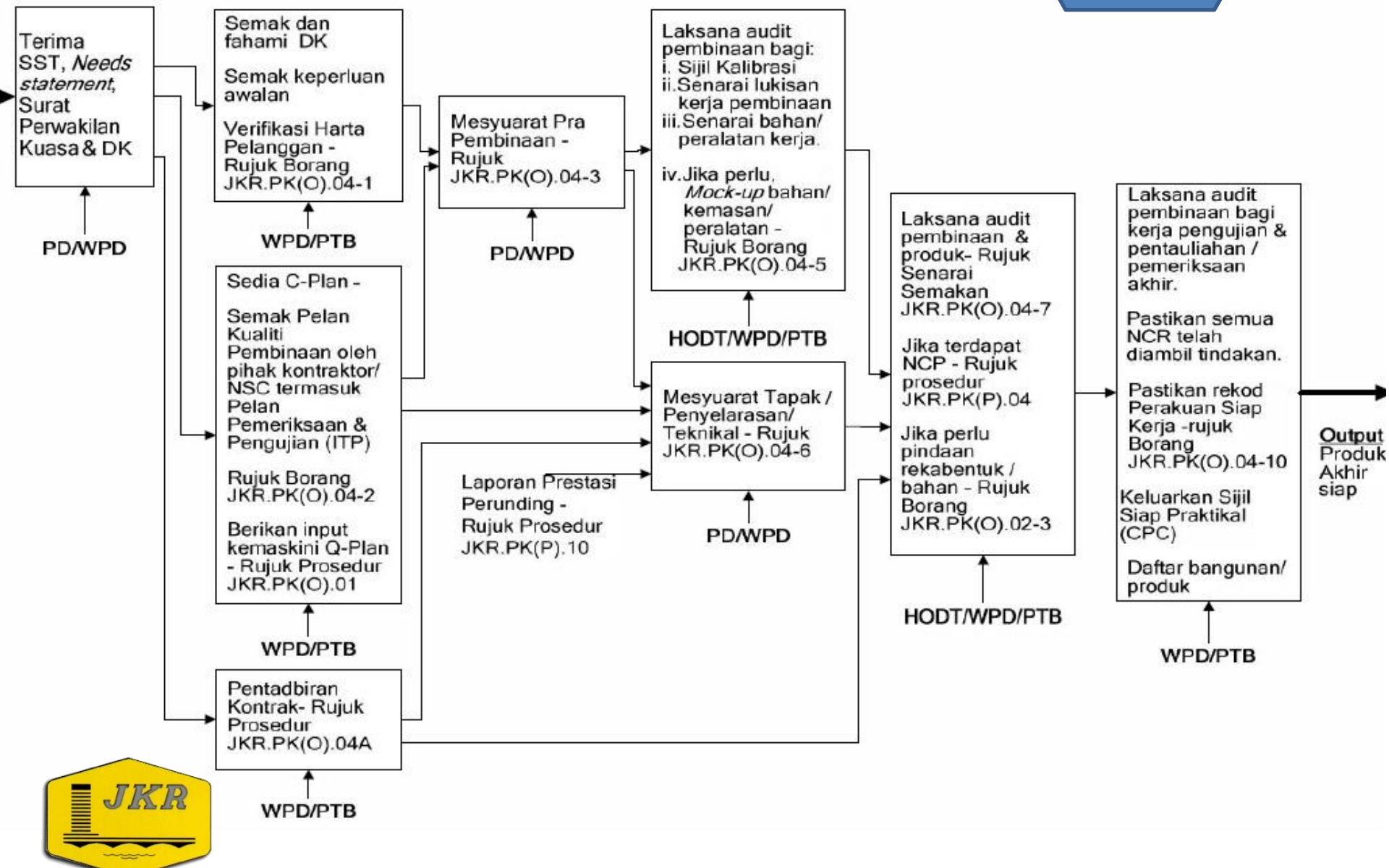


Kategori Tanggungjawab/Risiko	Konvensional			Reka-Bina	
	Pm	Prb	K	Pm	KRB
Design Reviews	x			1	x
Difference between design criteria and detail design	x				x
Errors or omissions arise during construction	x	2			x
Project site safety			x		x
Constructibility of design	x				x
Redesign if required	x				x
Site supervision			x		x
Testing and commissioning			x		x
Coordination of construction			x		x

Project site safety			x		x
Constructibility of design	x				x
Redesign if required	x				x
Site supervision			x		x
Testing and commissioning			x		x
Coordination of construction			x		x
Permits and approval	3		4	5	6
Environment Management Plan	x			7	7
Coordination with other works	x		8		x
Quality control and Quality assurance	9		10	11	x
Differing subsurface conditions	x		12	13	14
Design defects	x	15			x
Construction defects			x		x

Penyeliaan Tapak Bina

6.2 Proses Kerja Pembinaan & Penyeliaan Tapak Bina (Reka dan Bina)



6.2 SISTEM KUALITI PEMBINAAN OLEH PIHAK KONTRAKTOR (Bagi Kontrak Reka Dan Bina Sahaja)

Sistem Kepastian Kualiti yang perlu dikemukakan oleh Kontraktor hendaklah sekurang-kurangnya terdiri dari dokumen berikut:

6.2.1 Manual (Pelan) Kualiti Projek yang sekurang-kurangnya mengandungi maklumat berikut:

a. POLISI DAN OBJEKTIF KUALITI KONTRAKTOR
b. CARTA ORGANISASI KONTRAKTOR, SUB-KONTRAKTOR & PERUNDING (termasuk senarai tugas & tanggungjawab pegawai-pegawai penting),
c. MATRIKS KOMUNIKASI DI ANTARA JKR, KONTRAKTOR, SUBKONTRAKTOR DAN PERUNDING
d. MATRIKS TANGGUNGJAWAB UNTUK KONTRAKTOR, SUBKONTRAKTOR DAN PERUNDING
e. SALINAN PENYATAAN KEHENDAK KERAJAAN (NEED STATEMENTS)
f. SENARAI DOKUMEN PROSIDUR KUALITI
g. SENARAI LUKISAN PEMBINAAN YANG TELAH DILULUSKAN
h. SENARAI BAHAN-BAHAN YANG PERLU KELULUSAN
i. PROGRAM KERJA ASAL (CPM) YANG DILULUSKAN
j. SUMBER KONTRAKTOR (seperti jentera, peralatan, tenaga kerja termasuk sub kontraktor yang diluluskan)

6.2.2 Pelan Kepastian Kualiti yang mengandungi maklumat berikut:

a. PROSEDUR PENGURUSAN KUALITI
b. ALIRAN KERJA TEKNIKAL
c. PELAN PEMERIKSAAN DAN UJIAN
d. PELAN PENGURUSAN ALAM SEKITAR (untuk projek di kawasan sensitif

6.2.3 METHOD STATEMENT (jika ada)

Pengurusan projek

SENARAI SEMAKAN AUDIT PEMBINAAN PROJEK R&B.

Nama Projek :.....

Bidang Audit : *Kerja Arkitektur / Awam / Mekanikal / Elektrikal / Lain-lain (nyatakan) .....

*** potong mana tidak berkenaan**

Audit ini adalah berdasarkan kepada skop yang telah dinyatakan dalam Penyataan Kehendak Kerajaan atau keperluan-keperluan lain yang telah ditetapkan.

Bil	Perkara	Dilaksanakan**		Catatan
		Ya	Tidak	
1	Versi senarai terbaharu yang digunakan:			
	i. Dokumen Kualiti			
	ii. Lukisan Kerja Pembinaan			
	iii. Bahan-bahan			
2	Audit pematuhan ke atas kontraktor bagi:			
	i. Sijil-sijil berkaitan Contoh: sijil kalibrasi peralatan dsbnya			
	ii. Rekod-rekod bagi borang-borang Pemeriksaan/Pengujian bagi sesuatu kerja tersebut termasuk kelulusan perunding. Rekod-rekod tersebut perlu merangkumi peringkat penerimaan (incoming process), peringkat pemerosesan (inprocess) dan peringkat akhir (output).			
	iii. Borang-borang *Noncorforming Report* (NCR) (jika ada)			
	iv. Laporan tindakan pembetulan & pencegahan termasuk penutupan NCR			
	v. Rekod kelulusan pindaan reka bentuk.			

Gunakan lampiran jika perlu bagi memperincikan lagi pemeriksaan rekod-rekod di atas.
(** tandakan √ yang mana berkaitan. Sekiranya tidak dilaksanakan, sila isikan borang NCR bagi tindakan Kontraktor).

Ulasan lain (jika ada):.....
.....

....
Tandatangan WPD Tarikh

Bil	Perkara	Dilaksanakan**		Catatan
		Ya	Tidak	
1	Versi senarai terbaharu yang digunakan:			
	i. Dokumen Kualiti			
	ii. Lukisan Kerja Pembinaan			
	iii. Bahan-bahan			
2	Audit pematuhan ke atas kontraktor bagi:			
	i. Sijil-sijil berkaitan Contoh: sijil kalibrasi peralatan dsbnya			
	ii. Rekod-rekod bagi borang-borang Pemeriksaan/Pengujian bagi sesuatu kerja tersebut termasuk kelulusan perunding. Rekod-rekod tersebut perlu merangkumi peringkat penerimaan (incoming process), peringkat pemerosesan (inprocess) dan peringkat akhir (output).			
	iii. Borang-borang *Noncorforming Report* (NCR) (jika ada)			
	iv. Laporan tindakan pembetulan & pencegahan termasuk penutupan NCR			
	Rekod kelulusan pindaan reka bentuk.			

SENARAI SEMAKAN PROJEK R&B

Borang JKR/RB/3

Projek:	No. Rujukan:
No. Kontrak:	Audit Kontraktor: YA/TIDAK*
Skop/Aktiviti: **Peringkat Perancangan Pembinaan** (Penyediaan Sistem Kepastian Kualiti)	Peringkat Audit: DOKUMEN

Pegawai/Pasukan Projek JKR:	Wakil Kontraktor:
1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

	Butiran Semakan/ Verifikasi/ Penilaian	Rujukan Piawaian/ Spesifikasi	Pematuhan (Y/T)	No. Ruj. NCR	Tarikh & ttr WPD penutupan NCR
1.	Manual Kualiti mengandungi sekurang-kurangnya maklumat seperti di dalam *C-Plan*	SPK JKR.PK(O).04 Para 6.2.1			
2.	Pelan Kepastian Kualiti mengandungi sekurang-kurangnya maklumat seperti di dalam *C-Plan*	SPK JKR.PK(O).04 Para 6.2.2			
3.	*Method Statement* mengandungi tatakerja / kaedah pembinaan / pemasangan keseluruhan skop kerja	SPK JKR.PK(O).04 Para 6.2.3			
4.	*Method Statement* disahkan oleh Perunding selaras dengan Spesifikasi, Lukisan Pembinaan				
5.	Prosedur / Manual / Garispanduan / *Standard* berada di pejabat tapak / makmal untuk rujukan personel Kontraktor				

Perakuan

Adalah dengan ini disahkan bahawa penemuan audit projek bagi aktiviti/skop yang dirujuk adalah seperti butiran diatas

Wakil Pengarah Projek JKR (yang hadir & menilai)	Wakil Kontraktor Yang Di Beri Kuasa
..... Nama: Jawata Cop R Tarikh.	..... Nama: Jawatan: Cop Rasmi: Tarikh:

SENARAI SEMAKAN PROJEK R&B

Borang JKR/RB/7

Projek:	No. Rujukan:
No. Kontrak:	Audit Kontraktor: YA/TIDAK*
Skop/Aktiviti: **Peringkat Perancangan Pembinaan** (Spesifikasi, Rekabentuk dan Lukisan Pembinaan)	Peringkat Audit: DOKUMEN

Pegawai/Pasukan Projek JKR:	Wakil Kontraktor:
1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

	Butiran Semakan/ Verifikasi/ Penilaian	Rujukan Piawaian/ Spesifikasi	Pematuhan (Y/T)	No. Ruj. NCR	Tarikh & ttr WPD penutupan NCR
1.	Senarai induk lukisan pembinaan / lukisan kerja dinyatakan indek, pindaan, tarikh edaran				
2.	Pengeluaran spesifikasi, lukisan pembinaan / lukisan kerja untuk edaran ke tapak bina mengikut senarai yang disahkan oleh HOPT (spesifikasi, rekabentuk dan lukisan telah diaudit oleh HOPTdan pengesahan Perunding Pemeriksa Bebas*(Independent Checking Engineer)* jika berkaitan)				
3.	Lukisan pembinaan / lukisan kerja yang telah dipinda dan melibatkan perubahan skop Kontrak telah diluluskan oleh Jawatankuasa Perubahan JKR (jika ada)				
4.	Lukisan pembinaan / lukisan kerja yang akan digunapakai oleh Kontraktor di tapak bina bertandatangan dan cop Jurutera/Arkitek Profesional rekabentuk				
5.	Semua staf Kontraktor, Perunding Pengawasan Tapak, Sub Kontraktor, Pembekal merujuk kepada dokumen-dokumen yang sah dan terkini				

Perakuan

Adalah dengan ini disahkan bahawa penemuan audit projek bagi aktiviti/skop yang dirujuk adalah seperti butiran diatas

Wakil Pengarah Projek JKR (yang hadir & menilai)	Wakil Kontraktor Yang Di Beri Kuasa
..... Nama: Jawatan: Cop Rasmi: Tarikh:	..... Nama: Jawatan: Cop Rasmi: Tarikh:

SENARAI SEMAKAN PROJEK R&B

Borang JKR/RB/13C2

Projek:	No. Rujukan:
No. Kontrak:	Audit Kontraktor: YA/TIDAK*
Skop/Aktiviti: **Peringkat Pembinaan:** (BANGUNAN - Struktur)	Peringkat Audit: DOKUMEN/ PROSES/ PRODUK*

Pegawai/Pasukan Projek JKR:	Wakil Kontraktor:
1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

No	Butiran	Rujukan Piawaian/ Spesifikasi	Pematuhan (Y/T)	No. Ruj. NCR	Tarikh & ttr WPD penutupan NCR
	Kerja Pembinaan				
	i. Kerja Konkrit				
	a) Perancangan Pemeriksaan dan Ujian				
	1) *Request for Inspection (RFI)*				
	2) Spesifikasi/ Piawai yang berkaitan				
	3) Ujian bahan-bahan				
	-besi tetulang				
	- pasir				
	- batu baur				
	4) Kriteria Pengesahan dan Kelulusan Pembekal Konkrit Bancuh-dulu oleh Jurutera				
	5) Bancuhan konkrit percubaan				
	- keputusan ujian kiub				
	- pengesahan kelulusan bancuhan				
	6) Rekod Pemeriksaan dan Ujian				
	- Pembukaan acuan				
	- *slump test*				
	- ujian kiub				
	7) Kriteria dan pengesahan kelulusan ujian oleh Jurutera				
	8) Penguji / Makmal yang bertauliah				
	iksaan dan				
	ection (*RFI*)				

No	Butiran	Rujukan Piawaian/ Spesifikasi	Pematuhan (Y/T)	No. Ruj. NCR	Tarikh & ttr WPD penutupan NCR
	Ujian bahan keluli dan *bolt*				
	Ujian kimpalan				
	Bahan kalis api				
	Lapisan Anti-karat				
	Lapisan cat penyudah				
	Jurukimpal yang bertauliah				
	Spesifikasi/ Piawai yang berkaitan				
	Penguji / Makmal yang bertauliah				
	3) *Cold-formed*				
	Pembekal tersenarai dalam senarai JKR				
	Mematuhi *Method Statement*				
	Spesifikasi Piawai JKR				
	Pengesahan bahan mengikut spesifikasi oleh Jurutera				
	Penguji / Makmal yang bertauliah				
	iii. Kerja konkrit tuang dulu				
	a) Perancangan Pemeriksaan dan Ujian				
	1) *Request for Inspection (RFI)*				
	2) Mematuhi *Method Statement*				
	3) Pengesahan pemasangan oleh Jurutera				
	4) Pengesahan bahan mengikut spesifikasi oleh Jurutera				
	5) Penguji / Makmal yang bertauliah				
	iv. Kerja kayu				
	a) Perancangan Pemeriksaan dan Ujian				
	1) *Request for Inspection (RFI)*				
	2) Pengesahan/ujian bahan				
	3) Mematuhi *Method Statement*				
	4) Spesifikasi/ Piawai yang berkaitan				
	5) Pengesahan pemasangan oleh Jurutera				

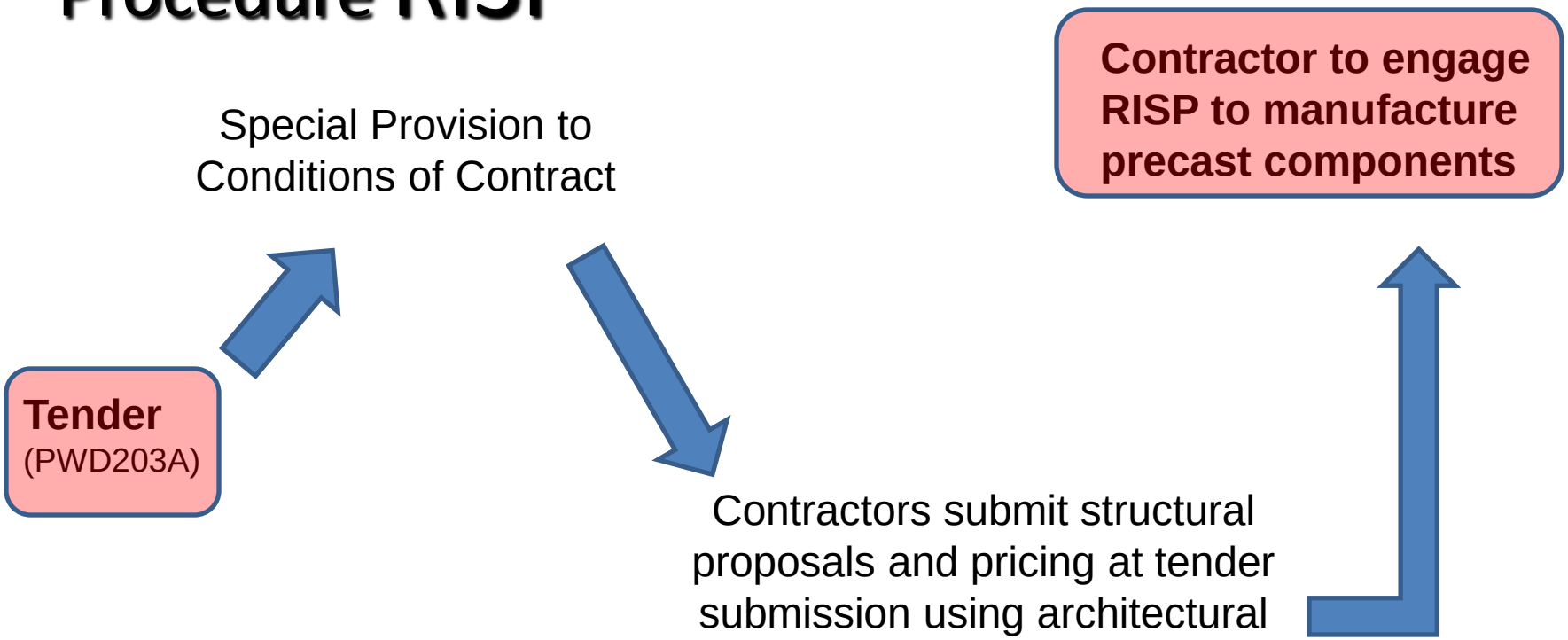
IBS / RISP

Implementation of IBS in JKR is carried out by adopting the concept of '*request for proposal*' from the Contractors using the available products from manufacturers (RISP)

RISP approach is developed to allow for the uncoupling of the firmed and variable structural design work to make concurrent activities possible

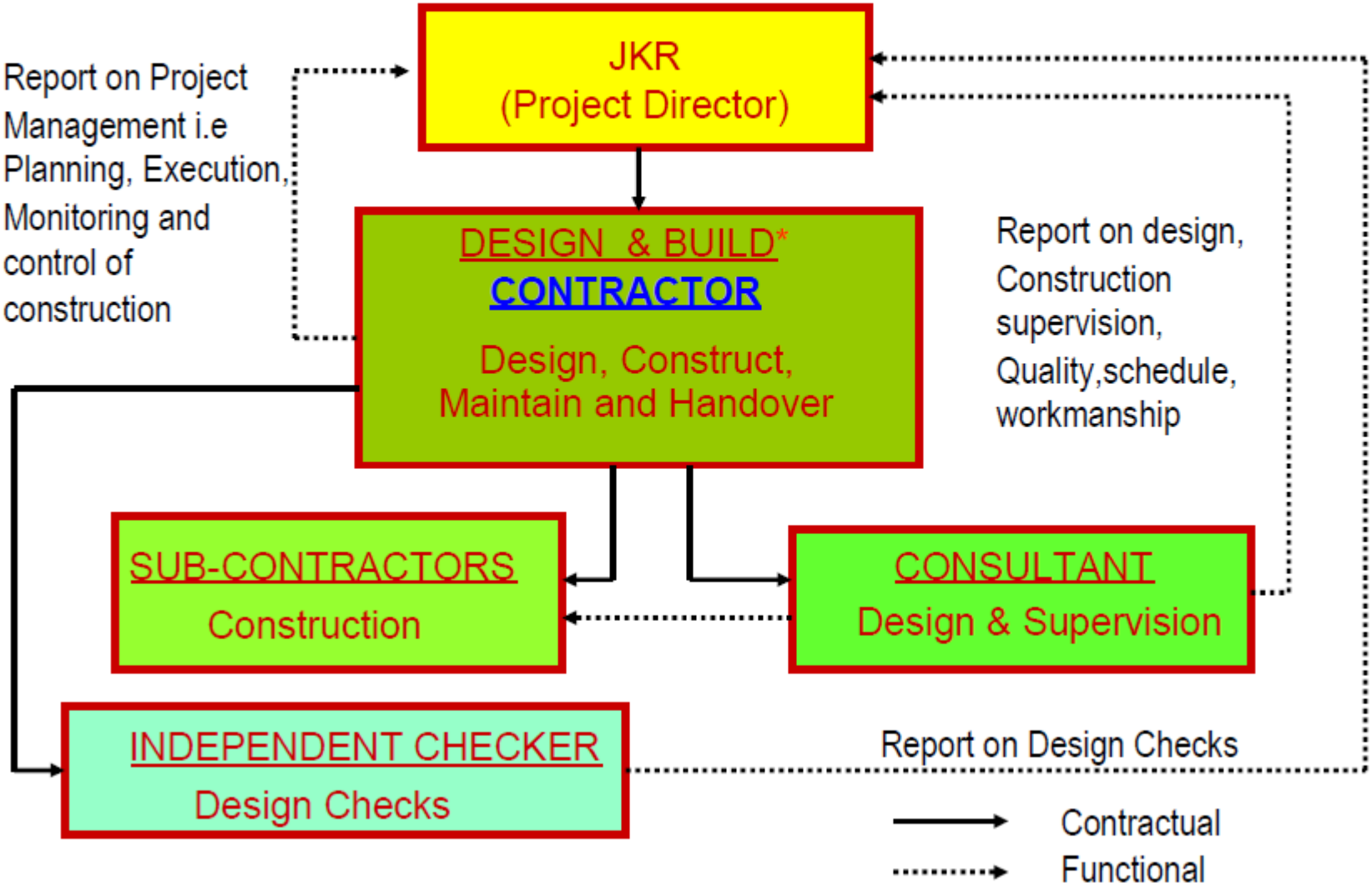
Lower cost of producing structural designs is achieved by using components already on the market

revisit: Procurement Procedure RISP



Rajah 2: Perkaitan fungsi & sistem penyampaian projek R&B

[DESIGN AND BUILD CONTRACT WITH
*PROJECT MANAGEMENT BY CONTRACTOR]



SPECIAL PROVISION

SPECIAL PROVISION TO THE CONTRACT PERTAINING TO THE CONTRACTOR'S PROPOSED DESIGN USING INDUSTRIALISED BUILDING SYSTEM (IBS)

A) This Special Provision applies where Contractor is required to submit Contractor's Proposed Design using Industrialized Building System and shall be deemed as part of the Contract.

B) Notwithstanding the design and specification supplied by the Government, the Contractor is required under the Contract to undertake the design of part of the Works determine by the Government as stipulated in the Contract.

1. INTERPRETATION

(a) In this Special Provision, unless the context otherwise requires and save and specifically defined herein, words and expressions defined in the Contract shall have the same meaning when used herein.

(b) Contractor's Proposed Design means a complete structural design of part of the Work as stipulated under recital A of this Special provision using Industrialized Building System as proposed by the Contractor by employing a Registered Industrialized Building System Provider approved by the Government.

(c) Registered Industrialized Building System Provider means a Company registered under the Company's Act 1965 and approved by the Government which undertakes to design, manufacture and supply prefabricated structural components and complete the on-site installation.

(d) Contractor's Professional Engineer means a Registered Engineer with the Board of Engineer employed by the Contractor to check and approve the design of the Registered Industrialized Building System Provider and supervise on behalf of the Contractor, the on-site installation of the prefabricated structural components as stipulated under clause (c) above of this Special Provision.

2. REPRESENTATION AND WARRANTY ON THE CONTRACTOR'S PROPOSED DESIGN

JKR

The Contractor hereby represents and warrants to the Government that-

(a) the Contractor has capabilities and technical knowledge with regard to Contractor's Proposed Design and will complete the Works using Industrialized Building System;

SPECIAL PROVISION

(b) the Contractor shall employ a Registered Industrialized Building System Provider as approved by the Government to design, manufacture and supply prefabricated structural components and complete the on-site installation;

Change of RISP after Letter of Award is issued

SPECIAL PROVISION

(b) The Contractor shall submit to the S.O. all drawings, specifications, calculations and any other relevant information pertaining to the Contractor's Proposed Design for approval. No work shall be commence without prior written consent of the S.O..

Advice from CKASJ on their appropriateness

SPECIAL PROVISION

(d) The approval of Contractor's Proposed Design by the S.O. pursuant to sub-clause (b) and any action, decision, instruction or consent taken, made or given by the Government or the S.O. as the case may be under this clause shall not absolve the Contractor from its responsibility under sub-clause (c) and the Contractor shall be liable and shall fully indemnity and keep the Government indemnified for any design defects, damage, inadequacies or insufficiency of Contractor's Proposed Design.

(a) The Contractor shall provide to the Government a banker's guarantee issued by an approved licensed bank/financial institution of the sum of **Ringgit ..... (RM .....)** (hereinafter referred to as "the Contractor's Proposed Design Guarantee Bond") substantially in the form as in Appendix ..... upon or before the issuance of the Certificate of Practical Completion of the Contractor's Proposed Design. Such Contractor's Proposed Design Guarantee Bond shall remain valid for a period of five (5) years from the date of practical completion of the Contractor's Proposed Design.

(b) If any defect or damage shall occur to the Contractor's Proposed Design or any part thereof as a result of any defect, fault, insufficiency or inadequacy in the designs including workmanship, materials or equipment arising directly from design fault then the approved licensed bank / financial institution issuing the Contractor's Proposed Design Guarantee Bond pursuant to clause (a) above will indemnify and pay the Government, on demand by the Government in writing and notwithstanding any objection by the Contractor or any other third party, the sum of ..... being equal to 5% of the cost of the Contractor's Proposed Design or such part thereof as may be demanded.

(c) If the Contractor's Proposed Design Guarantee Bond is not deposited with the Government in accordance with clause 3.2(a) of this Special Provision, then the Government shall have the right to claim from the Performance Bond as stipulated under clause 13 of the Conditions of Contract.

(a) In addition to Contractor's Proposed Design Guarantee Bond, the Contractor shall deposit to the Government a Contractor's Proposed Design Guarantee as a security to the Contractor's obligations under this Contract. The Contractor's Proposed Design Guarantee shall be effective for the duration of five (5) years commencing from the date of practical completion ("the Contractor's Proposed Design Guarantee Period").

(b) If any defect or damage shall occur to the Contractor's Proposed Design or any part thereof as a result of any defect, fault, insufficiency or inadequacy in the design including workmanship, material or equipment arising from design default during the Contractor's Proposed Design, the Government shall issue to the Contractor a notice specifying the default and requiring the Contractor to remedy the same within the period specified at the Contractor's own cost and expense. If the same is not remedied, the Government shall be entitled, without prejudice to any other rights or remedies it may possess against the Contractor under this

SPECIAL PROVISION

4.3 The Contractor shall with prior consent of the S.O. employ Contractor's Professional Engineer for purposes of endorsing the design and supervising the construction and completion of the Works which relates to Contractor's Proposed Design.

SPECIAL PROVISION

4.5 The Contractor shall enter into agreements with the Registered Industrialized Building System Provider and the Professional Engineer as stipulated under clauses 2(b) and 2(c) of this Special Provision and shall deposit eight (8) copies of each of the contract entered to the S.O. as a condition precedent before the

5.1 The Contractor shall submit monthly supervision reports in relation to the works (or at any time at the discretion of the S.O.) to the S.O. pertaining to Industrialized Building System Design on the following:

(a) progress of works properly done on Site;
(b) progress of the Industrialized Building System Design;
(c) any tests done on the Site;
(d) safety measures at the Site;
(e) environmental impact assessment of Industrialized Building System design and related works; and
(f) any other matter as required by the Government,

5.2 All such reports which are to be submitted by the Contractor shall be duly verified and certified by the Contractor, Registered Industrialized Building System Provider and the Contractor's Professional Engineer.

5.3 The submission of such reports under this clause shall be a condition precedent to any interim payment that the Contractor shall be entitled under clause 28 of Contract. In the event that the Contractor fails to comply with the requirement of this clause, the Government shall be entitled to withhold the interim payment that the Contractor would otherwise be entitled to.

SPECIAL PROVISION

8.2 Notwithstanding clause 8.1, if in the opinion of the S.O. the variation is necessary for the purpose of suitability, functionality and safety of the Works, the Contractor shall effect the variations. For the purpose of this clause, what constitutes "suitability, functionality and safety of the Works" shall be solely determined by the S.O. and such determination shall for all intents and purposes be final and conclusive. Notwithstanding thereto the Contractor shall remain responsible for the design of the works as provided under clause 3 of this Special Provision.

JKR

SPECIAL PROVISION

8.3 Where a variation under clause 8.2 results in extra cost, the said extra cost shall be borne by the Contractor. However, if the variation results in a reduction in cost, the Contract Sum shall be accordingly reduced.

ELAKKAN PERTUKARAN REKABENTUK IBS OLEH PEGAWAI PENGUASA

Penerangan dlm mesyuarat pra-pembinaan kepada SO dan pasukan, kontraktor dan sebagainya

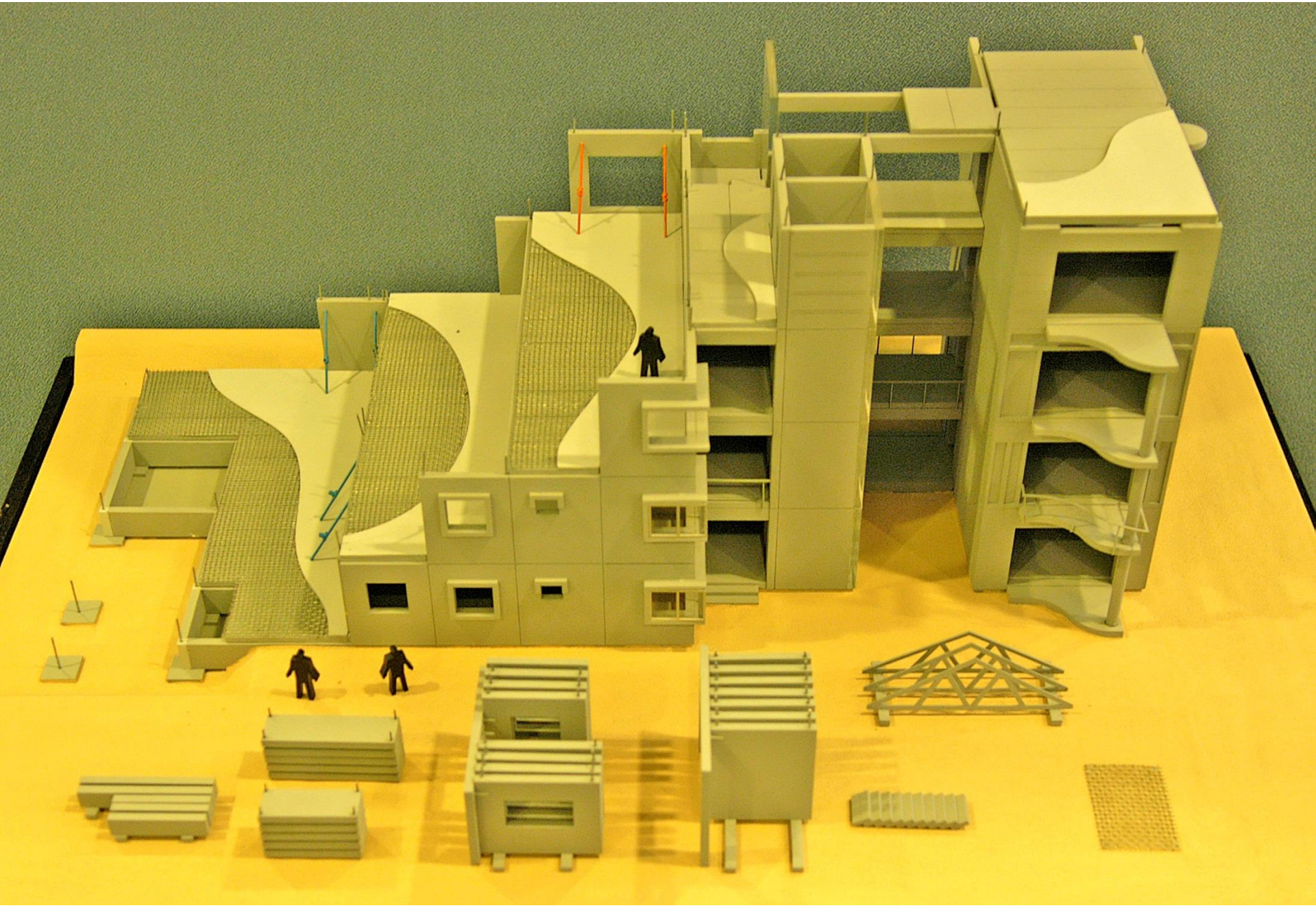
- Construction workflow
- Hendaklah mengikut sistem IBS dalam lukisan kontrak (kategori kerangka, panels, jenis papak, rasuk RC atu pra tegasan dll)

- Penyelarasan rekabentuk, Rfi dan sebagainya

ELAKKAN PERTUKARAN REKABENTUK IBS OLEH PEGAWAI PENGUASA

- Pemilihan precaster hendaklah berdasarkan sistem yang sama dan mengikut lukisan
  - Constructible
  - Stable system
  - functional
- Akibat pertukaran:
  - melibatkan rekabentuk, yuran perunding dan warranty,
  - Perlanjutan masa (rekabentuk semula), pertambahan komponen
  - Kerugian kepada kerajaan jika kontraktor buat tuntutan

- STRUCTURAL FORMS IBS >>> REVISIT



STRUCTURAL FORMS OF PRECAST CONCRETE

- **Skeletal Frame**
- **Bearing Walls**
- **Facades**
- **Cell System /Modular buildings**
- **Mixed System**
- **Portal Frame**

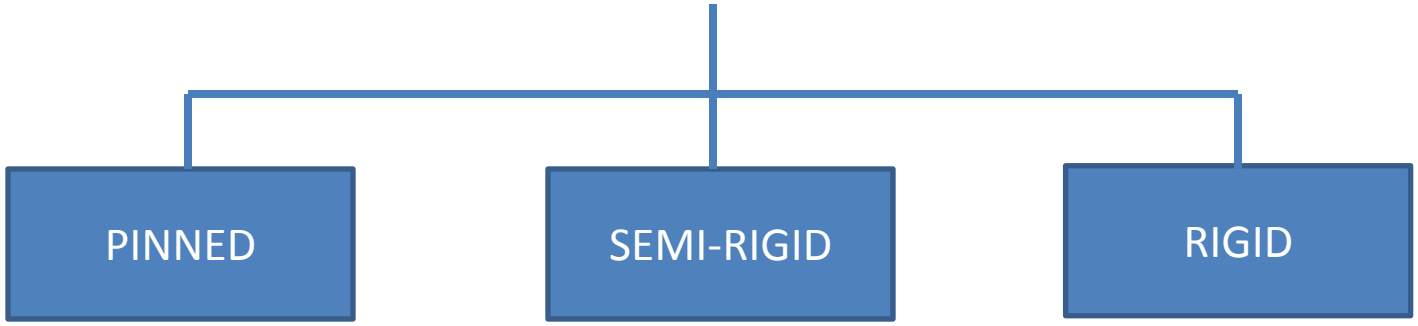
JENIS-JENIS SISTEM

- Kerangka
- Shear walls
- Panels
- Blok
- Formwork system

- BRACED OR UNBRACED? >>>
- CONNECTIONS >>>

CONNECTION

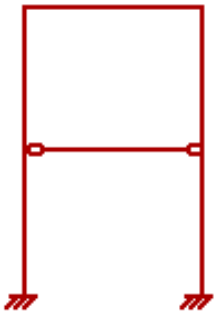
TYPE OF CONNECTIONS



Transfer mainly shear forces. The connection lead to simple construction system

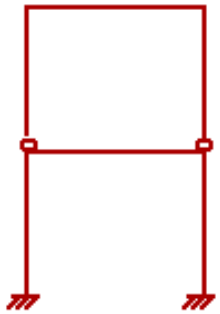
Rigid connection are able to transfer moment and shear force. In precast, rigid connection are possible in many situation, particularly at foundation and column-beam

PINNED



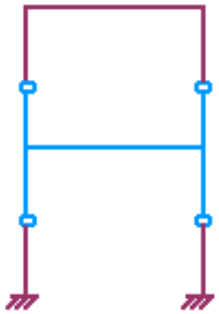
skeletal frame

beam-column connection.



portal frame

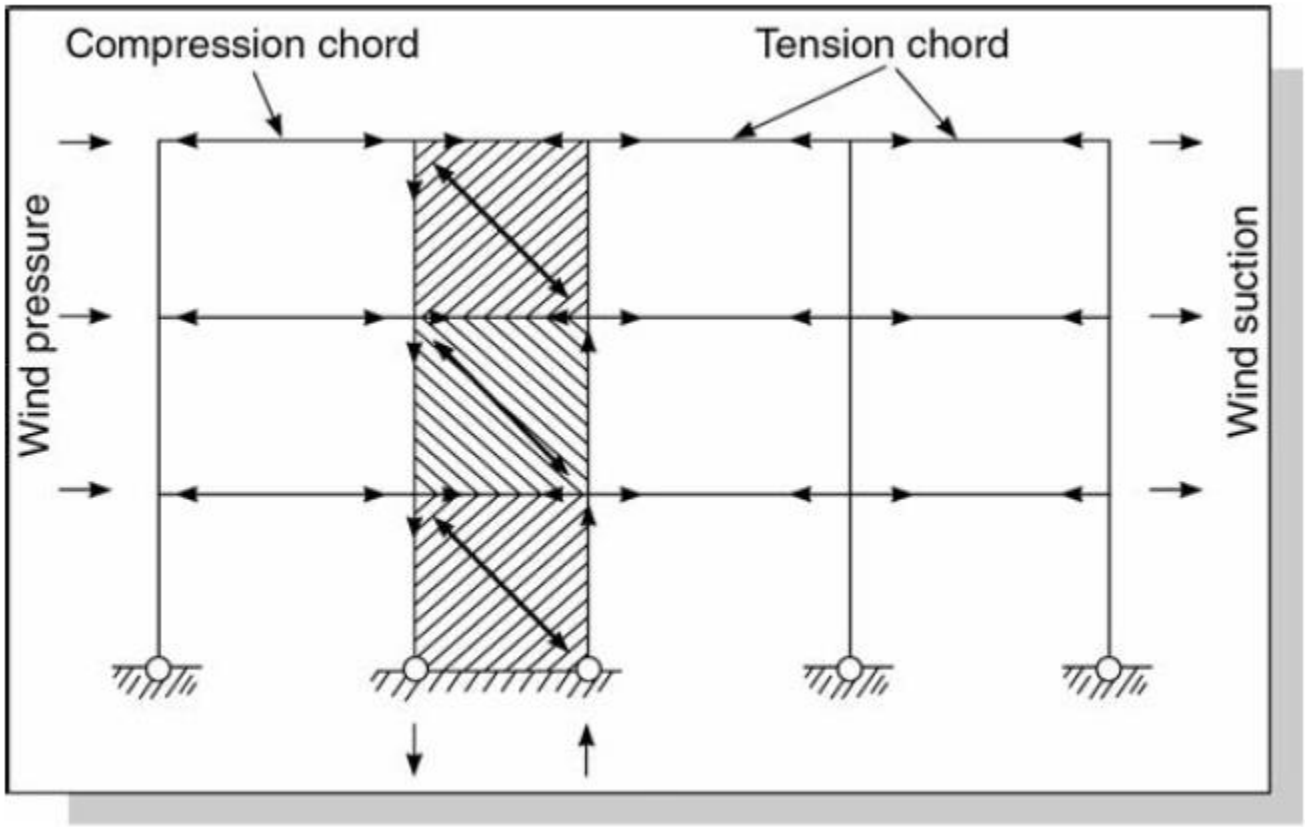
column connection.



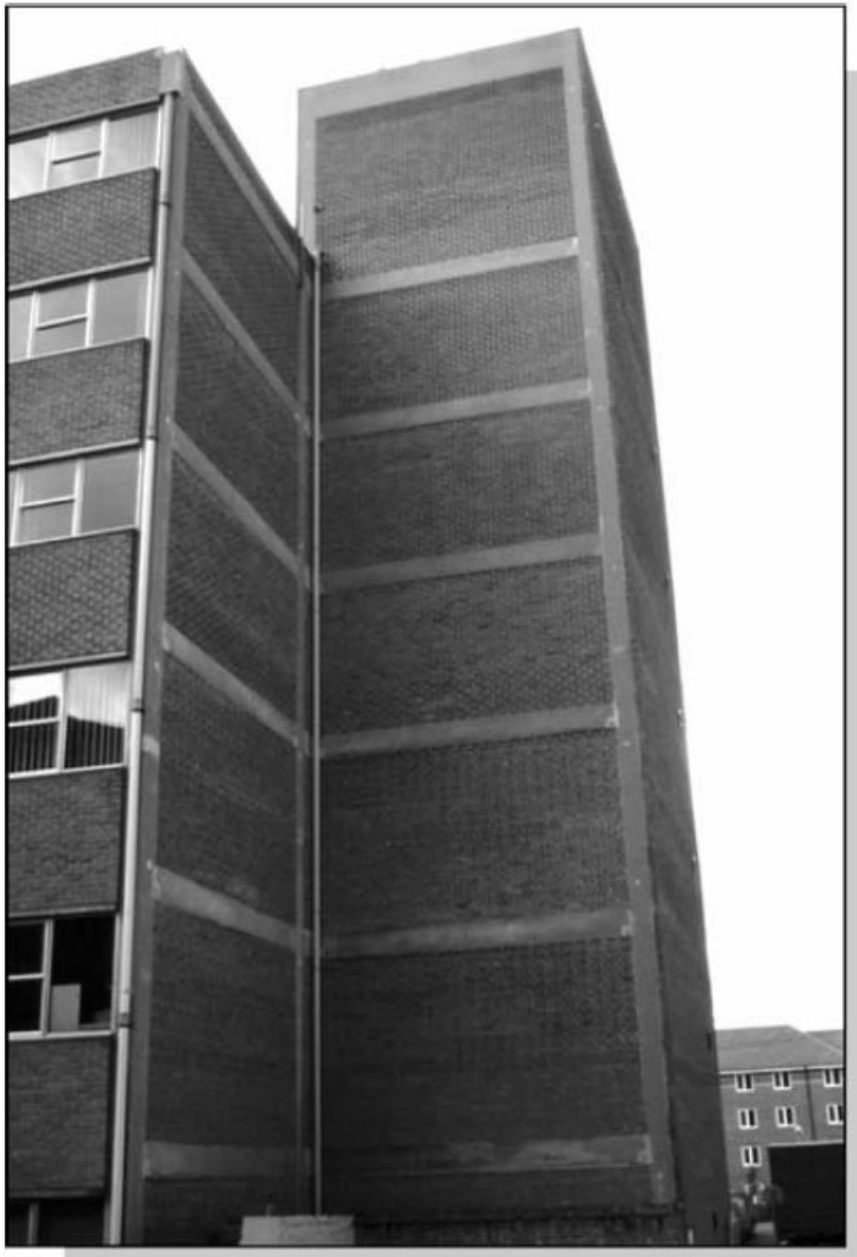
H frame

minimum column moment.

BRACED OR UNBRACED

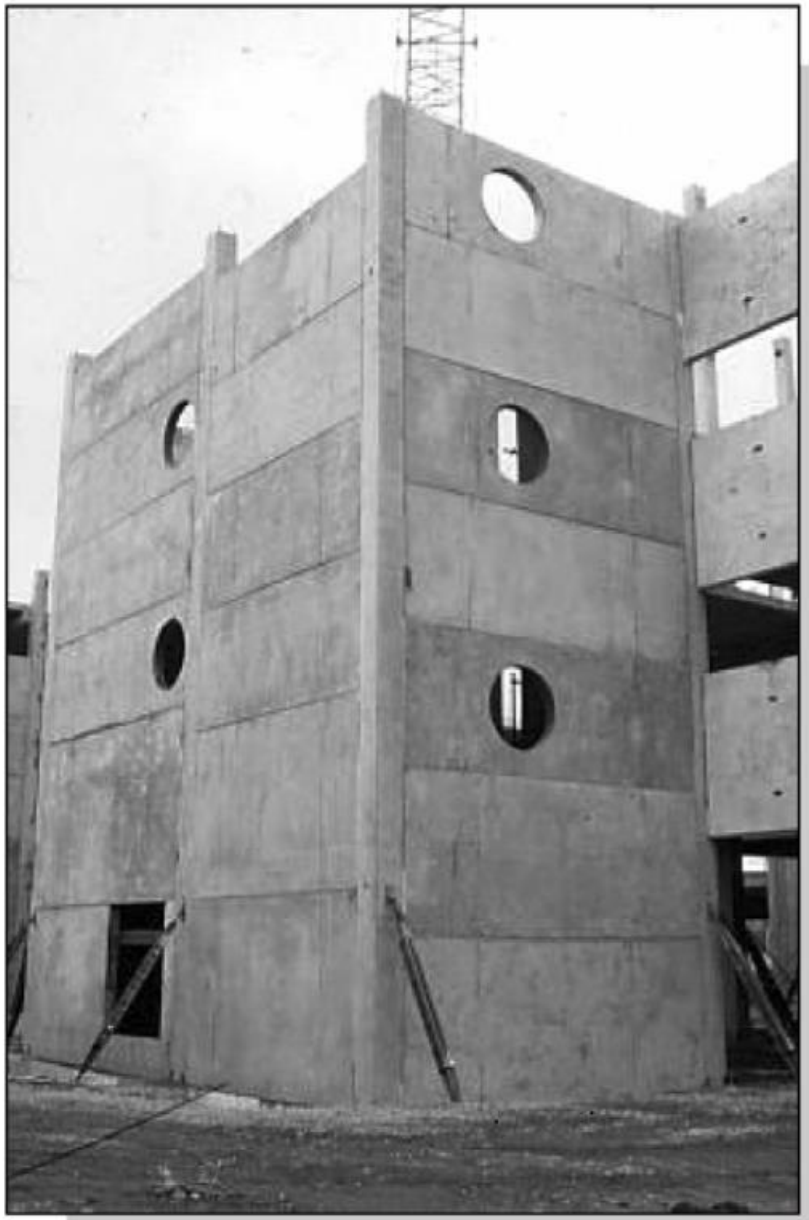


Horizontal load transfer through braced structures

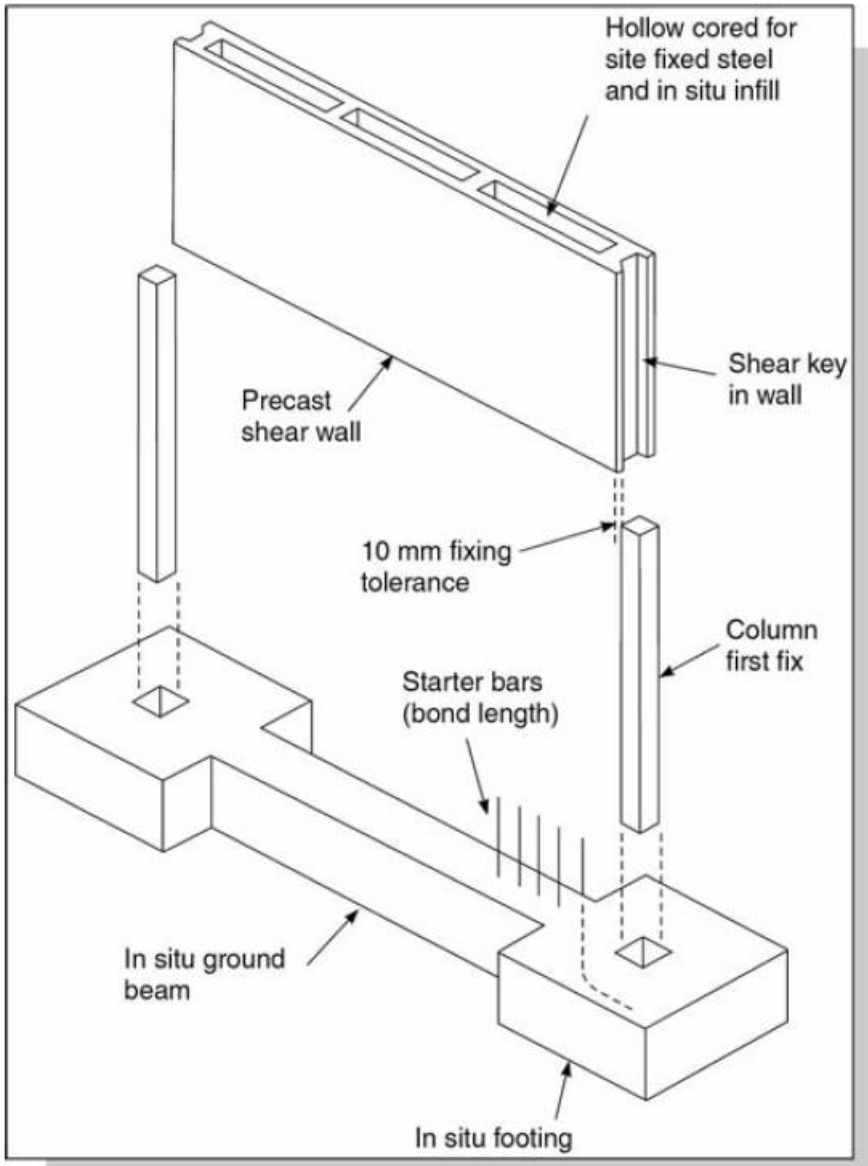


Brick infill shear wall.

Precast concrete cross bracing



Precast concrete infill shear walls



Precast hollow core cantilever wall

SKELETAL FRAMES

- Consisting of columns, beams and slabs.
- Imposed load are carried to foundation by beams and column.
- Large span and open space.
- High degree of flexibility and greater freedom in planning and usage of floor area.
- Easily adaptable to future extension.
- Suitable for industrial building, shopping malls, car parks, school, office, hospital etc.

BEARING WALLS

- Speed of construction.
- Ready to paint surfaces
- Acoustic insulation
- Suitable for residential apartments, hotel and general housing

CELL SYSTEM

- Speed of construction.
- Surface finishes which can be completely done in factory.
- Usage: Bathrooms, kitchens and occasionally for apartments, hotels, prison.
  - Large crane capacity required.

MIXED SYSTEM

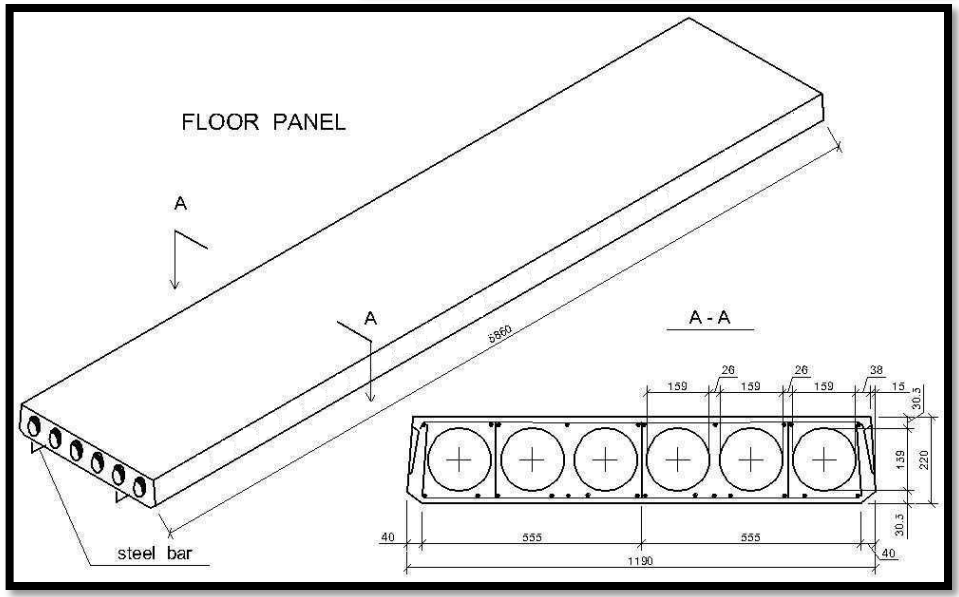
- Also named as hybrid system.
- Precast concrete structure in combination with other building system such as insitu, steel masonry.
- Greater attention to design, detail and construction of precast concrete joints interfacing with insitu or other building system.

PORTAL FRAME

- Consisting of column and roof rafters or beams
- Single storey warehouse, manufacturing facilities.

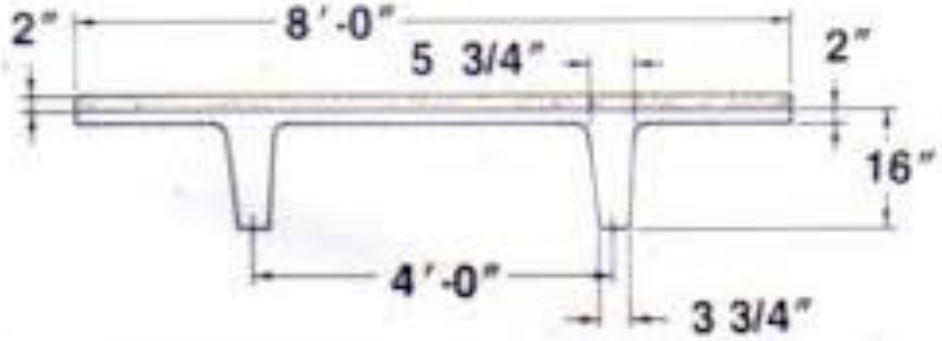
HOLLOW CORE SLAB

- Efficient design and production
- Easy and rapid onsite installation
- Thickness (100mm – 500mm)
- Width – 1.2m
- Span – 7.0m – 22.0m



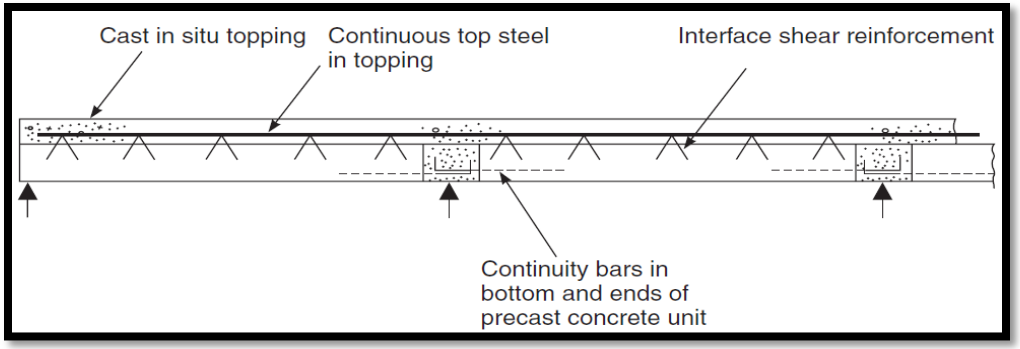
DOUBLE – T FLOOR

- Higher load carrying capacity
- Longer span than hollow core slab.
- Width – 2.4m
- Can be RC or prestress.



HALF SLAB

- Precast concrete panel utilised as permanent formwork for the floor slab's cast in-situ concrete topping.
- Can be construct either on precast beam or in-situ beam or steel beam.
- Thickness – 50mm – 65mm
- Width – 2.4m
- Span – up to 7m



PRECAST PLANK

- Rectangular slab for small span and low capacity of load.

PRECAST BEAM

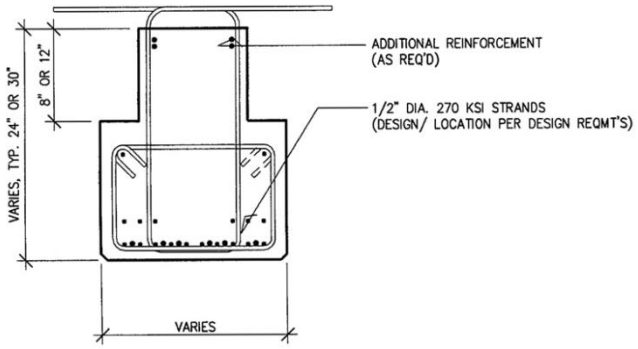
TYPE OF PRECAST BEAM

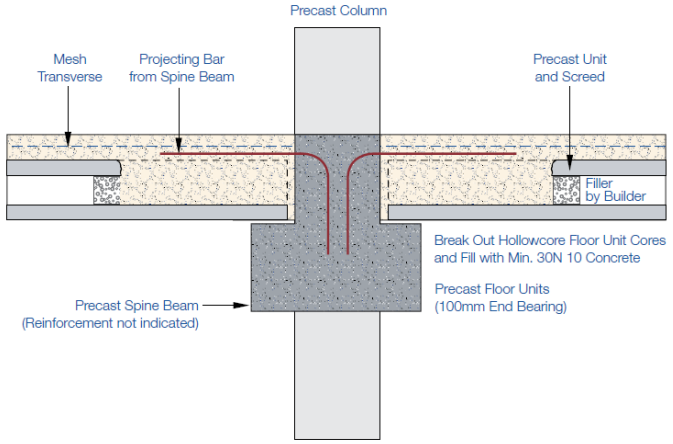
- Reinforced concrete precast beam
- Prestress concrete precast beam

GENERAL DESIGN CRITERIA

- The beam may be composite or non-composite. Composite beams act with the floor and screed to form a monolithic structure.
- Support conditions can be design as simply supported or continuous.
- Standardized design are prepared for beam that may vary in depth, breadth or reinforcement.

PRECAST BEAM

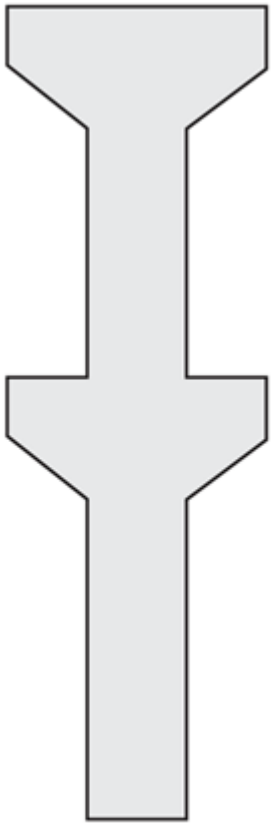




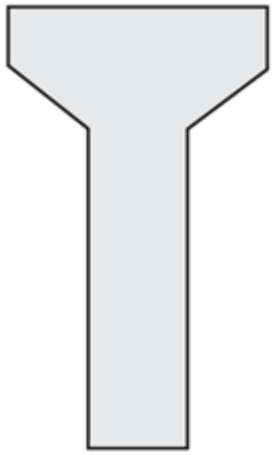
PRECAST COLUMN

- Precast column are the main vertical load carrying members in skeletal frame.
- They may also be used as horizontal load carrying members but their capacity for mid-rised building are very limited.
- Precast column can be cast in 1-storey height or multi storey height depending on design and transportation/handling factor.

PRECAST COLUMN



Multi Storey Column



Single Storey Column

PRECAST WALL

- Precast wall give a large degree of freedom in floor usage and planning in designing for lateral

PRECAST STAIRCASE

- Main consideration of designing precast staircase is connection detail which usually been design as simply supported.

QUALITY ASSURANCE STAGES

- DESIGN (JKR AND OTHERS INCL. INDEPENDENT CHECKER)
- PRODUCTION/CASTING/STORAGE/ TRANSPORTATION (SYSTEM PROVIDERS/CONTRACTORS)
- CONSTN. STAGE –PREFABRICATING /INSTALLATION (CONTRACTORS)
- SUPERVISION – audit/component inspections/General requirements (JKR AND OTHERS)

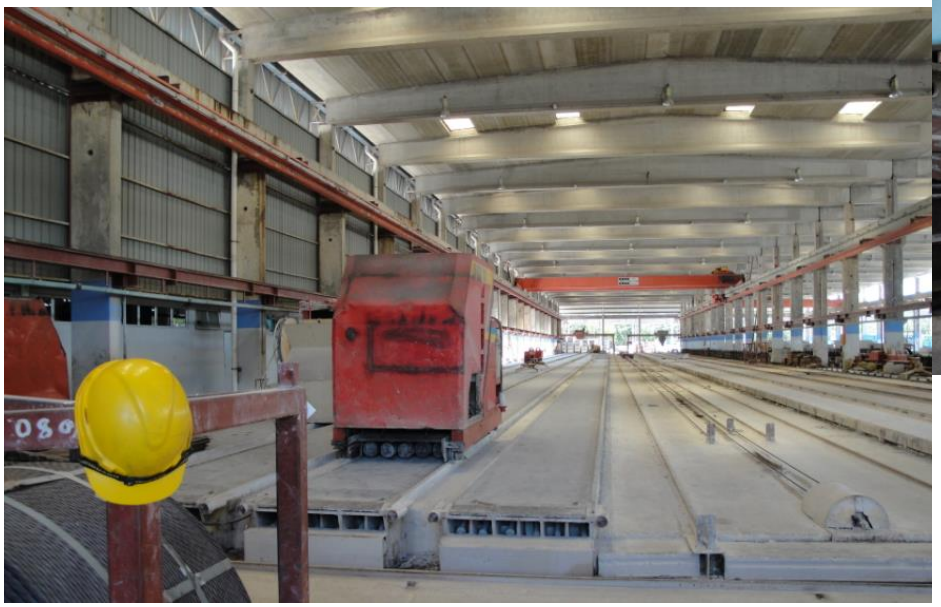
QA / QC DI KILANG

NO.	ITEM	CHECKLIST			REMARKS
		YES	NO	N/A	
6	Age of precast component lifting	√			* Lifting the precast component from mould to storage yard at 15 Mpa (10 hrs) * Transport the precast component to the construction site after 7 days
7	Concrete testing	√			* Cube test day 1-28, slump test, others
8	Storage of finish product	√			* Stacking and protected
9	Precast concrete component production process	√			* Mould preparation, bar installation, concreting with vibrating, cutting, lifting, curing and transportation is carried out properly
10	Precast concrete component dimensional accuracy	√			* ± 10 mm

INSPECTED BY :

INSPECTED BY :


C-52-01
15-01-2010




UNIT TEST

CUBE STRENGTH &TOLERANCES

- CONCRETE STRENGTH DURING LIFTING AND HANDLINGS
- CONCRETE STRENGTH DURING INSTALLATION (7 DAYS STRENGTH - MINIMUM)
- CONCRETE STRENGTH AT SERVICE (28 DAYS STRENGTH)
- DIMENSIONS AND SIZES

Quick check

QUICK CHECK						
	Checklist	Inspection			Remarks
		Date	Result	Sign	
	COMPONENT INSPECTION				
1	Correct component type				
2	Critical dimensions (within tolerance) ~ Length ~ Width ~ Height or thickness ~ Squareness				
3	Surface condition ~ No honeycomb ~ No crack ~ No chipping ~ Edge straight ~ No excessive pinholes ~ Flatness or evenness				
4	Lifting points / inserts ~ Location ~ Physical condition				
5	Sleeve system / connections ~ Starter bar (length, size and spacing) ~ Loop and lapping bar (length, size) ~ Corrugated sleeve (location and cleanliness)				
6	M&E services ~ Location ~ Physical condition				
7	Storage and loading points ~ Condition ~ Stacking method				
	PRE-ERECTION				
8	Tools, equipment (drills, auto-level, theodolite, brackets, bolts) and temporary props and bracings				
9	Precast elements to be erected are delivered to storage or loading points				
10	Survey reference lines and level marks				
11	Starter bar of lower unit (number, spacing, size and length) for vertical components such as wall and column units				
12	Location and conditions of corrugated pipe sleeves				
13	Shim plate level				
14	Bracker rods and waterproofing strip position				
	INSTALLATION				
15	Setting out position of elements ~ Verticality ~ Alignment ~ Level				
16	Adequacy of temporary supports				

17	Grouting work (check mix ratio) ~ Horinzontal joints ~ Corrugated pipe sleeve connection				
18	Joint and connection details ~ Rebar connection ~ Weld connection ~ Cast in-situ joints connection				
	FINAL INSPECTION				
19	No Visible crack or damage				
20	Watertightness test on ~ External wall panels and ~ Joints between external wall and windows frame				

COMPONENT INSPECTION 2
QUICK CHECK

CORRECT COMPONENT
~ beam
~ column
~ slab
~ foundation

CRITICAL DIMENSION (WITHIN TOLERANCE)
~ Length
~ Width
~ Height or thickness
~ Squareness

SURFACE CONDITION

~ No honeycomb

~ No crack

~ No chipping

~ Edge straight

~ No excessive pinholes

~ Flatness or evenness

LIFTING POINTS/INSERTS

~ Location

~ Physical condition

SLEEVE SYSTEM / CONNECTIONS

~ Starter bar (length, size and spacing)

~ Loop and lapping bar (length, size)

~ Corrugated sleeve (location and cleanliness)

M&E SERVICES

~ Location

~ Physical condition

STORAGE AND LOADING POINT

~ Condition

~ Stacking method

PRE-ERECTION

Tools, equipment (drills, auto-level, theodolite, brackets, bolts) and temporary props and bracings
Precast elements to be erected are delivered to storage or loading points
Survey reference lines and level marks
Starter bar of lower unit (number, spacing, size and length) for vertical components such as wall and column units
Location and conditions of corrugated pipe sleeves
Shim plate level
Bracker rods and waterproofing strip position

INSTALLATION

Setting out position of elements
~ Verticality
~ Alignment
~ Level
Adequacy of temporary supports
Grouting work (check mix ratio)
~ Horinzontal joints
~ Corrugated pipe sleeve connection
Joint and connection details
~ Rebar connection
~ Weld connection
~ Cast in-situ joints connection

FINAL INSPECTION

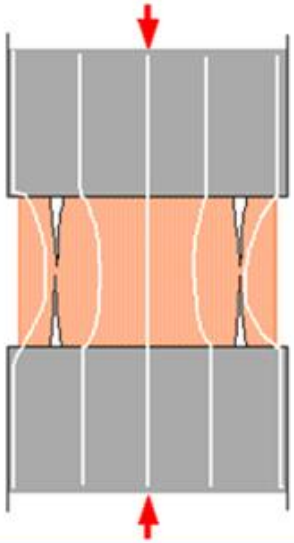
No Visible crack or damage
Watertightness test on
~ External wall panels and
~ Joints between external wall and windows frame

GROUTING MORTAR

The opposite occurs if the grout is too strong.

The precast component will induce tensile failure in the grout and, because the grout is not reinforced, it will readily split.

This is undesirable because of the difficulty in reinforcing the in-situ grout.



Guidelines for grout strength

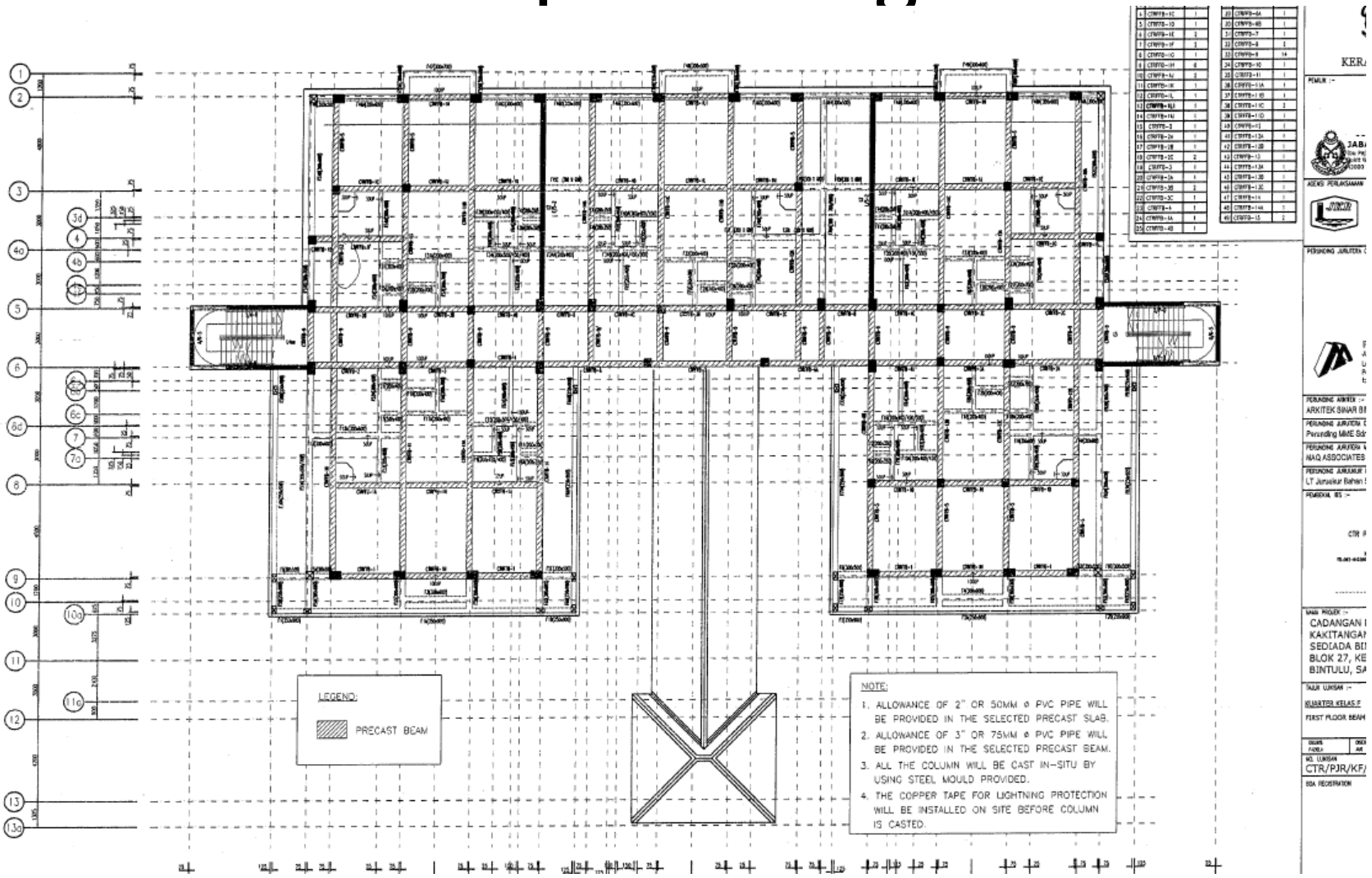
In most cases the strength of the grout will be equal to that of the precast concrete.

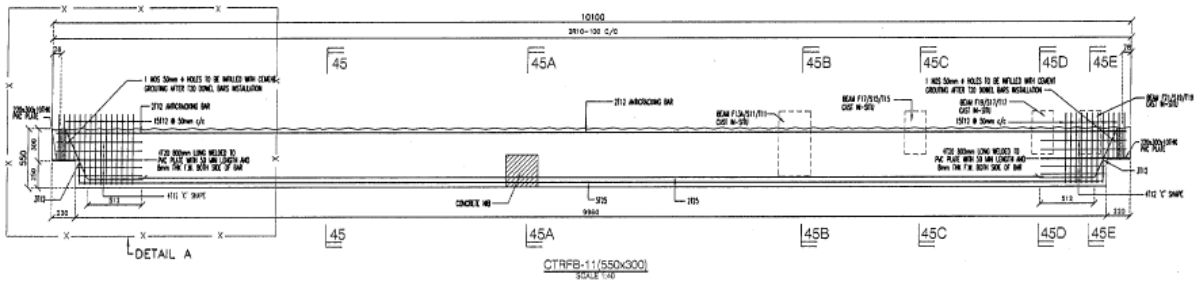
If this is not possible then the strength of the grout should be at least 80% that of the precast concrete.

Construction/Shop Drawing

- Lukisan pembinaan perlu ada masa mesyuarat pertama
- Penerangan mengenai keperluan lukisan IBS
  - Details on Structural systems
  - Components and ties requirement
  - System formworks
- PROJECT convensional – structural items is in D&B modes. (Delivery flowcharts/Review)
- Shop drawings
- Penyelarasan dengan precaster/RFI
- Installers

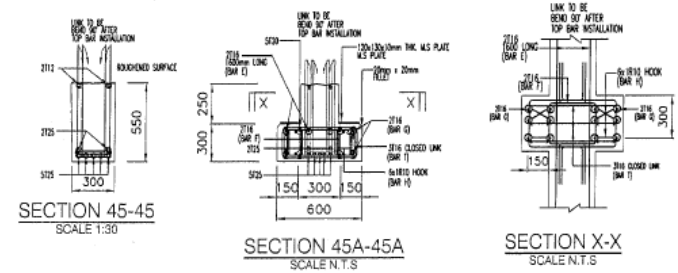
Shop drawings

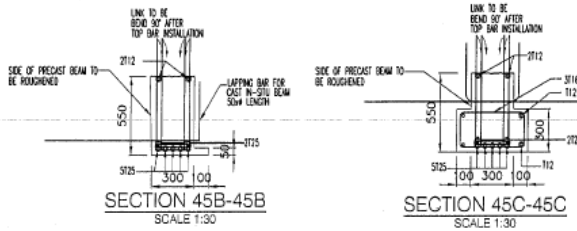


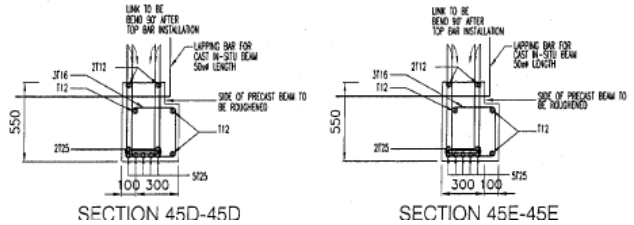


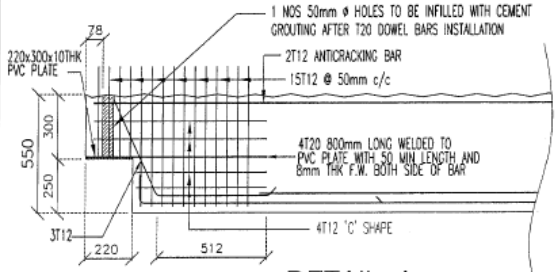
CTRFB-11(550x300)
SCALE 1:20

REINFORCEMENT LAYOUT









DETAIL A
SCALE 1 : 20

DETAILS

KUARTER KELAS F

CODE	DIMENSION	QUANTITY
CTRFFB-11	550 X 300 X 10100	1
CTRFSB-11	550 X 300 X 10100	1
CTRFTB-11	550 X 300 X 10100	1

PROJECT :
LOT 269, BLOK 27, KEMENA LAND DISTRICT, BINTULU, SARAWAK.
KUARTER KELAS F

TITLE : **CTRFB-11**	SCALE : AS SHOWN
DRAWN BY : WONG	CHECKED BY : ANA
APPROVED BY : LIM SIM	DATE : MAY 2015
DRAWING NO. : CTR/PJR/KF/PRD/B48	REV. 02

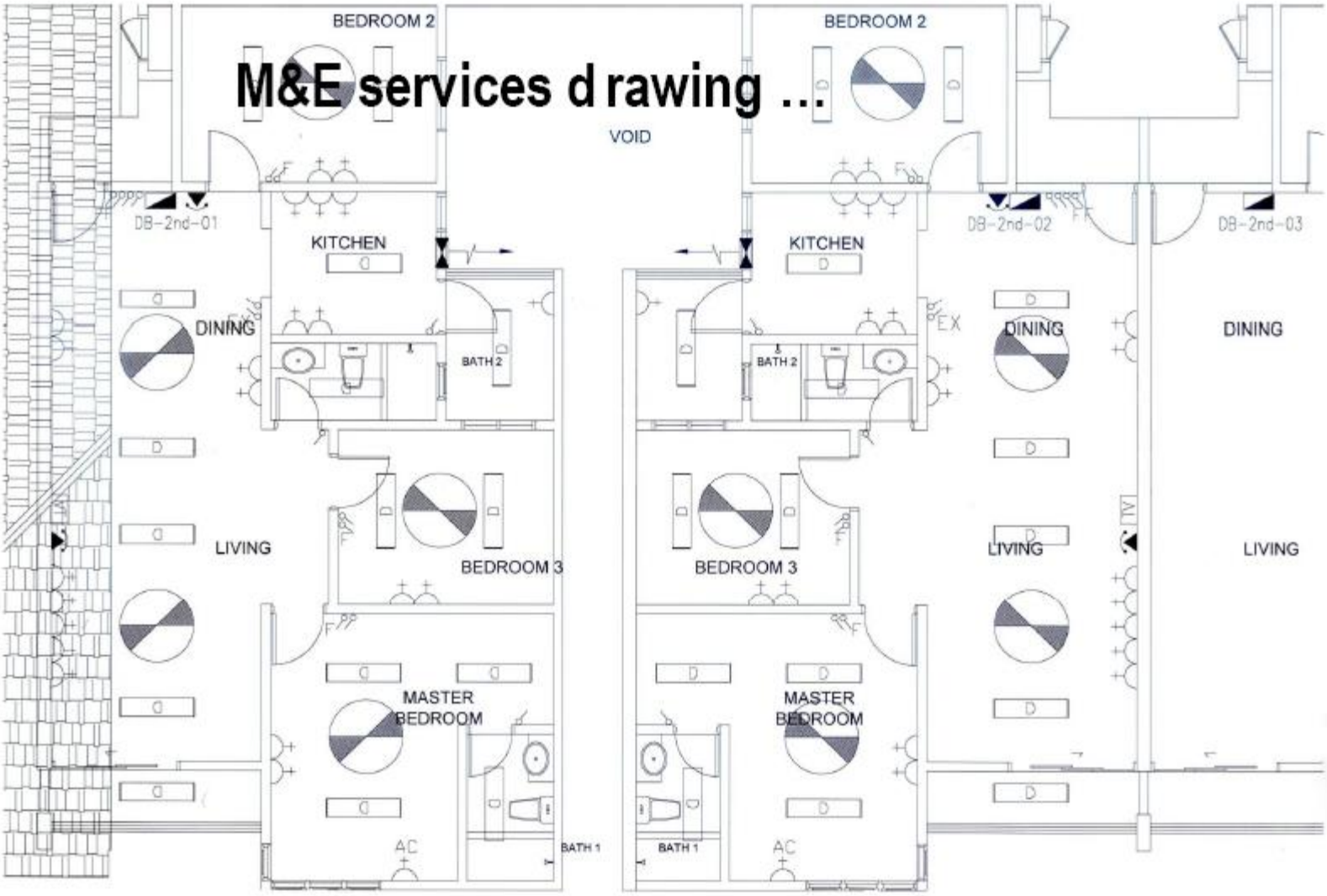
NOTES :
1) ALL DIMENSION FOR :
- FINISHED PRODUCT ± 10mm
- REINFORCEMENT ± 5mm

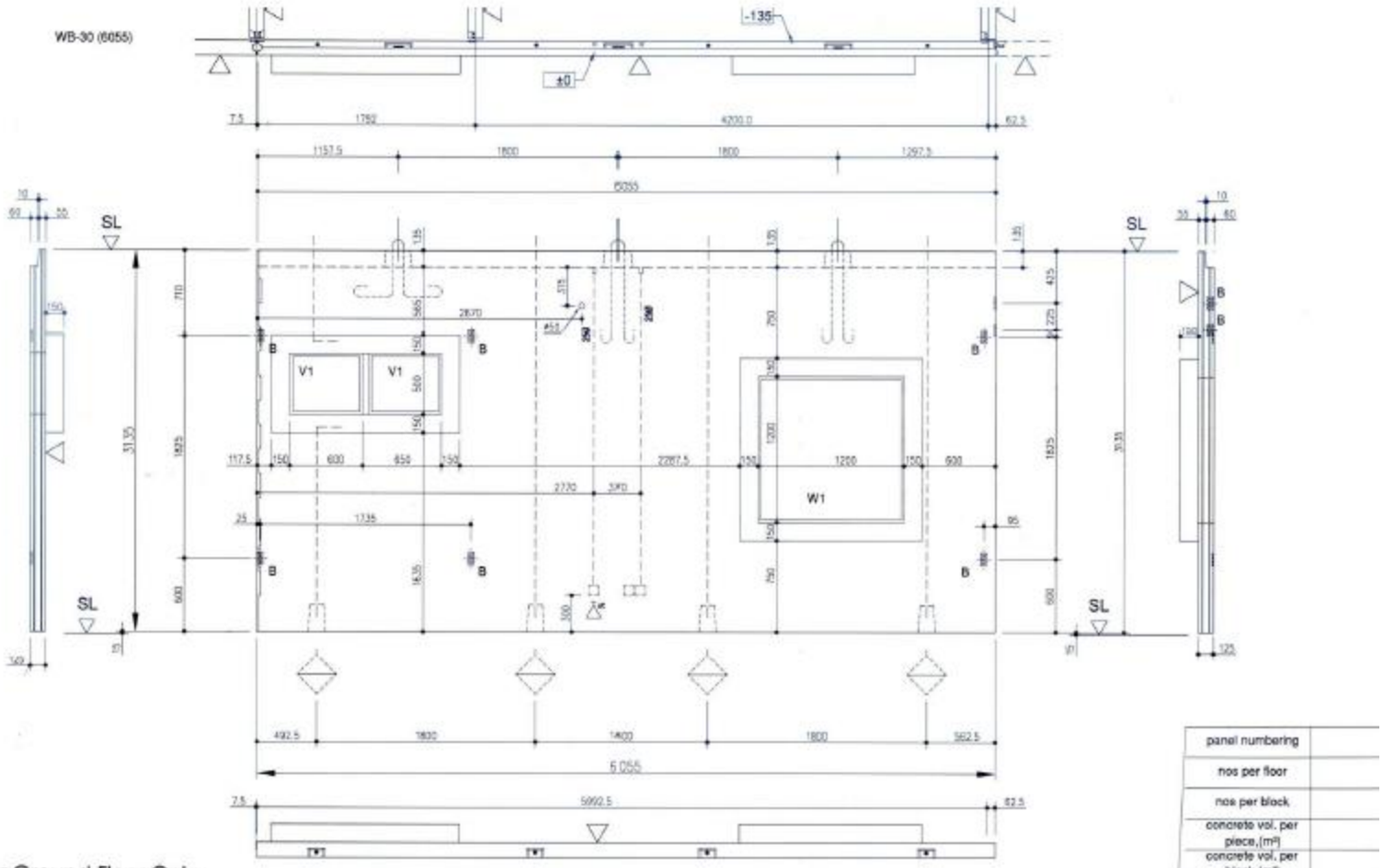
CTR PREFAB SYSTEM SDN BHD (867324-W)

Spesifikasi precast components

- RUJUK Spesifikasi untuk komponen precast >>akan ditunjukkan masa presentation.

Penyelarasan dengan lukisan dan kerja M&E





panel numbering	
nos per floor	
nos per block	
concrete vol. per piece,(m³)	
concrete vol. per block,(m³)	
weight (tonnes)	

Typical M&E Shop Drawing