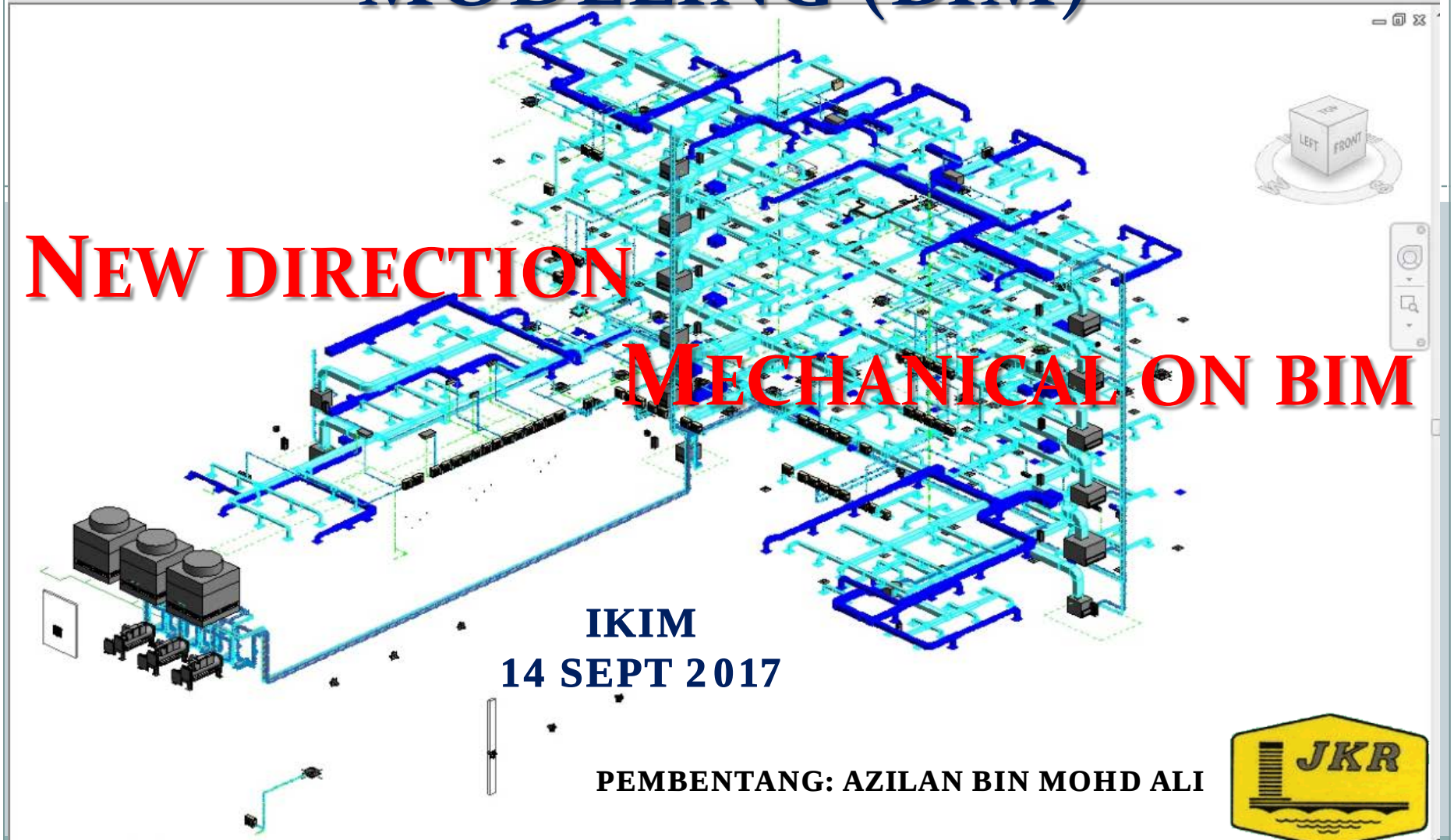
BUILDING INFORMATION MODELING (BIM)



NEW DIRECTION

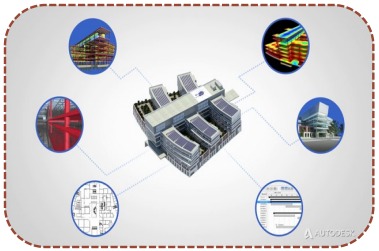
MECHANICAL ON BIM

IKIM

14 SEPT 2017

PEMBENTANG: AZILAN BIN MOHD ALI

ISI KANDUNGAN

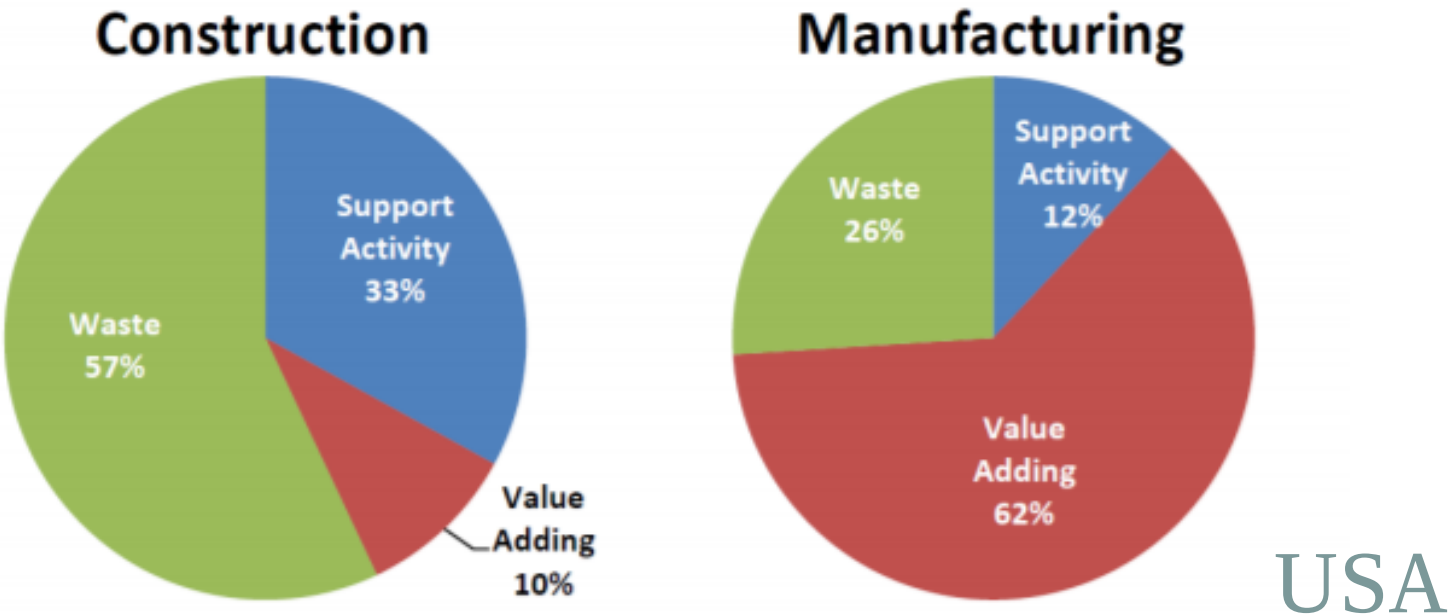


- HARAPAN JKR & INDUSTRI
- PENGENALAN & KEGUNAAN BIM
- RUJUKAN BIM & PELAKSANAAN
- TENDER BIM MEKANIKAL
- BIM DI MASA HADAPAN

HARAPAN JKR & INDUSTRI TERHADAP BIM

HARAPAN JKR

In 2004 the Construction Industry Institute estimated that **57% of money spent on construction is non-value-added—which is WASTE.[2] With the U.S. construction market estimated at US$1.288 trillion for 2008, at 57% waste, over $600 billion per year is being wasted.**



USA

Figure 1: A large portion of the money spent in the construction industry is wasted, especially when compared to the manufacturing industry.

HARAPAN JKR

NBS

UK

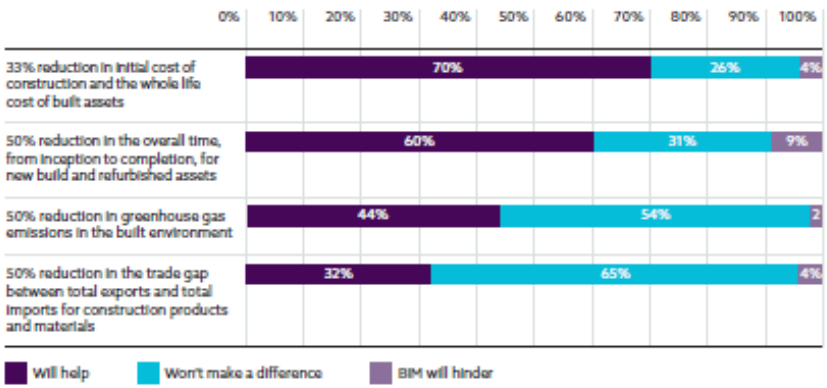
National BIM Report 2017

The Government's construction strategy

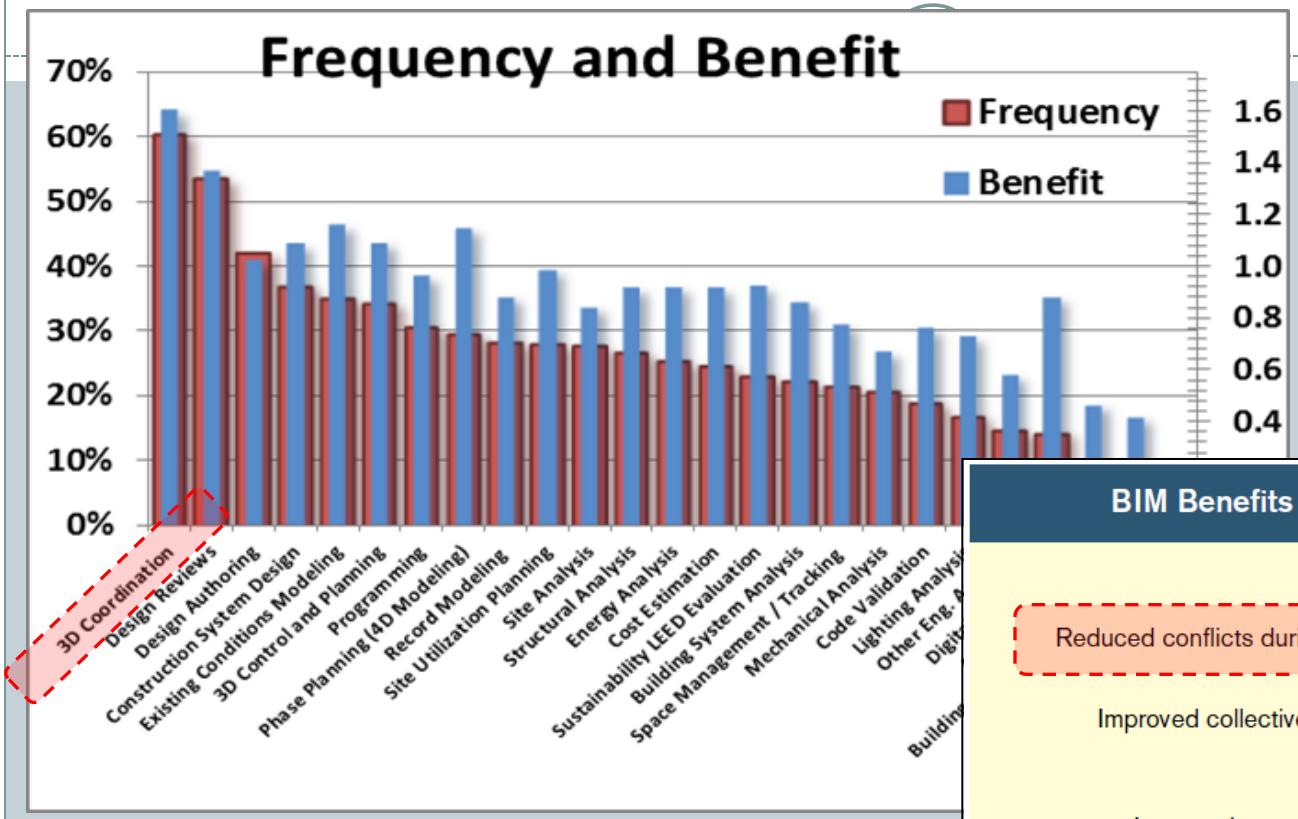
The UK's BIM mandate is strategic; it derives from the Government's construction strategy. Within the strategy are four ambitious targets. The role of BIM, in part, is to support our reaching them. The targets are for lower cost, more rapid delivery, fewer greenhouse emissions, and a better trade balance for construction products. The graph below shows the design community's assessment of BIM's ability to help meet those targets.

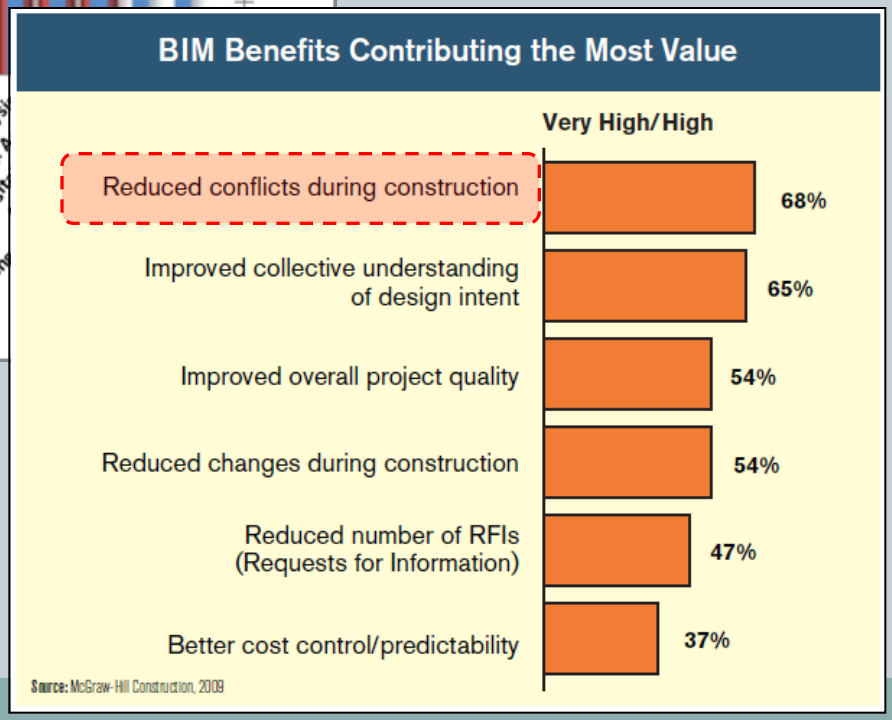
Very few think that BIM will stand in the way of our meeting these targets. Seventy percent see that BIM will help bring cost reduction in the design build and maintain life cycle. Sixty percent see that BIM will help bring time efficiencies, reducing time from inception to completion. Less pronounced is BIM's ability to reduce greenhouse gas emissions (44% agree that it will help), or improve the trade gap in construction products (32% agree).

Please tell us the role you think BIM will have in our achieving the following...



Faedah BIM





Sumber: Mcgraw Hill, 2009

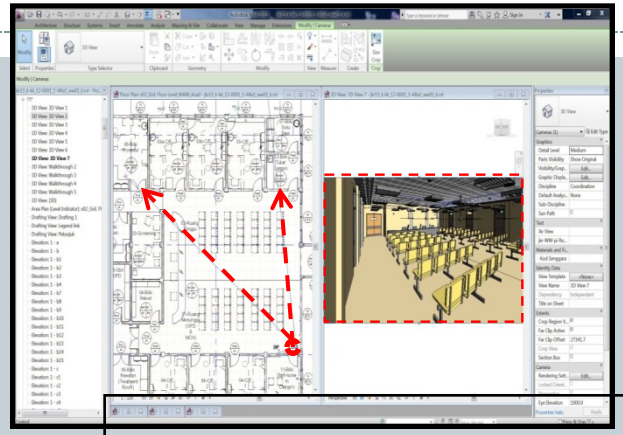
MANAFAAT BIM

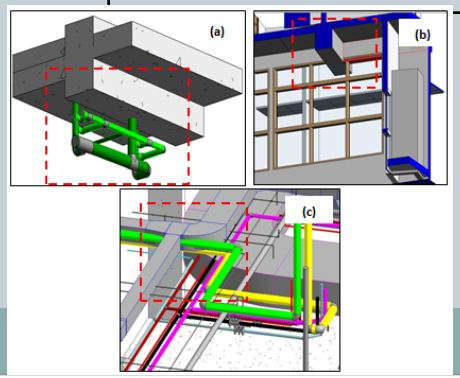
Secara khususnya, penggunaan model BIM dalam projek JKR ini dapat membantu :

- melaksana proses kajian rekabentuk

- memberi visualisasi 3D kepada pelanggan dan pasukan projek

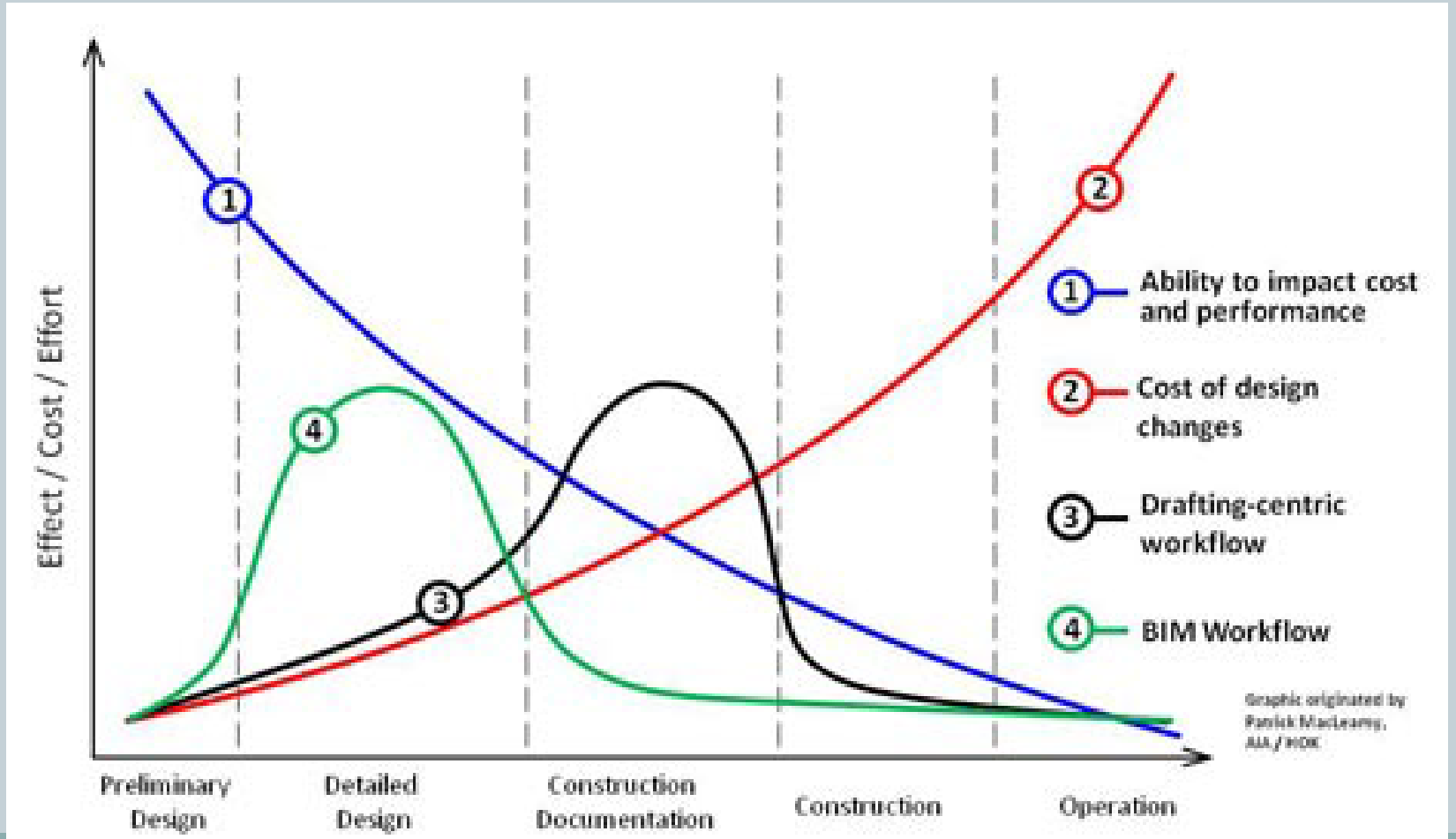
- mengurangkan konflik pertembungan semasa di tapak





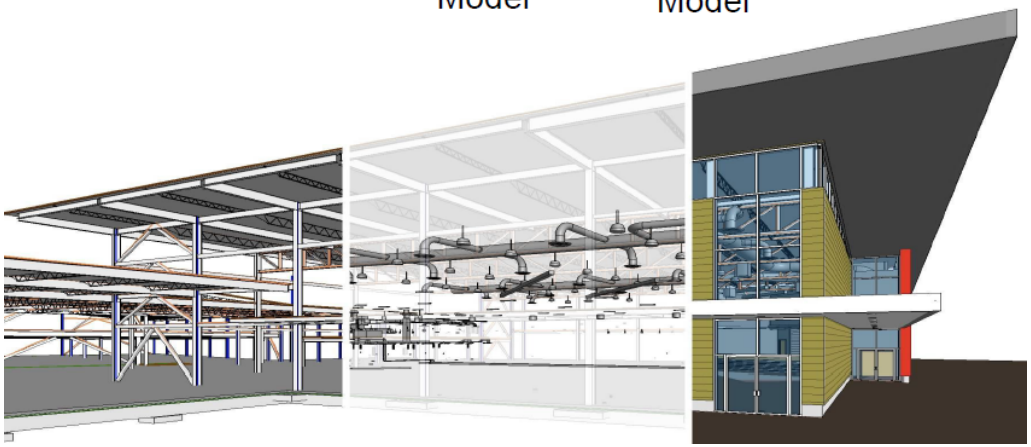
Graph of Effect/Cost/Effort vs Project Phase

- BIM vs Traditional Approach



BIM di dalam industri automobil

Structural Model ⟷ MEP Model ⟷ Architectural Model

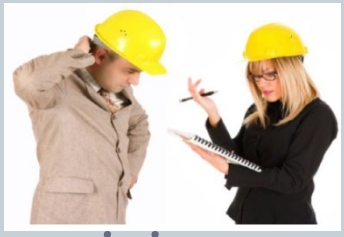


BIM di dalam industri pembinaan

LATAR BELAKANG

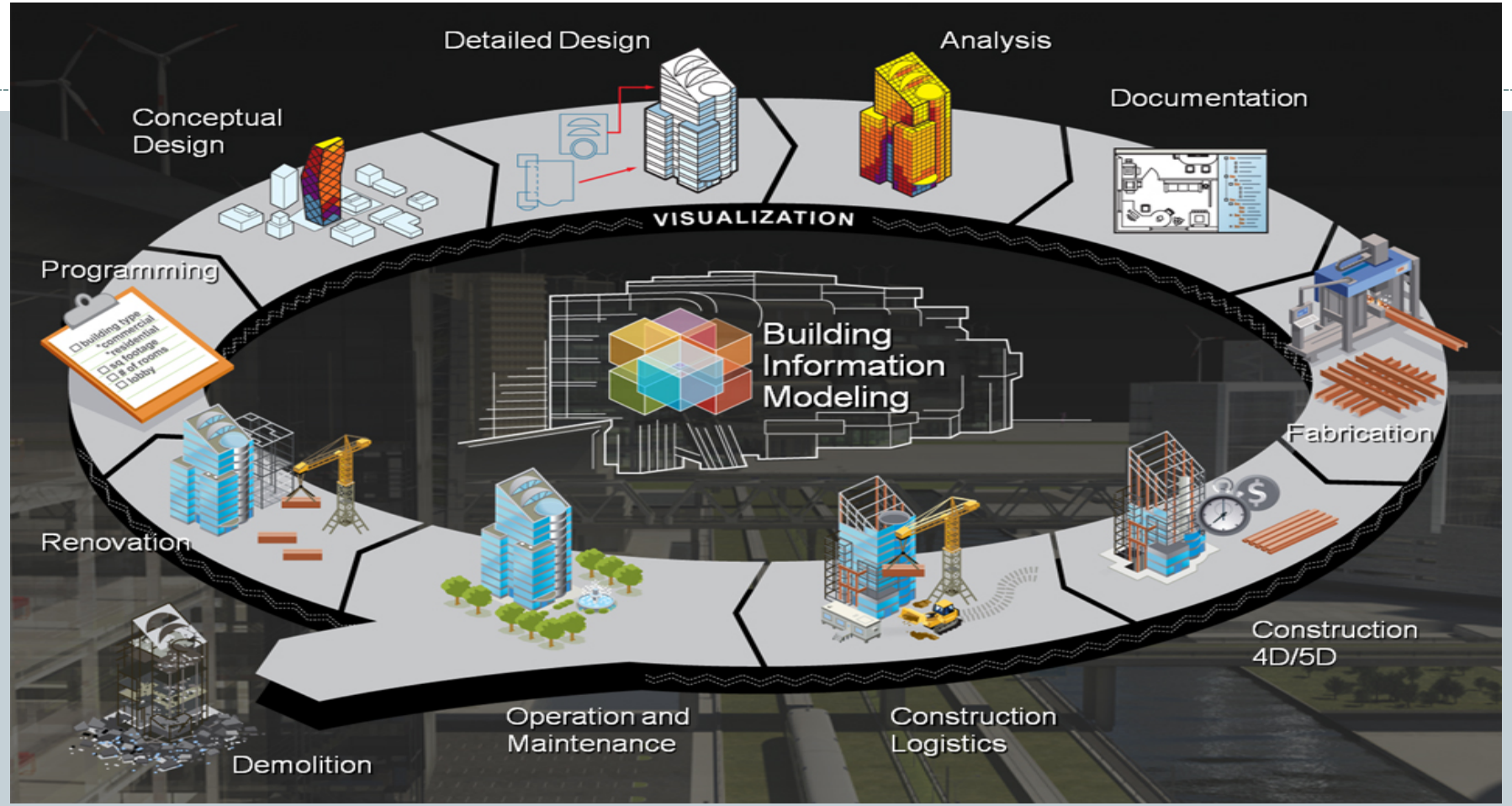
Isu konflik / percanggahan pembinaan yang timbul akibat kelemahan koordinasi dan komunikasi akan mengakibatkan :

- Kelewatan projek
- Peningkatan kos
- Kualiti mutu pembinaan terjejas



Penggunaan **Building Information Modeling (BIM)** dilihat sebagai inovasi terbaru bagi mengurangkan isu konflik / percanggahan pembinaan

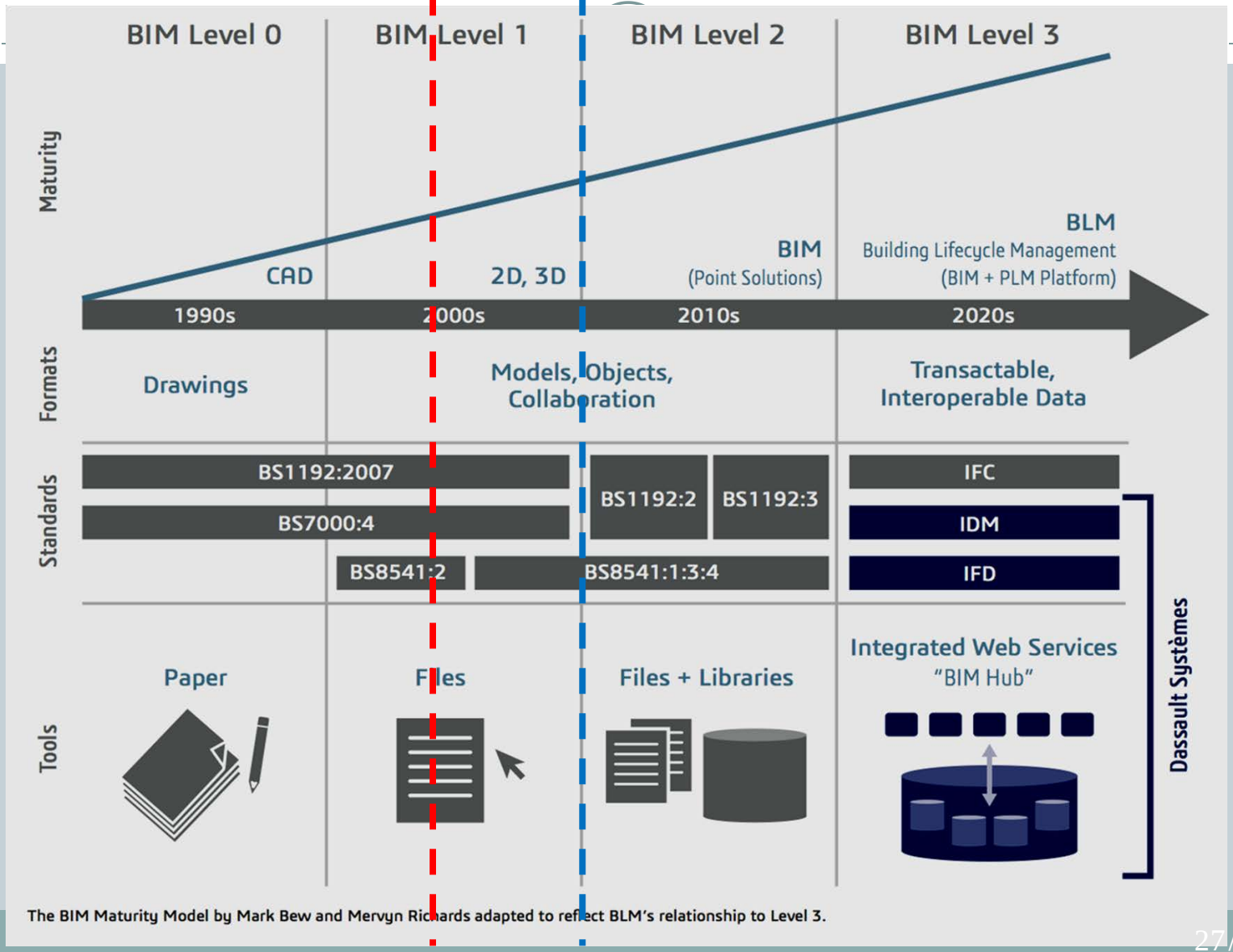
DEFINISI



Building Information Modeling (BIM) merupakan proses penyediaan dan penggunaan model menerusi teknologi digital 3D berparametrik yang mengandungi pelbagai informasi bagi meningkatkan sistem penyampaian di sepanjang kitar hayat pelaksanaan projek

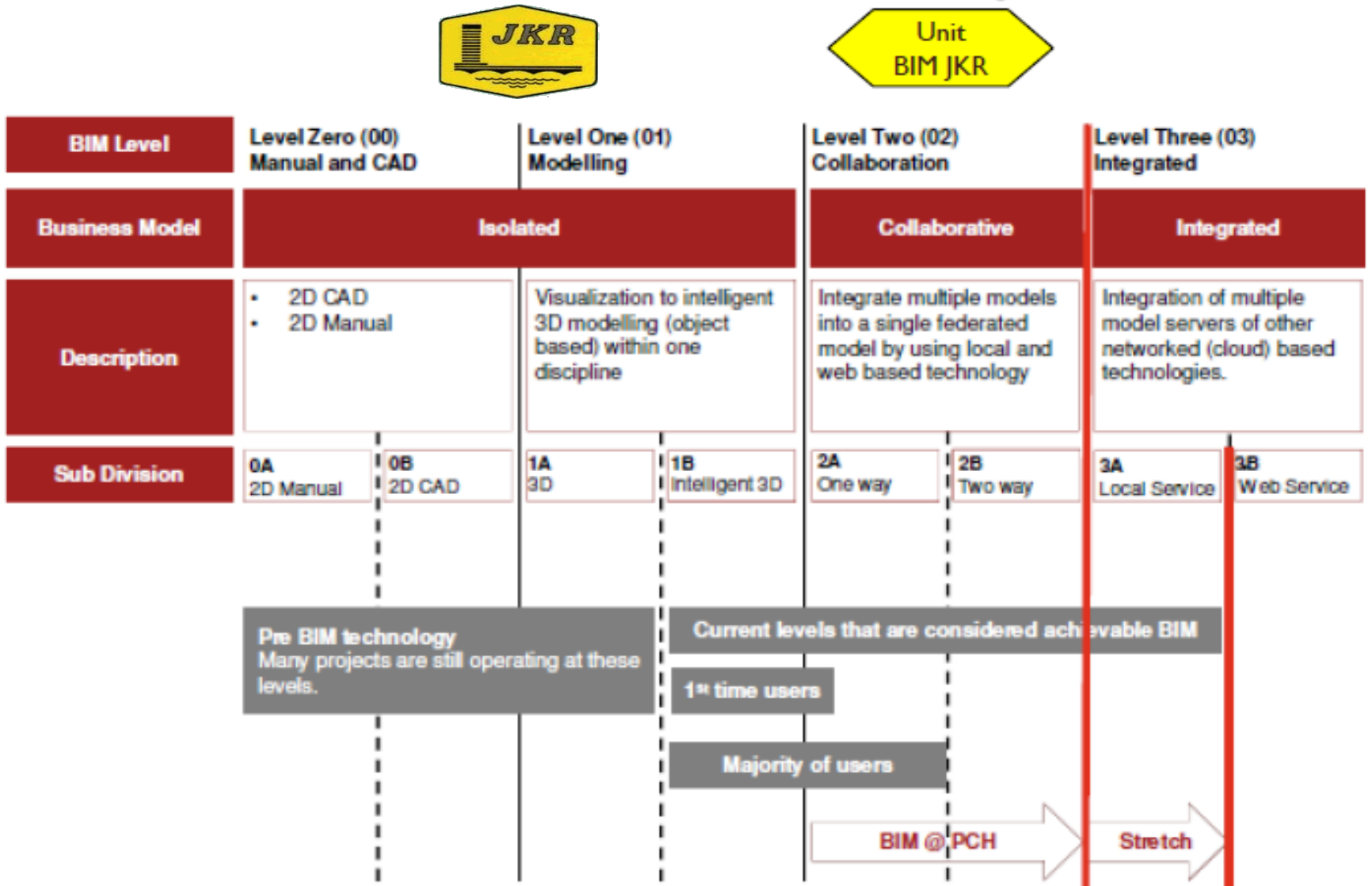
Current Level in Malaysia

2017 UK National Report BIM Level 2



The BIM Maturity Model by Mark Bew and Mervyn Richards adapted to reflect BLM's relationship to Level 3.

Status BIM di JKR (Maturity Level)



Source: modified from the the Australian Institute for Architects (AIA) and CRC for Construction innovation.

DETAIL ACTIVITIES AND BASELINE SCHEDULE

P4a Facilitate BIM Adoption in Construction Industry via Regulation

FOCUS AREA	No	ACTIVITIES	2016			2017				2018				2019				2020				KPI	CITP	
			Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
Guide	1	Continously Develop National BIM Guide												K1				K2		K3			P4a Facilitate BIM Adoption in Construction Industry via Regulation	TERAS PRODUKTIVITI
	2	Enhancement of KPI for P4 Inisiative												K1				K2		K3				
Policy	3	Develop BIM Procurement Specification												K1				K2		K3		**K1** 40% of Public Project Above RM 100mn Implement BIM Level 2 (Q1 2019)		
	4	Pilot BIM procurement with selected public project												K1				K2		K3				
	5	Publish circulars on BIM Procurement specification changes to Government Procurement Entities (KKR, MOF, JKR)												K1				K2		K3				
Technology & Impl'tion Agency	6	Develop BIM Based building design review and checking system												K1				K2		K3				
	7	Testing BIM Based building design review and checking system for selected 1 PBT + Research Activities to support												K1				K2		K3		**K2** Pilot Project BIM Based Submission System on Selected PBT (DBKL, MBPJ, PJC, IRDA) - (Q1 2020)		
	8	Pilot Project BIM Based Submission System on Selected PBT (DBKL, MBPJ, PJC,IRDA)																K2		K3				
	9	Continous Education & Training for operator at PBT												K1				K2		K3				
Impl'tion Agency	10	Change management for JKR												K1				K2		K3				
	11	Software Customisation for JKR												K1				K2		K3		**K3** 5 Public Projects Implement BIM Level 3 (Q3 2020)		
	12	Tools and Plug in for JKR												K1				K2		K3				
Industrial/ Organisation	13	BIM Transformation Initiative for Consultant												K1				K2		K3				
	14	BIM Transformation Initiative for Contractor												K1				K2		K3				

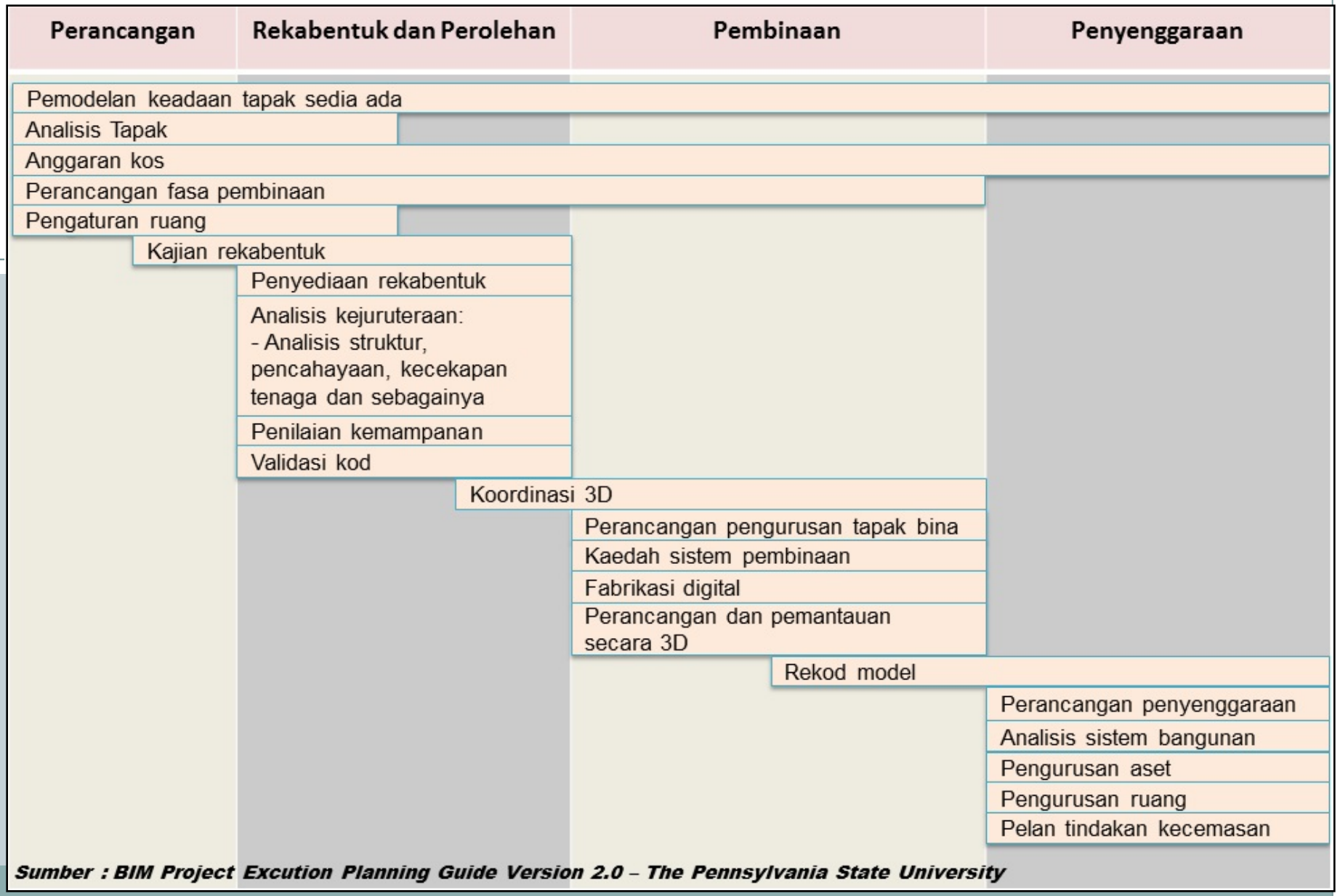
P4b Establish Reference Centre to Support Development and Adoption of BIM and Modern Methods

FOCUS AREA	No	ACTIVITIES	2016			2017				2018				2019				2020				KPI
			Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Certificate and Training	15	Development of BIM Module											K4									**K4** 1000 BIM Personnel Trained & Certified
	16	Launch BIM Accreditation Cert Program											K4									
BIM Transf'tion Agent (CIDB) & Technology	17	**Establish MyBIM Center (Q2 2016)**	K5																			**K5** Establish MyBIM Center (Q2 2016)
	18	Develop Cloud Based Server																				
	19	Cloud Based Business Model																				
	20	Development of BIM based meeting room																				
	21	Support/Fasilitate Industrial (Training, BIM Facilities, Research and																				
Supporting BIM Transf'tion Agent	22	**4 Satellite Center to Support MyBIM Center**																				
	23	Establish BIM Academia Committee																				
	24	Guide and Spec for Support Center																				
	25	Train the trainer program and fund																				
	26	Fund for Pysical Development																				
	27	Fund for Research and Delivery																				
Technology	28	Continously develop and publish standard BIM Design Library-Hospital-Medical Library				K6																**K6** BIM Object Library (Q1 2017)
	29	Continously develop online reference center for learning and library resource-General Libraries							K7													**K7** Online BIM Reference Center

CITP: P4B Establish Reference Centre to Support Development & Adoption of BIM &Modern Methods; P4 Roll out technology advantage across project life-cycle

TERAS PRODUKTIVITI

KEGUNAAN BIM



Sumber : BIM Project Excution Planning Guide Version 2.0 – The Pennsylvania State University

PERANAN PERUNDING (BEP)

- MENYEDIAKAN REKABENTUK DALAM BIM
- MELAKSANAKAN CLASH ANALYSIS SEBELUM TENDER
- MENYEDIAKAN TENDER DOKUMEN MELALUI PERISIAN BIM (JKR – SOFTWARE REVIT) DAN IKUT FORMAT JKR(LOD 300)
- SEMAK WORKING DRAWING DALAM BIM (LOD 400)
- AS BUILT DRAWING DALAM BIM(LOD 500)
- ASET INVENTORI DARI KOMPONEN BIM

PERLAKSANAAN PROJEK BIM

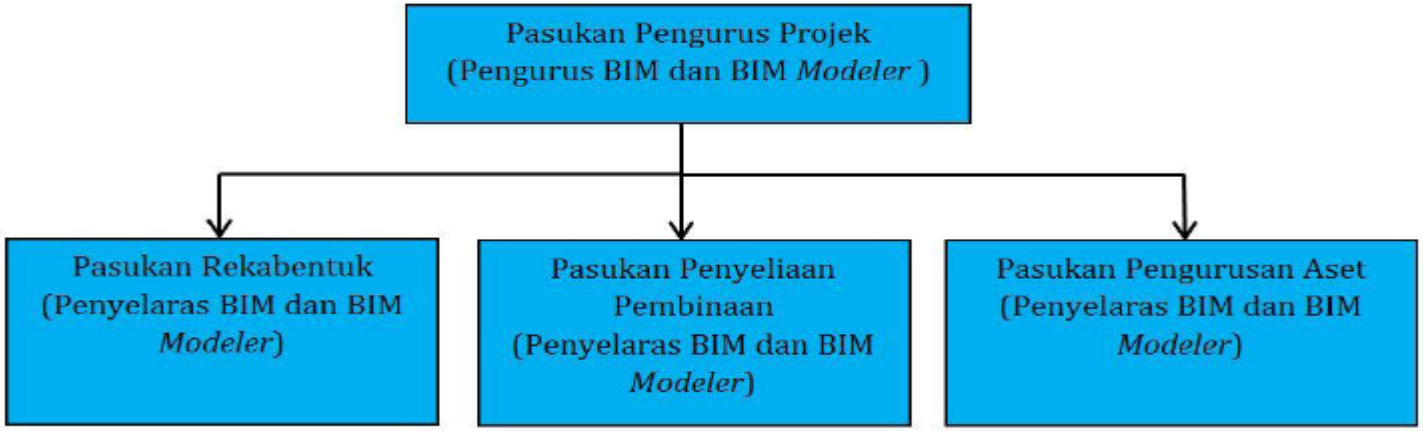
- PROJEK KK4

  REKABENTUK DALAM TEMPOH 3 BULAN

  DILAKSANAKAN SECARA REAL TIME

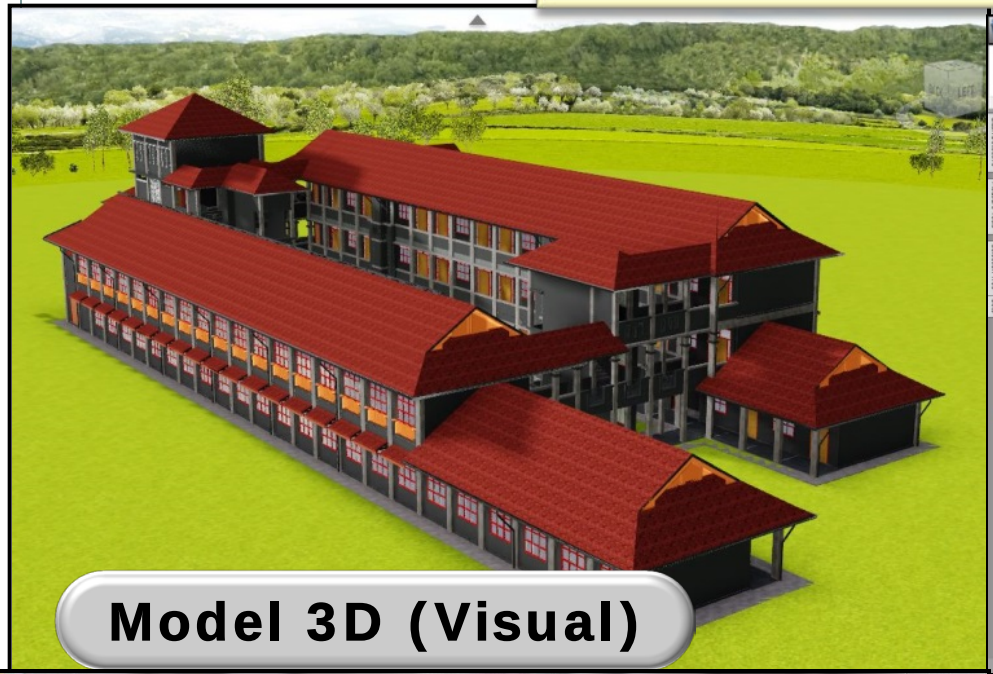
Carta Organisasi

Secara idealnya, carta organisasi pasukan projek ditunjukkan di dalam Rajah 3.1.

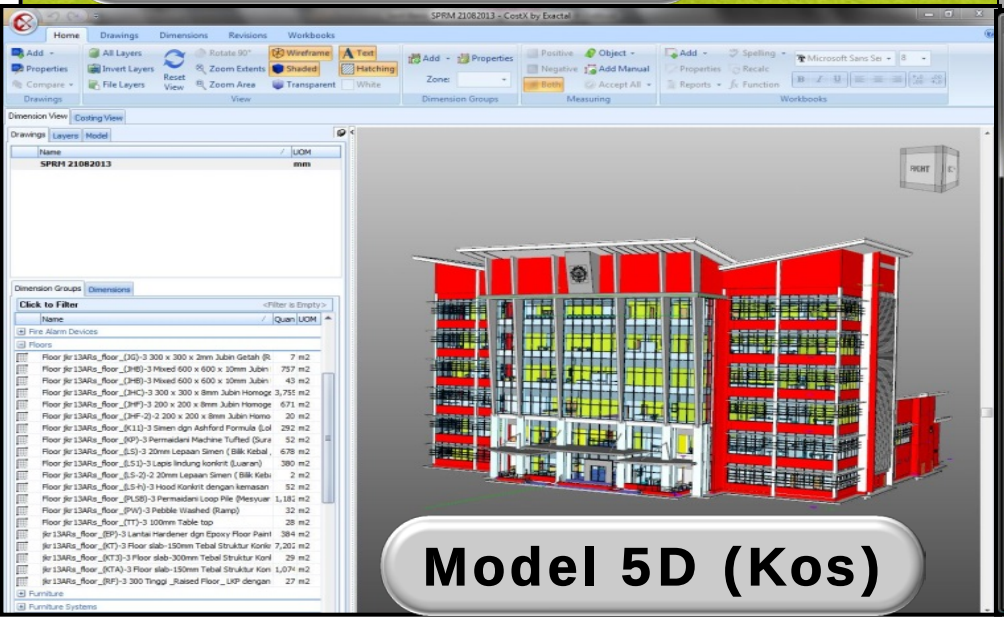


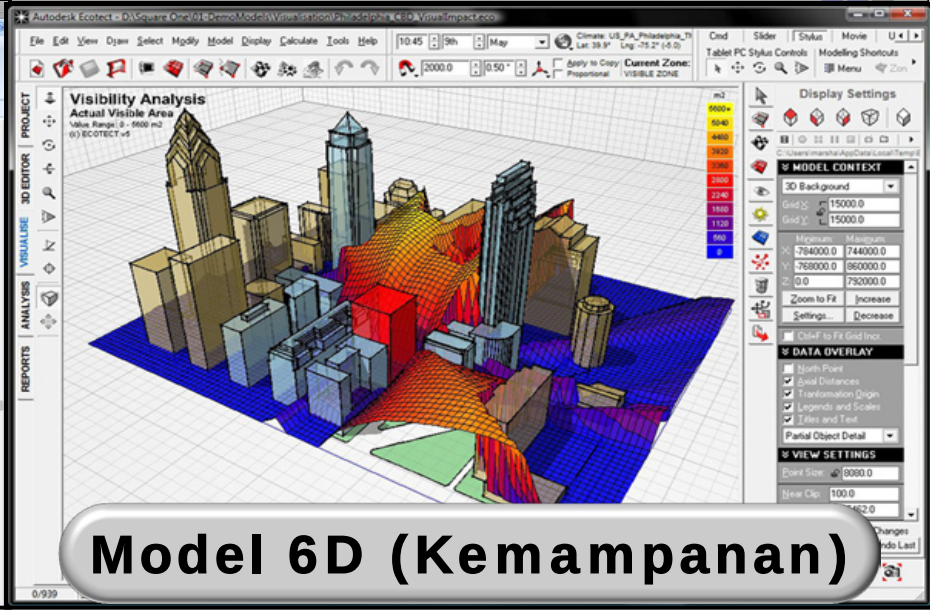
Rajah 3.1 : Carta organisasi pasukan projek

Model BIM

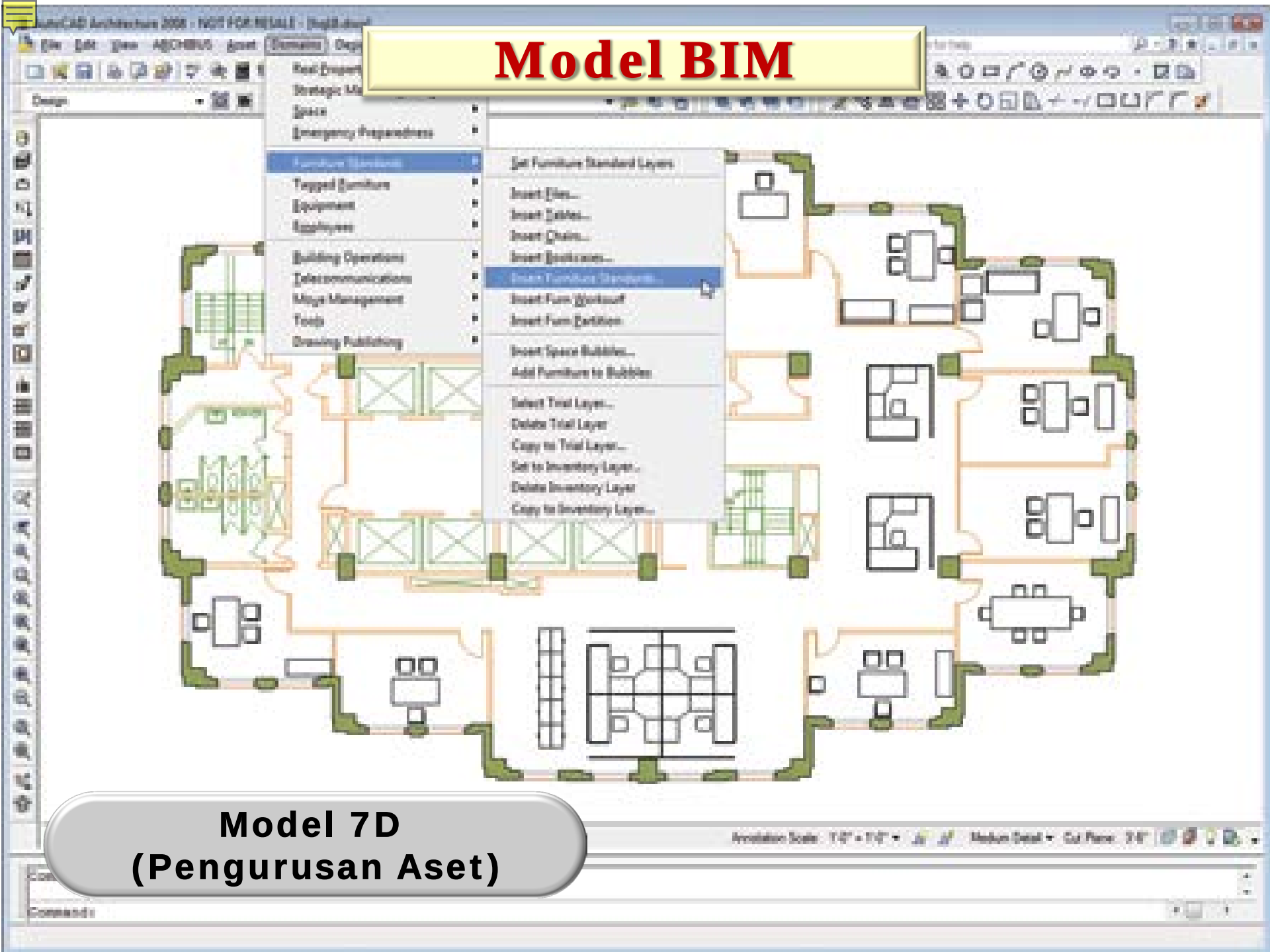

Model 3D (Visual)


Model 4D (Masa)
Monday 1:26:15 PM 12/1/2014 Day=407 Week=59


Model 5D (Kos)

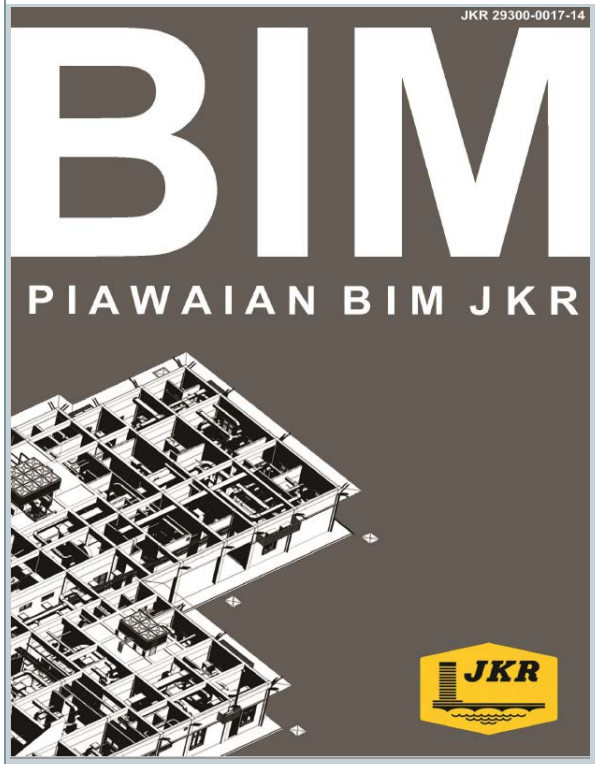

Model 6D (Kemampanan)
Visibility Analysis
Actual Visible Area

Model BIM



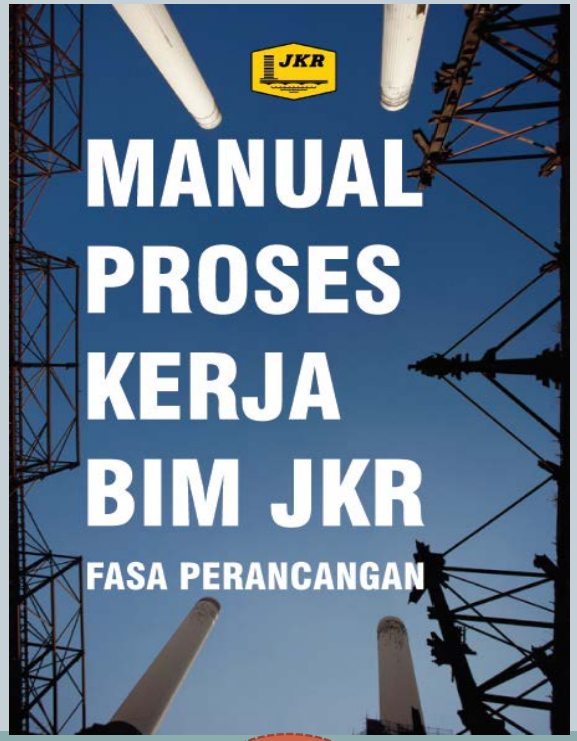
Model 7D
(Pengurusan Aset)

RUJUKAN BIM (BUKU TERBITAN JKR)



1

2

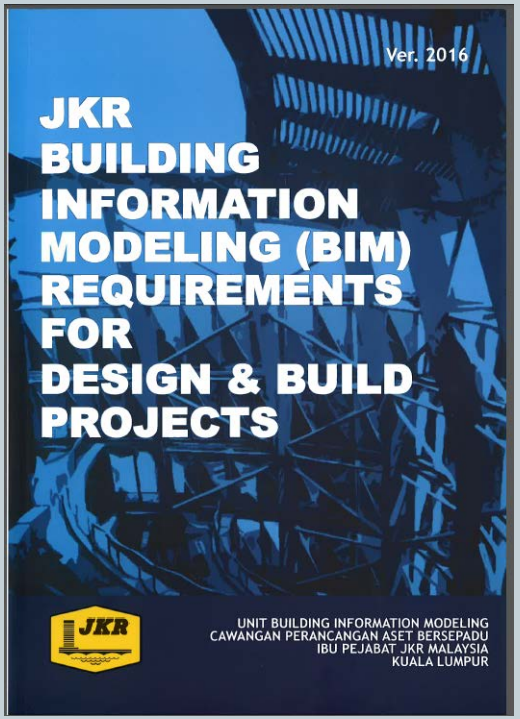


3

RUJUKAN BIM (BUKU TERBITAN JKR)

4

5



6

BIM NEED STATEMENT

BUILDING INFORMATION MODELING (BIM) REQUIREMENTS

FOR

(TITLE OF PROJECT)

Ketua Pengarah Kerja Raya
Ibu Pejabat JKR Malaysia
Jalan Sultan Salahuddin
50582 Kuala Lumpur

TABLE OF CONTENTS

3.2.4.4 Mechanical Systems Model

The Contractor shall model the following mechanical elements as per described in **Mechanical Need Statement** to a level that defines the design intent and accurately represents the detailed design solution. Mechanical elements are to be modelled for coordination within electrical discipline and interdisciplinary.

The Contractor shall carry out coordination work with relevant parties in accordance with good engineering practice. These elements shall include (where applicable) but not limited to:

- Air Conditioning and Mechanical Ventilation Systems
- Lifts, Dumbwaiters and Escalators System
- Medical Gases Pipeline Systems
- Fire Protection Systems
- Sterilizers and Associated Equipment
- Boilers, Calorifiers And Steam/Hot Water Reticulation System
- Building Supervisory System
- Pneumatic Tube System
- Cold And Hot Room And Associated Equipment
- Laboratory Equipment
- Dental Chair System
- Mortuary System
- Kitchen Equipment
- Liquid Petroleum Gas/Natural Gas
- Internal Cold Water Plumbing
- Internal Sanitary and Waste Water System
- Other mechanical equipment/system
- Conduit and trunking to be modelled for coordination with others (if applicable)
- Generated layout all mechanical system

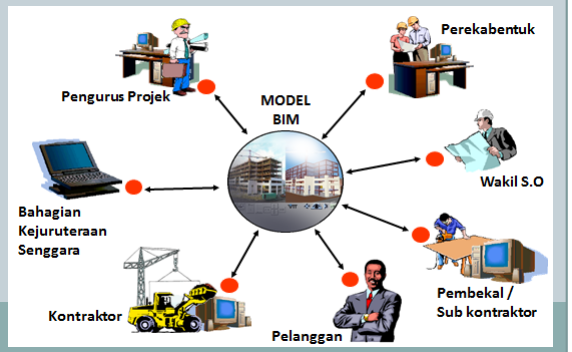
All components shall be modelled to the actual outside face dimension. Any components smaller than 15mm in size or diameter

Cabaran Pelaksanaan BIM di JKR

- Teknologi
  - Keupayaan rangkaian ICT
  - Lokasi dan ruang penyimpanan data
  - Kos perisian dan perkakasan yang sesuai

- Sumber manusia
  - Kompetensi
  - Perubahan mentaliti
  - Skop kerja

- Proses
  - Koordinasi projek secara berintegrasi perlu dilaksanakan di peringkat awal
  - Kolaborasi model BIM (Perkongsian, pertukaran dan pemindahan data)



BIM di JKR – Projek BIM

Institut Kanser Negara, Putrajaya

BIM Objectives:

- *Facilitate Design Review Process*
- *Manage client's expectation through visualization*
- *Minimize conflicts & re-work at construction site*
- *Verify Work Programme submitted via 4D Simulation*

Projek Perintis SMK Meru Raya, Ipoh

BIM Objectives:

- *Facilitate Design Review Process*
- *Manage client's expectation through visualization*

BIM di JKR – Projek BIM

Projek Perintis Klinik Kesihatan Maran, Pahang

BIM Objectives:

- *Facilitate Design Review Process*
- *Manage client's expectation through visualization*
- *Minimize conflicts & re-work at construction site*
- *Verify Work Programme submitted via 4D Simulation*

Projek Perintis SPRM Selangor

BIM Objectives:

- *Facilitate Design Review Process*
- *Manage client's expectation through visualization*
- *Minimize conflicts & re-work at construction site*
- *Verify Work Programme submitted via 4D Simulation*
- *Facilitate facility record capturing for FM system use*

BIM di JKR – Projek BIM

Projek RP3-RMK 10 - Kolej MARA Banting

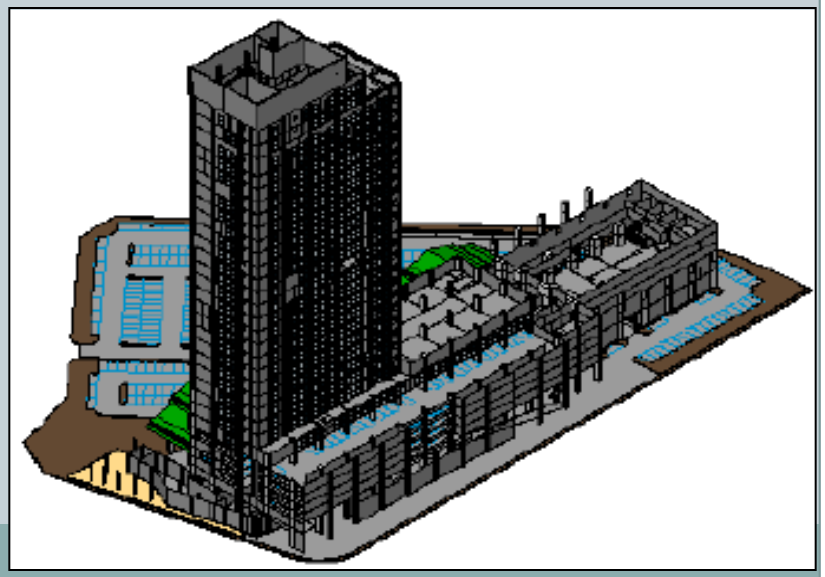
BIM Objectives:

- *Facilitate Design Review Process*
- *Manage client's expectation through visualization*
- *Minimize conflicts & re-work at construction site*

Bangunan Pentadbiran Majlis Bandaraya Kuala Terengganu

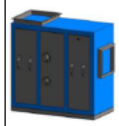
BIM Objectives:

- *Facilitate Design Review Process*
- *Manage client's expectation through visualization*
- *Minimize conflicts & re-work at construction site*
- *Verify Work Programme submitted via 4D Simulation*
- *Facilitate facility record capturing for FM system use*



FAMILY BIM MEKANIKAL

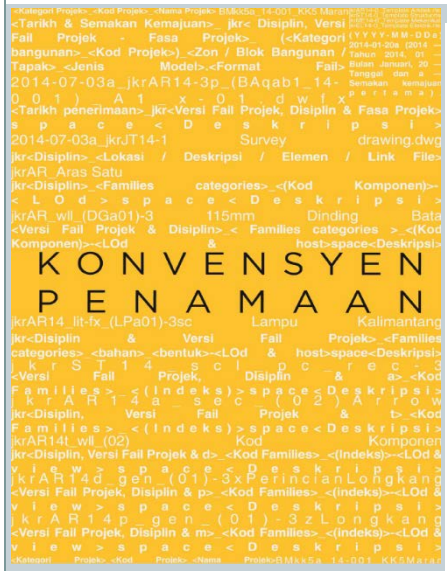
Jadual 5.7 : Contoh ***Family*** mekanikal

		Family						
								
		Fasa	Konsep	Awalan	Terperinci	Pembinaan	Siap Bina	Operasi & Senggaraan
		LOD	100	200	300	400	500	500
Dimension	*Width*		-	940mm	940mm	940mm	940mm	940mm
	Length		-	2000mm	2000mm	2000mm	2000mm	2000mm
	Height		-	1800mm	1800mm	1800mm	1800mm	1800mm
Electrical Loads	*Phase*		-	-	3Ø	3Ø	3Ø	3Ø
	Frequency		-	-	50Hz	50Hz	50Hz	50Hz
	Voltage (V)		-	-	415	415	415	415
Identity data	*Manufacturer*		-	-	-	A Sdn Bhd	A Sdn Bhd	X Sdn Bhd
	Model		-	-	-	K5DS 440B	K5DS 440B	K5DS 440B
	Capacity		-	-	200,000 Btu/h	200,000 Btu/h	200,000 Btu/h	200,000 Btu/h
	Weight		-	-	300 kg	300 kg	300 kg	300 kg
	Cost		-	-	-	RM 150,000	RM 150,000	RM 150,000
	Installation date		-	-	-	12.03.2014	12.03.2014	03.12.2030

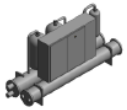
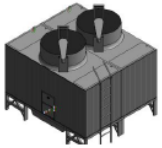
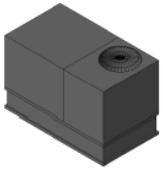
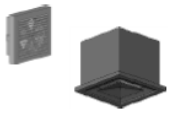
Jadual 5.4 : Hubungkait di antara LOD dan LOd

Level of Development	***Level of Detail***
LOD 100	Elemen ***Family*** hanya mempunyai rupabentuk konsep tanpa sebarang ***Parameter*** atau geometri.
LOD 200	Elemen ***Family*** mempunyai rupabentuk asas dan mengandungi ***Parameter*** geometri seperti maklumat anggaran dimensi (contoh: panjang, lebar dan/atau tebal).
LOD 300	Elemen ***Family*** mempunyai rupabentuk terperinci dan mengandungi ***Parameter*** geometri dan bukan geometri minimum seperti jenis bahan berdasarkan maklumat keperluan rekabentuk dan spesifikasi. (contoh: 900mm x 2100mm pintu panel kayu)
LOD 400	Elemen ***Family*** mempunyai rupabentuk yang mengandungi ***Parameter*** geometri dan bukan geometri berdasarkan maklumat pembinaan dan pemasangan sebenar yang diperlukan di tapak. (contoh: maklumat bingkai pintu, *ironmongery* dan nama pembekal)
LOD 500	Elemen ***Family*** mempunyai rupabentuk yang mengandungi ***Parameter*** geometri dan bukan geometri berdasarkan maklumat pembinaan dan pemasangan akhir di tapak. (contoh: rekod pengujian dan pentauliahan)
	Elemen ***Family*** mempunyai rupabentuk yang mengandungi beberapa ***Parameter*** geometri dan bukan geometri yang dikemaskini seperti maklumat rekod penyenggaraan aset. (contoh: tarikh penyenggaraan dan pengubahsuaian)

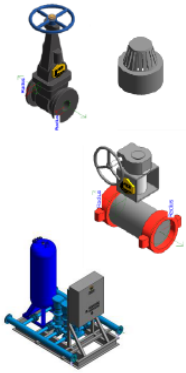
KONVENSYEN PENAMAAN



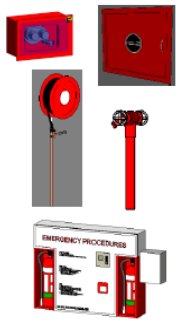
Jadual 5.11 : Contoh ***Family*** mekanikal (ACMV)

Categories	*Element*	*Image*
ACMV Equipment	*Air Handling unit*	
	Chiller unit	
	Variable refrigerant unit	
	Fan Coil unit	
	Cooling Tower	
	Split-type indoor and outdoor air conditioning units	
	Exhaust or extract air fans	
	Fresh air fans	
	Other fans such as jet fans	
	Heat Exchanges for projects with District Cooling	
ACMV Distribution	*Exhaust air ducts*	
	Fresh air ducts	
	Supply air ducts	
	Return air ducts	
	Transfer air ducts	
	Diffusers, air-boots, air grilles, air filters, registers	
	Fire dampers, motorized dampers, volume control dampers, CO_2 sensors, CO sensors	
Mechanical Piping	*Chilled water supply pipes including connections, fittings and valves*	
	Chilled water return pipes including connections, fittings and valves	
	Condensate drain pipes including connections, fittings and valves	
Others	*Switch boards, control, panels, control and monitoring modules*	
	Engineering Smoke Extract System (e.g. smoke curtains, ductless fans)	

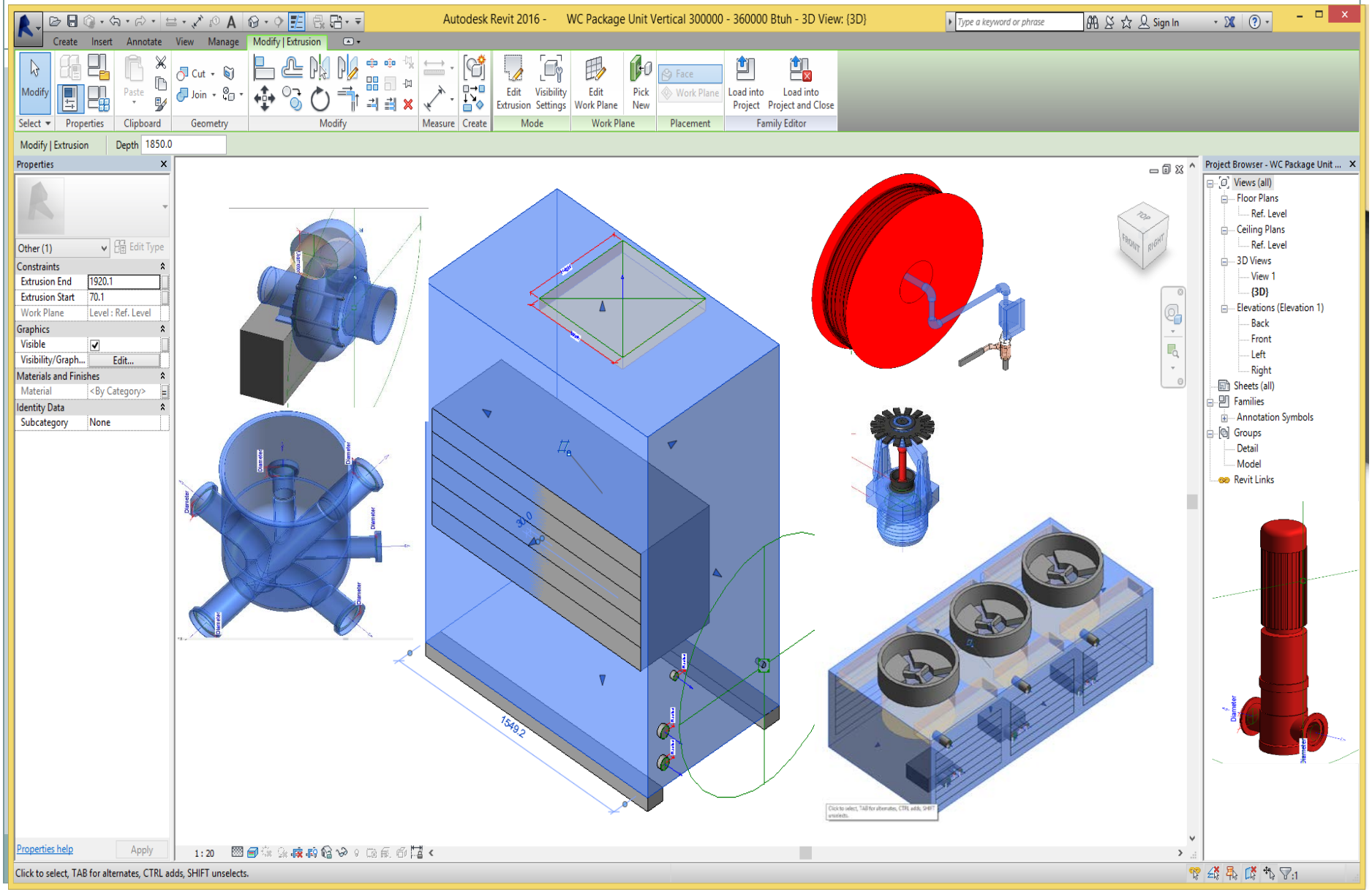
Jadual 5.12 : Contoh ***Family*** mekanikal (Paip dan Sanitari)

Element	*Image*
Pumps	
Control panels, monitoring and control sensors	
Plumbing BIM Elements only	
Internal cold water piping, fittings, valves including hot and cold water pipe work with all plumbing equipment	
Storage, water holding tanks, pressure vessels	
Pool filtration equipment	
Sanitary BIM Elements only	
Foul drainage, kitchen waste pipe work including floor drains, open trapped gullies, sealed trapped gullies and clean outs, vents and manholes	
Grease and sand traps	
Gully trap and inspection chamber	

Jadual 5.13 : Contoh ***Family*** mekanikal (Sistem Pencegah Kebakaran)

Element	*Image*
System piping, droppers, fittings, valves and sprinkler heads, sprinkler inlets, sprinkler control valve set, subsidiary valves, flow switches	
Fire alarm system and break glass unit	
Sprinkler system	
Wet and dry system	
Hose reels system	
Gas piping for suppression systems	
Heat or smoke detectors, control panels, monitoring and control sensors, pump panels, check meter positions	
Fire extinguishers	
Smoke curtains	

CONTOH KOMPONEN BIM

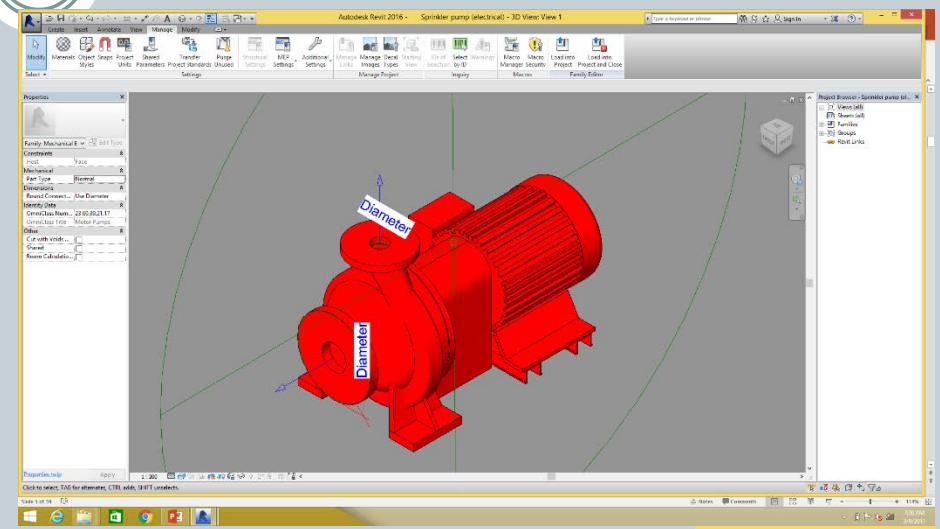


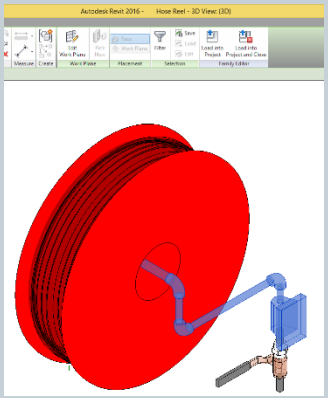
CONTOH PARAMETER KOMPONEN

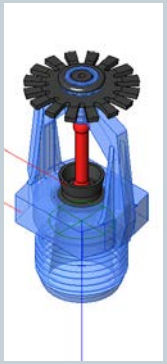
Ver. 2016 Appendix C 4

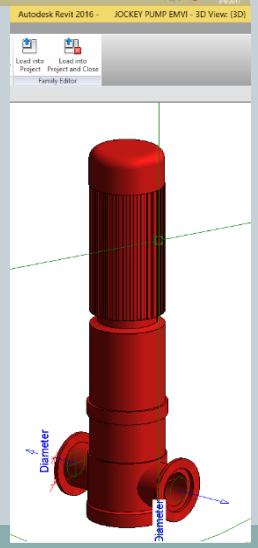
Family Category: **SPRINKLERS**

Category: **Mechanical SPRINKLERS**												
Parameter	**Level of Development**					**Parameter**	**Level of Development**				
Type	**LOD 100**	**LOD 200**	**LOD 300**	**LOD 400**	**LOD 500**	**Instance**	**LOD 100**	**LOD 200**	**LOD 300**	**LOD 400**	**LOD 500**
Mechanical						Identity Data					
Type_Device_jkr_stt			√	√	√	Nota_jkr_six			√	√	√
Power_Rating_jkr_stt			√	√	√	Phasing					
Testing_Commisioning_jkr_stu			√	√	√	Butiran APK_jkr six				√	√
						Tarikh Kelulusan APK_jkr sit				√	√
Sensor_Type_jkr_stt			√	√	√	General					
Coverage _Area_jkr_stt			√	√	√	No Kod DAK Ruang_jkr sit				√	√
Technical_Specification_jkr_stu			√	√	√	Nama Ruang_jkr sit				√	√
						Kod DAK Blok_jkr sit				√	√
Identity Data						Kod DAK Aras_jkr sit				√	√
Model				√	√	Data					
Manufacturer				√	√	No Pesanan Rasmi _jkr sit				√	√
Kod Jenis_jkr_stt				√	√	Tarikh Waranti Tamat_jkr				√	√
Spesifikasi_jkr_stx			√	√	√	Kos Perolehan_jkr sic				√	√
Jenis Kontrak_jkr_stt			√	√	√	Tarikh Tamat DLP_jkr sit				√	√
Kumpulan Peralatan_jkr sti			√	√	√	Alamat Pembekal_jkr sit				√	√
General						Tarikh Dipasang_jkr sit				√	√
Penerangan_jkr_stt			√	√	√	No Tel Kontraktor_jkr sit				√	√
Nota_jkr_stt			√	√	√	No Tel Pembekal_jkr sit				√	√
Lokasi_jkr stt			√	√	√	Alamat Kontraktor_jkr sit				√	√
Panduan Revit_jkr stx			√	√	√	Jangka Hayat_jkr sit				√	√
Panduan Rekabentuk_jkr stx			√	√	√	Pembekal_jkr sit				√	√
Data						Kontraktor_jkr sit				√	√
Sub Sistem_lkr stt			√	√	√	No Tag Label_jkr sit				√	√
Kod DAK Komponen_jkr stt				√	√	No Sijil Pendaftaran_jkr sit				√	√
Sistem_jkr stt			√	√	√	No Siri_jkr sit				√	√
Pengilang_jkr stt				√	√	Kapasiti_jkr sit				√	√
Model_jkr stt				√	√	Bekalan Elektrik_jkr sit				√	√









Conversion Naming

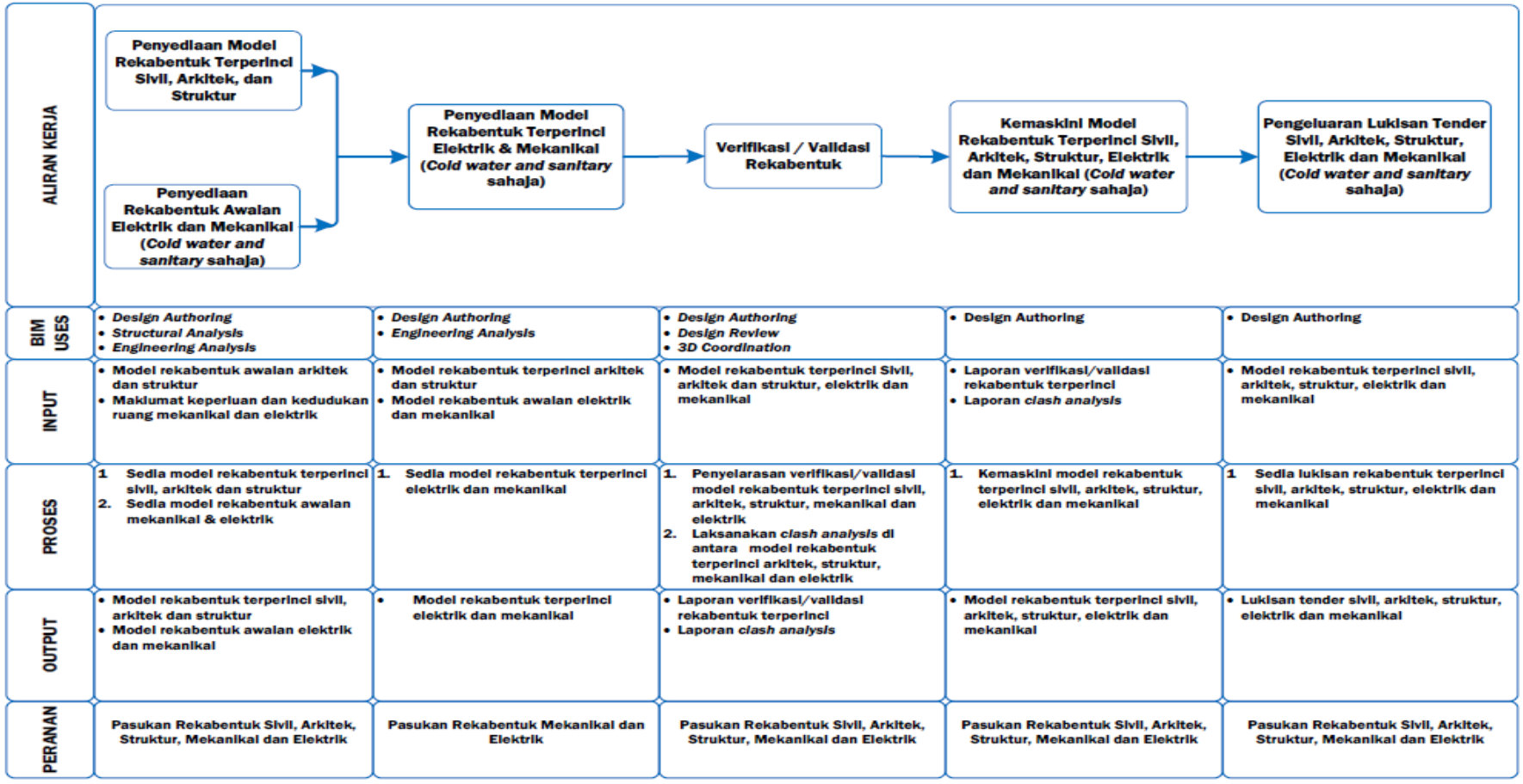
KOMPONEN FAMILY BIM MEKANIKAL

Bil	Kategori	Sumber	Disiplin	Komponen	Nama Fail	rmat F
1	Family	JKR	Mekanikal	Total Flooding Fire Extinguisher System	Nozzle.rfa	.rfa
2	Family	JKR	Mekanikal	Total Flooding Fire Extinguisher System	manual key switch.rfa	.rfa
3	Family	JKR	Mekanikal	Total Flooding Fire Extinguisher System	GRAVITY SHUTTER.rfa	.rfa
4	Family	JKR	Mekanikal	Total Flooding Fire Extinguisher System	flashing light model d-104.rfa	.rfa
5	Family	JKR	Mekanikal	Total Flooding Fire Extinguisher System	CYLINDER PUMP C02.rfa	.rfa
6	Family	JKR	Mekanikal	Total Flooding Fire Extinguisher System	CONTROL PANEL PE-HP2000.rfa	.rfa
7	Family	JKR	Mekanikal	Sprinkler System	Upright_Sprinkler.rfa	.rfa
8	Family	JKR	Mekanikal	Sprinkler System	Sprinkler pump (electrical).rfa	.rfa
9	Family	JKR	Mekanikal	Sprinkler System	pump control panel.rfa	.rfa
10	Family	JKR	Mekanikal	Sprinkler System	Pendent_Sprinkler.rfa	.rfa
11	Family	JKR	Mekanikal	Sprinkler System	PDS_Breeching Inlet(Sprinkler Tank).rfa	.rfa
12	Family	JKR	Mekanikal	Sprinkler System	JOCKEY PUMP EMVI.rfa	.rfa
13	Family	JKR	Mekanikal	Smoke Spill System	Pressurized Fan.rfa	.rfa
14	Family	JKR	Mekanikal	Gauges	temperature gauge.rfa	.rfa
15	Family	JKR	Mekanikal	Gauges	Pressure switch.rfa	.rfa
16	Family	JKR	Mekanikal	Gauges	Pressure Gauge.rfa	.rfa
17	Family	JKR	Mekanikal	Gauges	Flow switch.rfa	.rfa
18	Family	JKR	Mekanikal	Gauges	flow meter.rfa	.rfa
19	Family	JKR	Mekanikal	Fittings	zone isolator valve 4 inci.rfa	.rfa
20	Family	JKR	Mekanikal	Fittings	Y strainer (YS-F) 6 inci.rfa	.rfa
21	Family	JKR	Mekanikal	Fittings	Y strainer (YS-F) 2 inci.rfa	.rfa
22	Family	JKR	Mekanikal	Fittings	Vibration isolator.rfa	.rfa
23	Family	JKR	Mekanikal	Fittings	test valve.rfa	.rfa
24	Family	JKR	Mekanikal	Fittings	Reducer.rfa	.rfa
25	Family	JKR	Mekanikal	Fittings	motorized valve.rfa	.rfa
26	Family	JKR	Mekanikal	Fittings	GATE VALVE.rfa	.rfa
27	Family	JKR	Mekanikal	Fittings	float ball valve.rfa	.rfa
28	Family	JKR	Mekanikal	Fittings	flexible coupling (FJ-S).rfa	.rfa
29	Family	JKR	Mekanikal	Fittings	flexible coupling (FJ-F-01).rfa	.rfa
30	Family	JKR	Mekanikal	Fittings	Check Valve.rfa	.rfa
31	Family	JKR	Mekanikal	Fittings	drain valve.rfa	.rfa
32	Family	JKR	Mekanikal	Fittings	Butterfly Valve (BTV-01) 3 inci.rfa	.rfa
33	Family	JKR	Mekanikal	Fittings	balancing valve.rfa	.rfa
34	Family	JKR	Mekanikal	Fittings	alarm valve.rfa	.rfa
35	Family	JKR	Mekanikal	Fittings	alarm gong.rfa	.rfa
36	Family	JKR	Mekanikal	Fittings	AIR RELEASE VALVE.rfa	.rfa
37	Family	JKR	Mekanikal	Dry riser system	landing valve.rfa	.rfa
38	Family	JKR	Mekanikal	Dry riser system	landing valve.0004.rfa	.rfa
39	Family	JKR	Mekanikal	Dry riser system	landing valve.0003.rfa	.rfa
40	Family	JKR	Mekanikal	Dry riser system	landing valve.0002.rfa	.rfa
41	Family	JKR	Mekanikal	Dry riser system	landing valve.0001.rfa	.rfa
42	Family	JKR	Mekanikal	Cool Water System	submersible pump.rfa	.rfa
43	Family	JKR	Mekanikal	Cool Water System	Neutralization tank.rfa	.rfa
44	Family	JKR	Mekanikal	Lift System	Traction.rfa	.rfa
45	Family	JKR	Mekanikal	Lift System	Stretcher Lift.rfa	.rfa
46	Family	JKR	Mekanikal	Lift System	Hall Indicator.rfa	.rfa
47	Family	JKR	Mekanikal	Lift System	Hall Indicator top floor.rfa	.rfa
48	Family	JKR	Mekanikal	Lift System	Hall Indicator lobby.rfa	.rfa
49	Family	JKR	Mekanikal	Lift System	fireman switch.rfa	.rfa
50	Family	JKR	Mekanikal	Lift System	Counter Weight.rfa	.rfa
51	Family	JKR	Mekanikal	Lift System	Car Lift.rfa	.rfa
52	Family	JKR	Mekanikal	Lift System	Call Button.rfa	.rfa
53	Family	JKR	Mekanikal	Lift System	Call Button top floor.rfa	.rfa
54	Family	JKR	Mekanikal	Lift System	Call Button lobby.rfa	.rfa
55	Family	JKR	Mekanikal	Lift System	BUFFER.rfa	.rfa

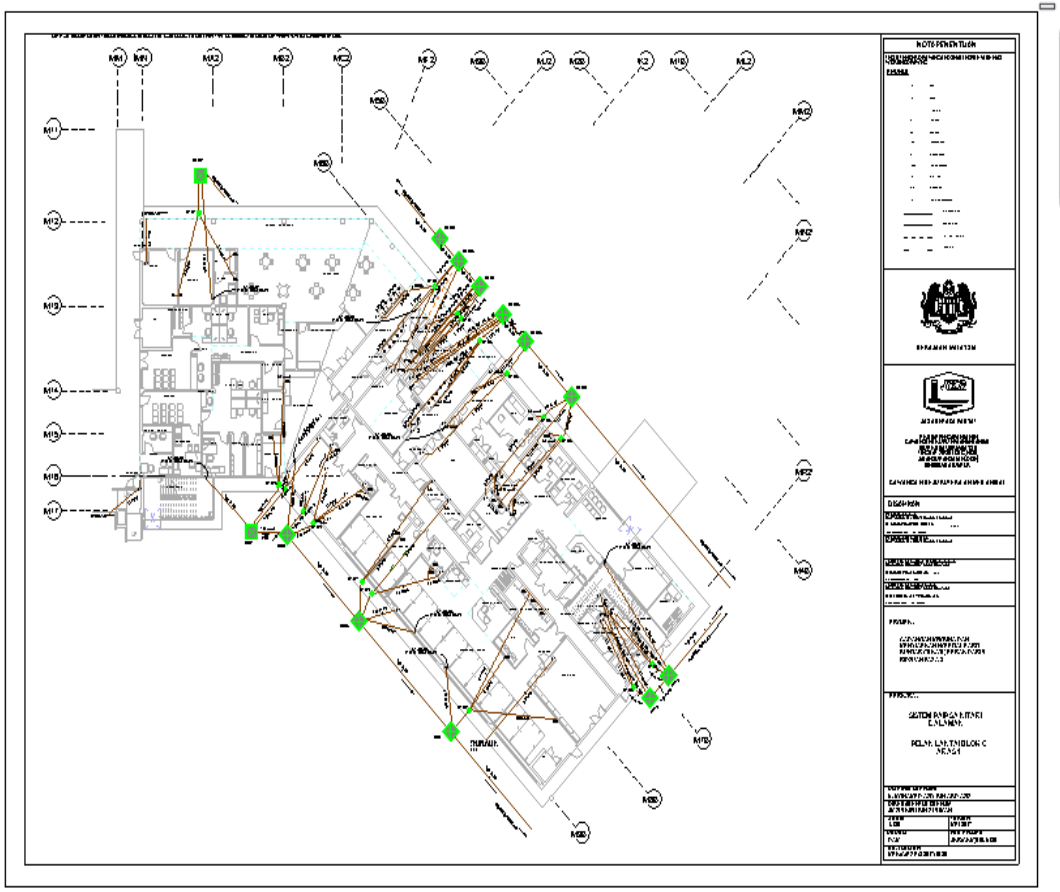
Name	Date modified	Type	Size
jkrME15_me-eqp-3 ACMV-Acsu-Wall Mounted	7/9/2015 3:51 PM	Revit Family	352 KB
jkrME15_me-eqp-3 ACMV-Ahu	7/9/2015 4:08 PM	Revit Family	636 KB
jkrME15_me-eqp-3 ACMV-Ahu-832013	7/9/2015 4:07 PM	Revit Family	736 KB
jkrME15_me-eqp-3 ACMV-Cc	7/9/2015 4:06 PM	Revit Family	652 KB
jkrME15_me-eqp-3 ACMV-Ch-Air cooled chiller	7/9/2015 4:06 PM	Revit Family	420 KB
jkrME15_me-eqp-3 ACMV-Ch-Water Cooled Chiller	7/9/2015 4:05 PM	Revit Family	1,124 KB
jkrME15_me-eqp-3 ACMV-Condensing Unit	7/9/2015 4:03 PM	Revit Family	500 KB
jkrME15_me-eqp-3 ACMV-Control Panel	7/9/2015 4:03 PM	Revit Family	632 KB
jkrME15_me-eqp-3 ACMV-Control Panel-Sheet	7/9/2015 4:02 PM	Revit Family	220 KB
jkrME15_me-eqp-3 ACMV-Cooling Tower Double	7/9/2015 4:02 PM	Revit Family	1,416 KB
jkrME15_me-eqp-3 ACMV-Cooling Tower Single	7/9/2015 4:01 PM	Revit Family	644 KB
jkrME15_me-eqp-3 ACMV-Cu	7/9/2015 4:00 PM	Revit Family	1,152 KB
jkrME15_me-eqp-3 ACMV-Cu-edit-12.3.2014	3/12/2014 10:10 AM	Revit Family	760 KB
jkrME15_me-eqp-3 ACMV-Cu-edit-12.3.2015	7/8/2015 9:30 AM	Revit Family	764 KB
jkrME15_me-eqp-3 ACMV-Cu-edit-12.3.2016	7/9/2015 3:59 PM	Revit Family	1,132 KB
jkrME15_me-eqp-3 ACMV-Cu-edit-12.3	7/9/2015 4:00 PM	Revit Family	768 KB
jkrME15_me-eqp-3 ACMV-Ef01-Wall Mounted 2	7/9/2015 3:58 PM	Revit Family	752 KB
jkrME15_me-eqp-3 ACMV-Fa01-Wall Mounted 2	7/9/2015 3:58 PM	Revit Family	788 KB
jkrME15_me-eqp-3 ACMV-Fcu-Ducted	7/9/2015 3:57 PM	Revit Family	624 KB
jkrME15_me-eqp-3 ACMV-Fresh Air Wall Symbol	7/9/2015 3:57 PM	Revit Family	248 KB
jkrME15_me-eqp-3 ACMV-Remote Control Ac	7/9/2015 3:56 PM	Revit Family	412 KB
jkrME15_me-eqp-3 ACMV-Screw Chiller	7/9/2015 3:55 PM	Revit Family	588 KB
jkrME15_me-eqp-3 ACMV-Wall Mounted Generic	7/9/2015 3:55 PM	Revit Family	300 KB

CARTA ALIR REKABENTUK

Jadual 6.7 : Carta alir fasa rekabentuk terperinci



TENDER DRAWING DALAM BIM



Properties

Sheet

Sheet: Sanitary Aras 1 | Edit Type

Graphics	
Visibility/Graph...	Edit...
Scale	As indicated
Text	
sheet_jkr_pi	Sanitary
Bil Luk jkr_si	MEK/C/PSP/...
Tarikh jkr_si	MEI 2017
Layout Drawin...	PELAN LANT...
No_Fail_jkr_si	JKR(CKM)010...
Skala_jkr_sit	1:125
Identity Data	
Dependency	Independent
Referencing Sh...	
Referencing De...	
Current Revisio...	
Current Revisio...	
Current Revisio...	
Current Revisio...	
Current Revisio...	
Current Revision	
Approved By	Approver
Designed By	JM ZULKIFLI ...
Checked By	Checker
Drawn By	DAIM
Sheet Number	S001
Sheet Name	Sanitary Aras 1
Sheet Issue Date	04/26/17
Appears In She...	☑
Revisions on S...	Edit...

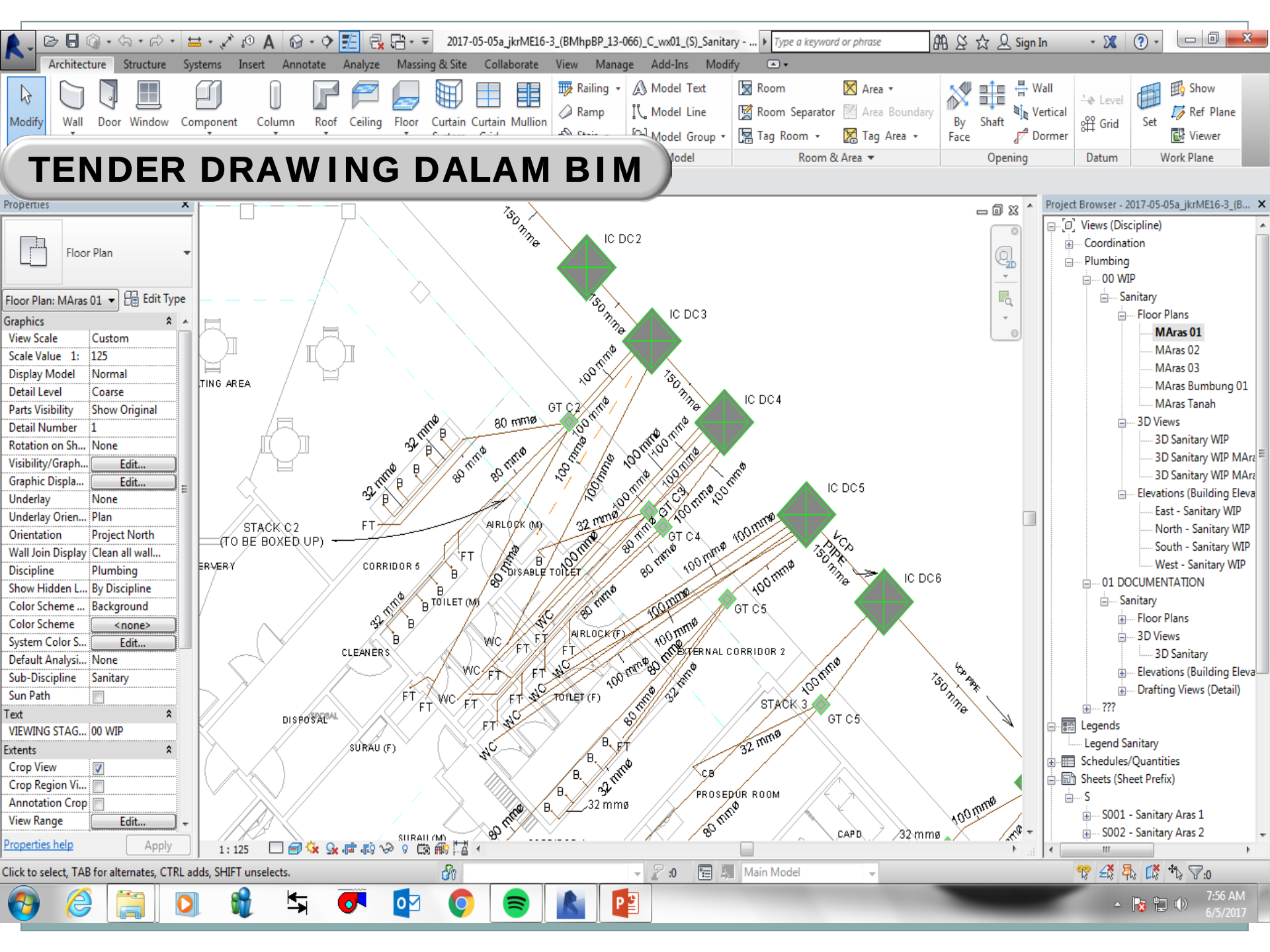
Properties help | Apply

Project Browser - 2017-05-05a_jkrME16-3_(B...

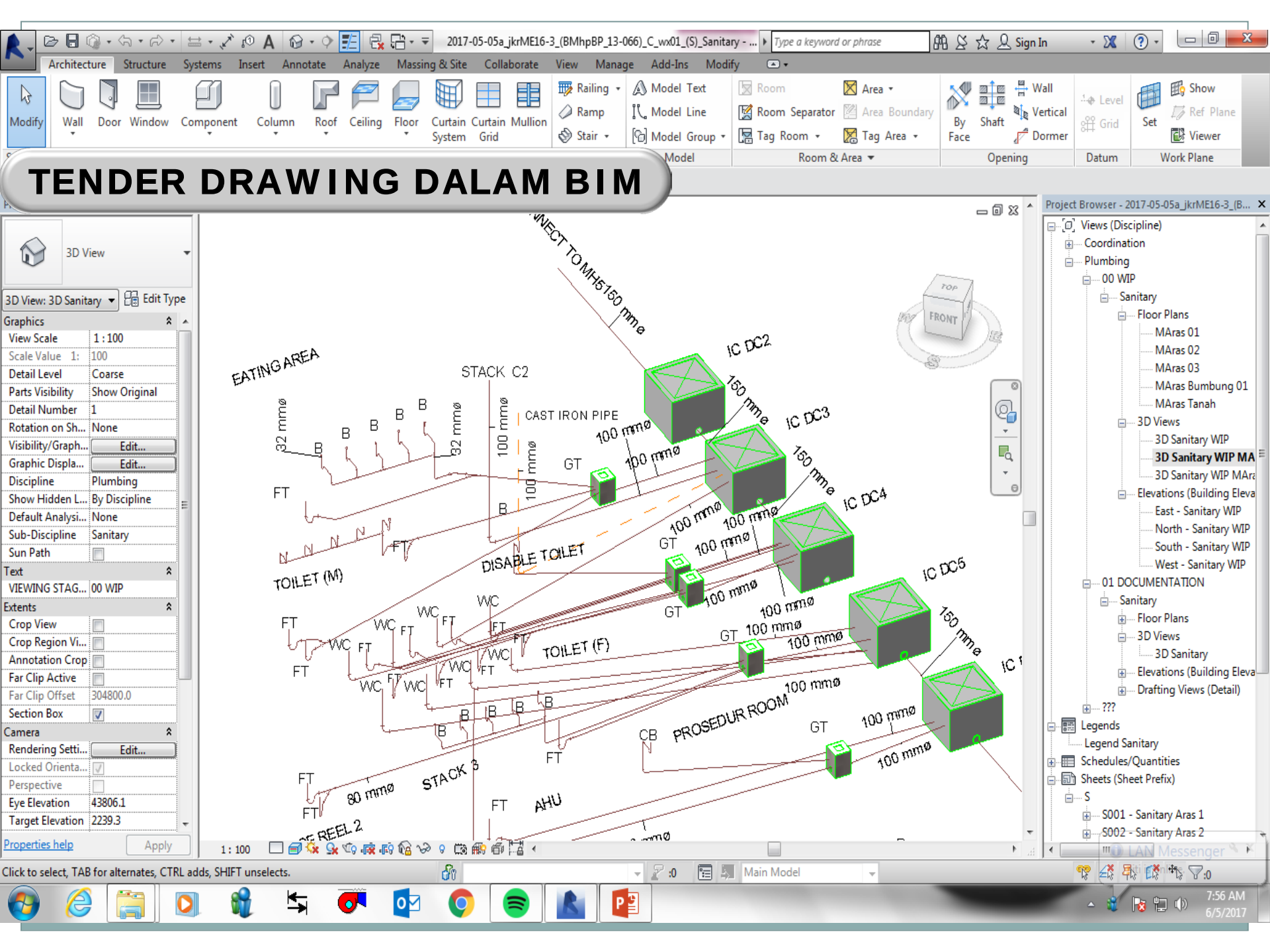
- Views (Discipline)
  - Coordination
  - Plumbing
    - 00 WIP
      - Sanitary
        - Floor Plans
          - MAras 01
          - MAras 02
          - MAras 03
          - MAras Bumbung 01
          - MAras Tanah
        - 3D Views
          - 3D Sanitary WIP
          - 3D Sanitary WIP MAra
          - 3D Sanitary WIP MAra
        - Elevations (Building Eleva
          - East - Sanitary WIP
          - North - Sanitary WIP
          - South - Sanitary WIP
          - West - Sanitary WIP
    - 01 DOCUMENTATION
      - Sanitary
        - Floor Plans
        - 3D Views
          - 3D Sanitary
        - Elevations (Building Eleva
        - Drafting Views (Detail)
    - ???
  - Legends
    - Legend Sanitary
  - Schedules/Quantities
  - Sheets (Sheet Prefix)
    - S
      - **S001 - Sanitary Aras 1**
      - S002 - Sanitary Aras 2

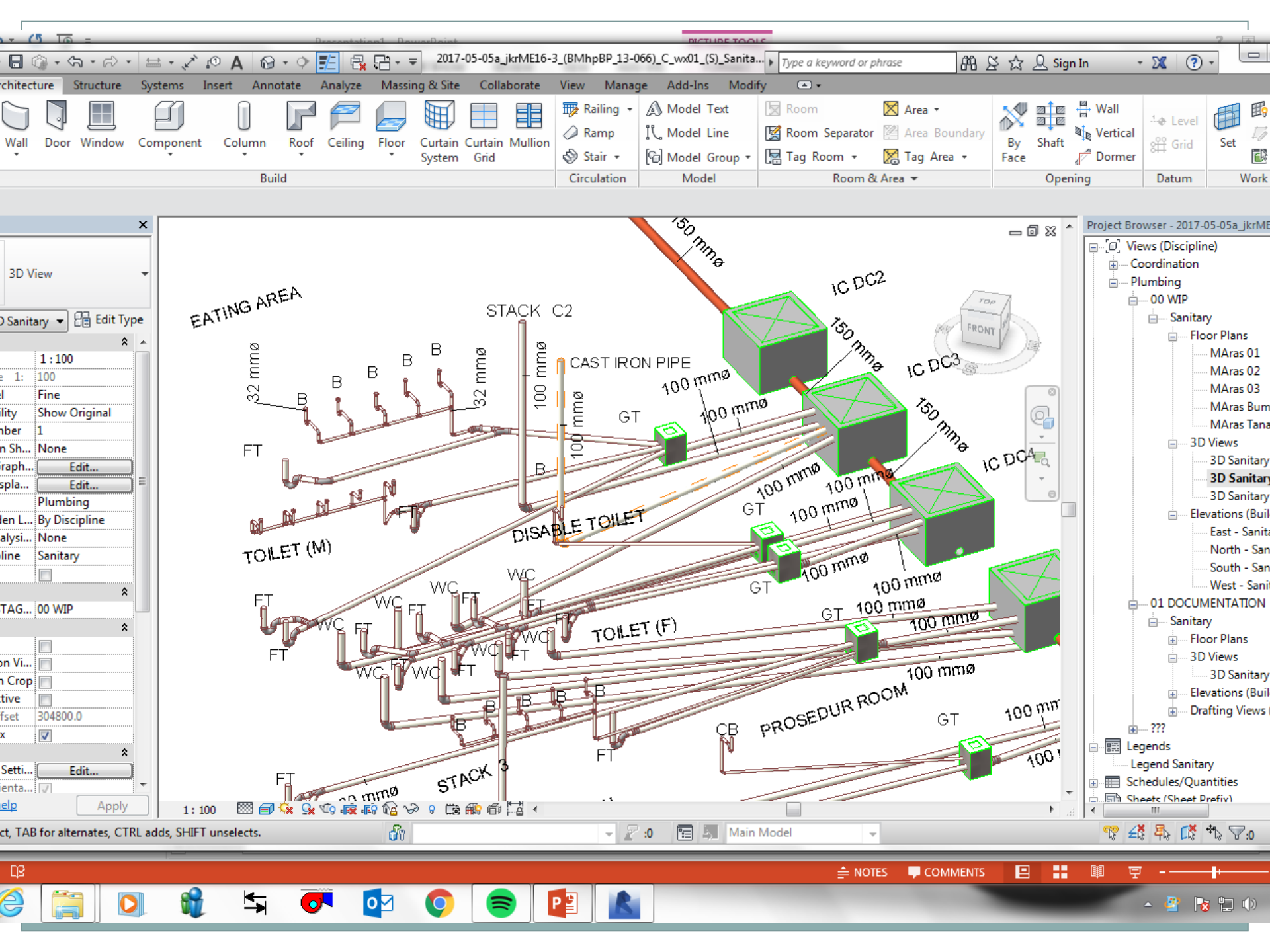
Ready | Main Model | 7:55 AM 6/5/2017

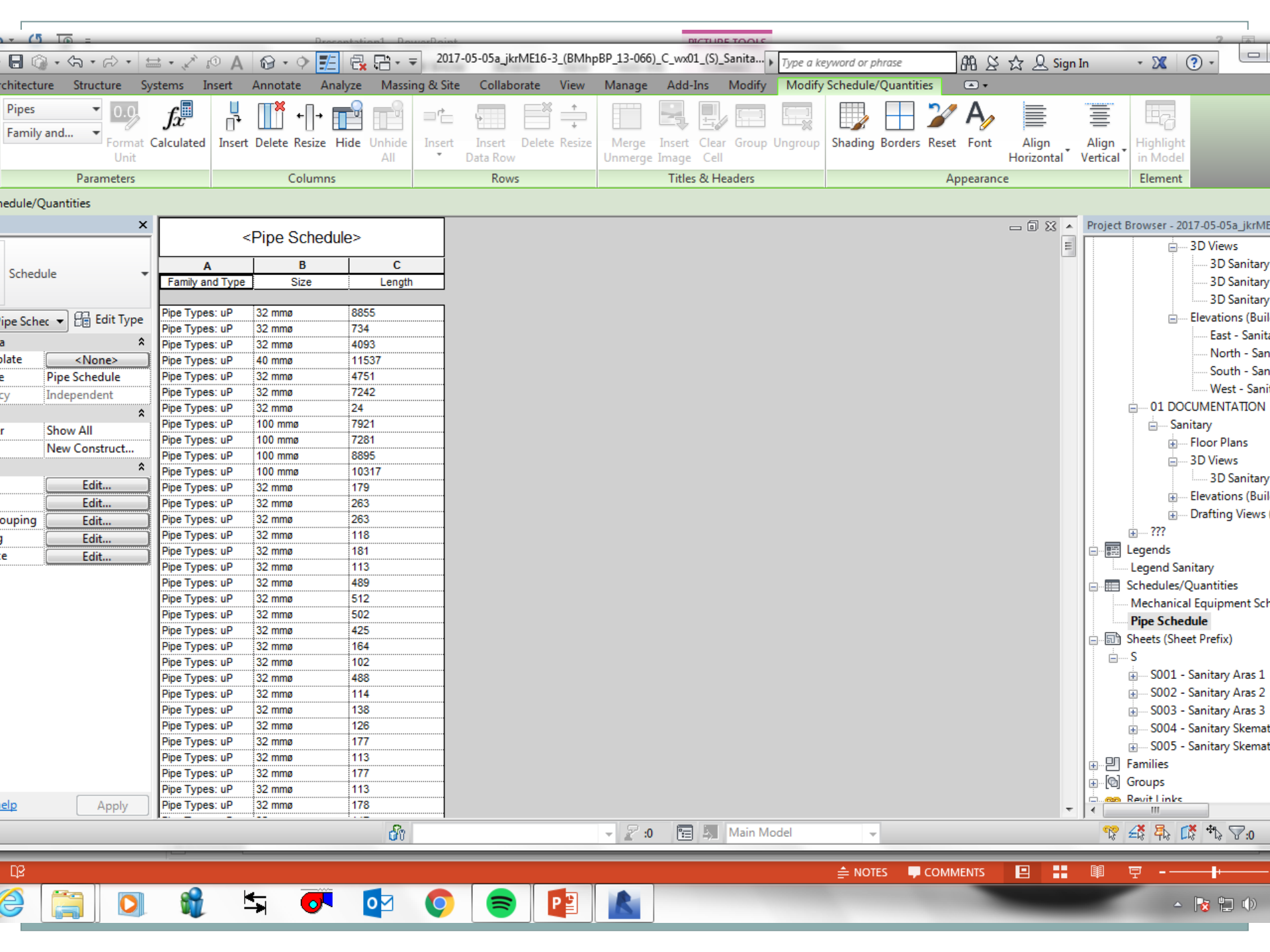
TENDER DRAWING DALAM BIM



TENDER DRAWING DALAM BIM




2017-05-05a_jkrME16-3_(BMhpBP_13-066)_C_wx01_(S)_Sanita...
Type a keyword or phrase
Sign In
Architecture
Structure
Systems
Insert
Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
Modify
Wall
Door
Window
Component
Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
Mullion
Railing
Ramp
Stair
Model Text
Model Line
Model Group
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
By Face
Shaft
Wall
Vertical
Dormer
Level
Grid
Set
Build
Circulation
Model
Room & Area
Opening
Datum
Work
3D View
Edit Type
Project Browser - 2017-05-05a_jkrME
Views (Discipline)
Coordination
Plumbing
00 WIP
Sanitary
Floor Plans
MAras 01
MAras 02
MAras 03
MAras Bum
MAras Tana
3D Views
3D Sanitary
Elevations (Buil
East - Sanita
North - San
South - San
West - Sani
01 DOCUMENTATION
Drafting Views
Legends
Legend Sanitary
Schedules/Quantities
EATING AREA
STACK C2
CAST IRON PIPE
IC DC2
IC DC3
IC DC4
150 mmø
100 mmø
32 mmø
GT
FT
WC
CB
TOILET (M)
DISABLE TOILET
TOILET (F)
PROSEDUR ROOM
STACK 3
1 : 100
Main Model
NOTES
COMMENTS


2017-05-05a_jkrME16-3_(BMhpBP_13-066)_C_wx01_(S)_Sanita...
Type a keyword or phrase
Sign In
Architecture Structure Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify Modify Schedule/Quantities
Pipes
Family and...
Format Unit
Calculated
Insert Delete Resize Hide Unhide All
Parameters
Columns
Insert Insert Data Row Delete Resize
Rows
Merge Unmerge Insert Image Clear Cell Group Ungroup
Titles & Headers
Shading Borders Reset Font Align Horizontal Align Vertical
Appearance
Highlight in Model
Element
Schedule
Edit Type
<None>
Pipe Schedule
Independent
Show All
New Construct...
Edit...
Apply
<Pipe Schedule>
A
B
C
Family and Type
Size
Length
Pipe Types: uP 32 mmø 8855
Pipe Types: uP 32 mmø 734
Pipe Types: uP 32 mmø 4093
Pipe Types: uP 40 mmø 11537
Pipe Types: uP 32 mmø 4751
Pipe Types: uP 32 mmø 7242
Pipe Types: uP 32 mmø 24
Pipe Types: uP 100 mmø 7921
Pipe Types: uP 100 mmø 7281
Pipe Types: uP 100 mmø 8895
Pipe Types: uP 100 mmø 10317
Pipe Types: uP 32 mmø 179
Pipe Types: uP 32 mmø 263
Pipe Types: uP 32 mmø 263
Pipe Types: uP 32 mmø 118
Pipe Types: uP 32 mmø 181
Pipe Types: uP 32 mmø 113
Pipe Types: uP 32 mmø 489
Pipe Types: uP 32 mmø 512
Pipe Types: uP 32 mmø 502
Pipe Types: uP 32 mmø 425
Pipe Types: uP 32 mmø 164
Pipe Types: uP 32 mmø 102
Pipe Types: uP 32 mmø 488
Pipe Types: uP 32 mmø 114
Pipe Types: uP 32 mmø 138
Pipe Types: uP 32 mmø 126
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S002 - Sanitary Aras 2
S003 - Sanitary Aras 3
S004 - Sanitary Skemat
S005 - Sanitary Skemat
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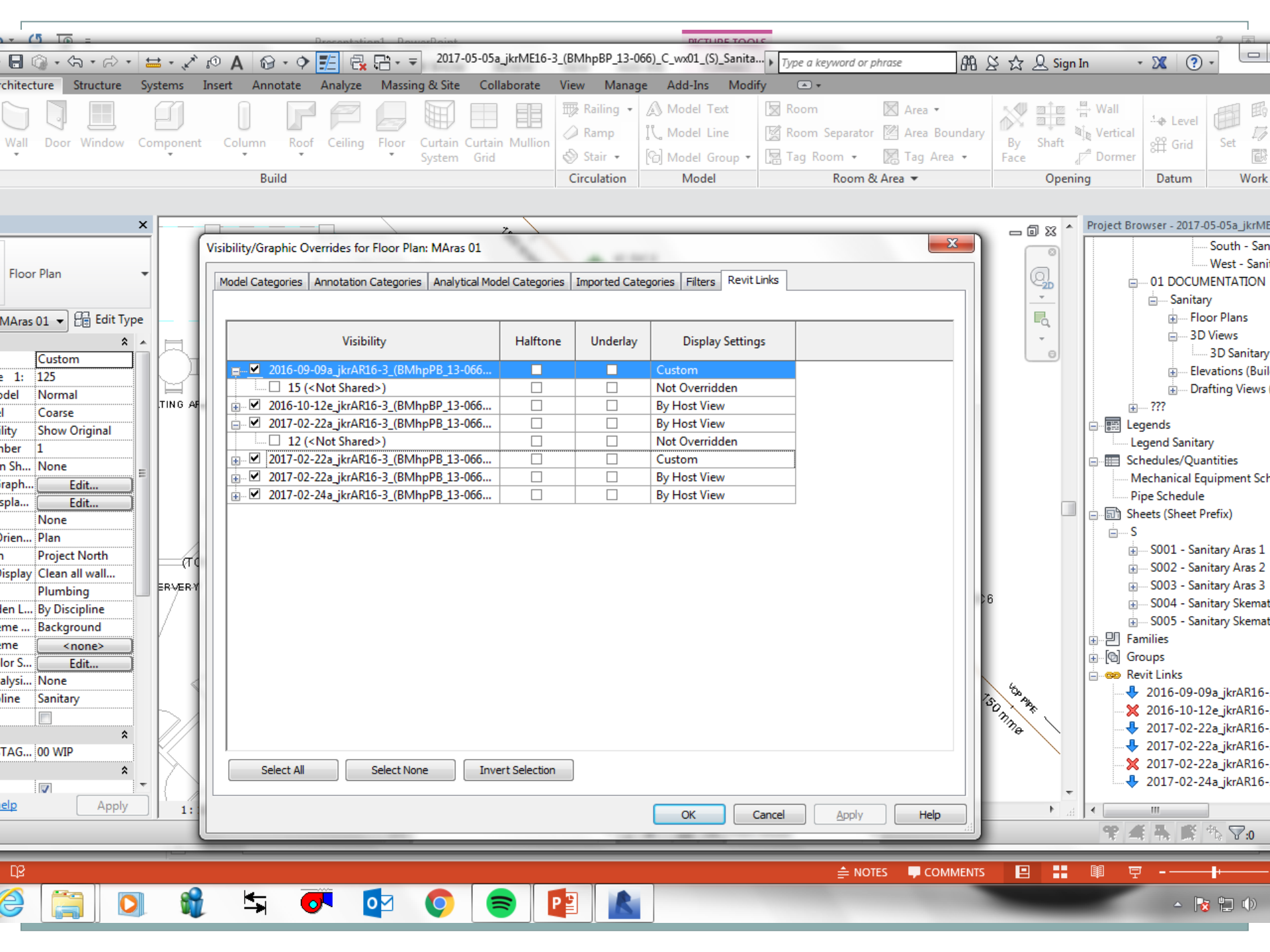
Revit Links
Main Model
NOTES
COMMENTS


2017-05-05a_jkrME16-3_(BMhpBP_13-066)_C_wx01_(S)_Sanita...
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Manage
Add-Ins
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Curtain System
Curtain Grid
Mullion
Railing
Ramp
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Model Text
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Model Group
Room
Room Separator
Tag Room
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Annotation Categories
Analytical Model Categories
Imported Categories
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2017-02-22a_jkrAR16-
2017-02-24a_jkrAR16-
VCP PIPE
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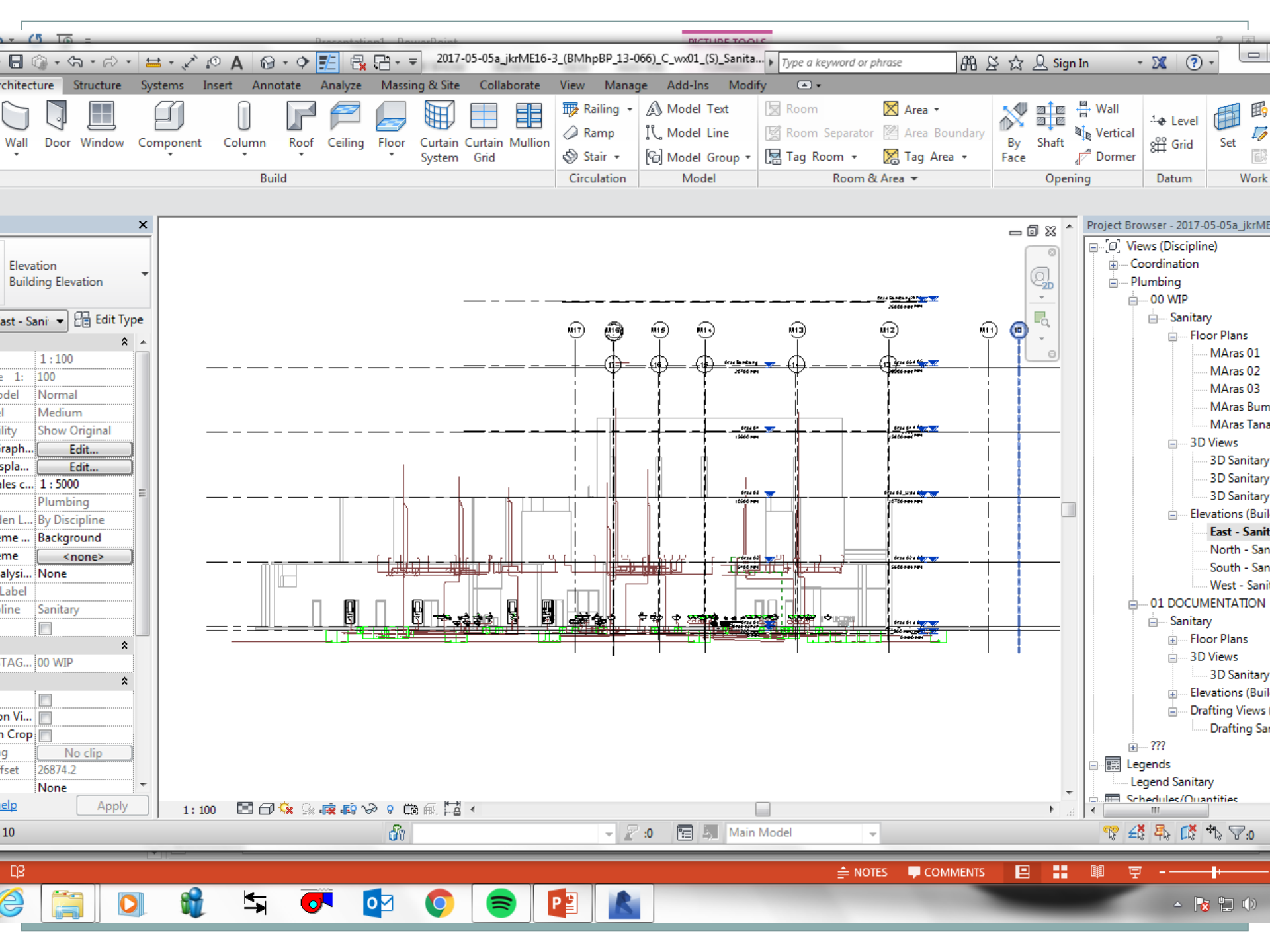
2017-05-05a_jkrME16-3_(BMhpBP_13-066)_C_wx01_(S)_Sanita...
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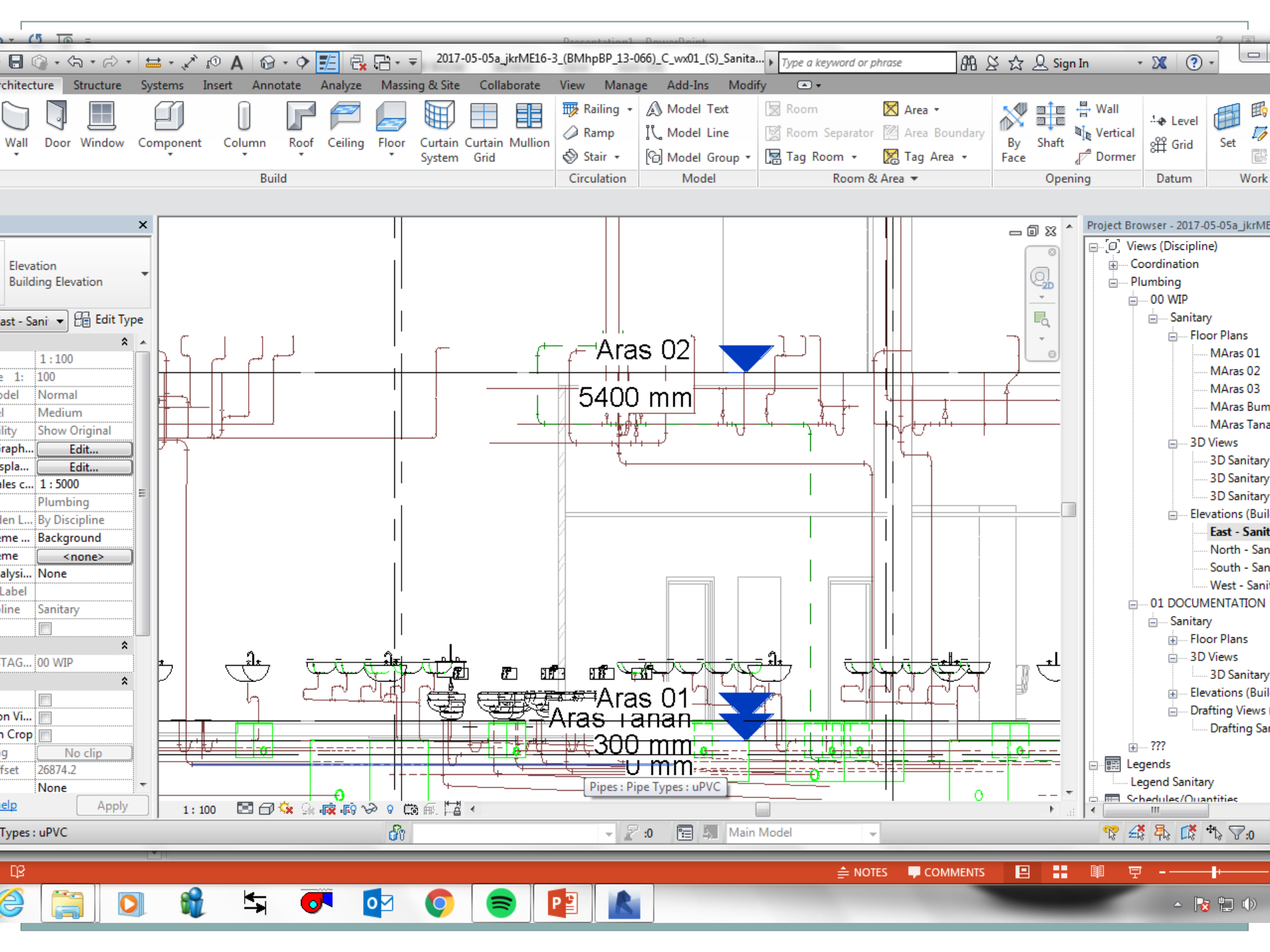
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Analyze
Massing & Site
Collaborate
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Column
Roof
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Curtain System
Curtain Grid
Mullion
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Stair
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Room Separator
Tag Room
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MAras Bum
MAras Tana
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Main Model
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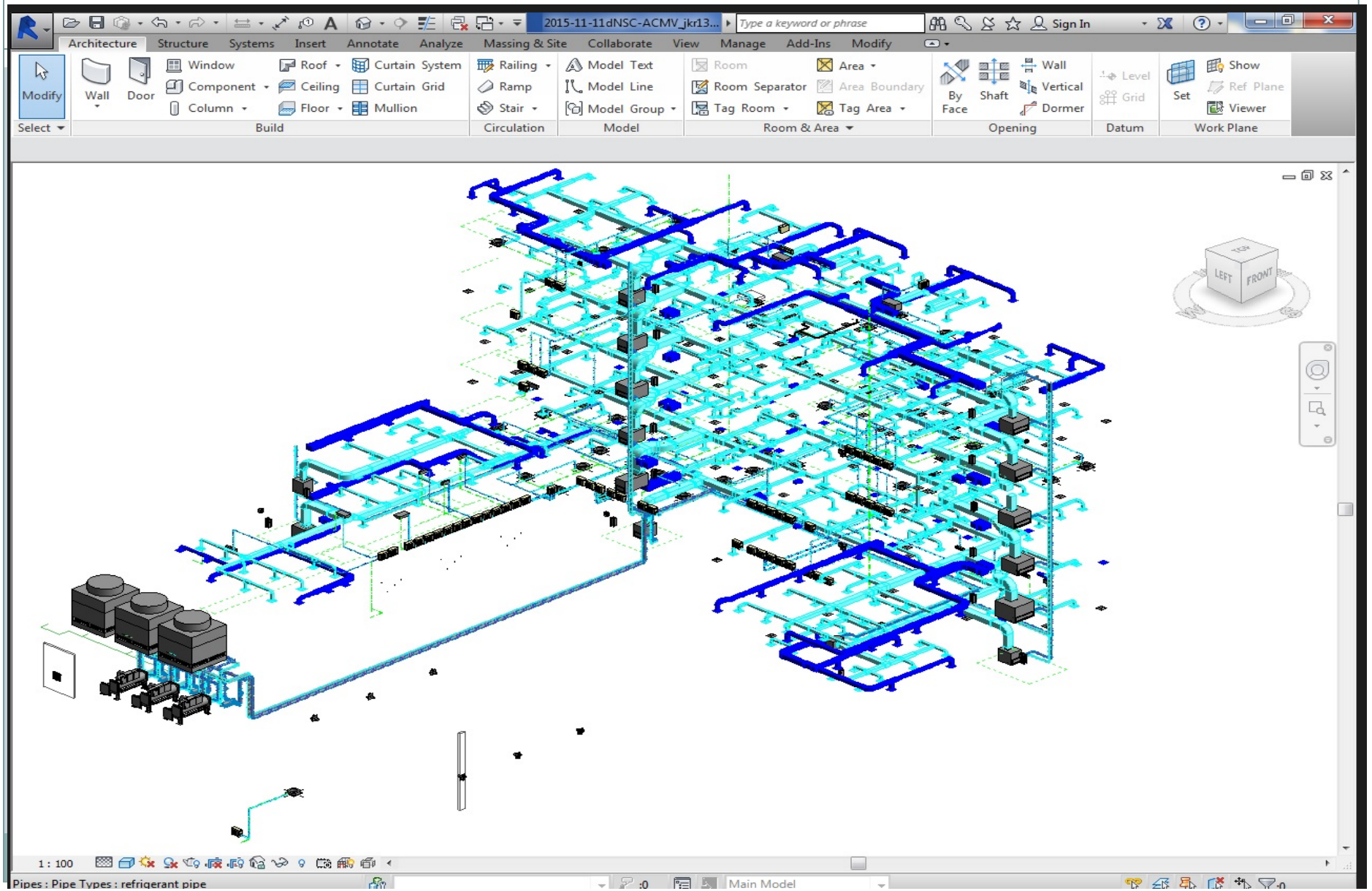
COMMENTS

PROJEK SPRM SELANGOR



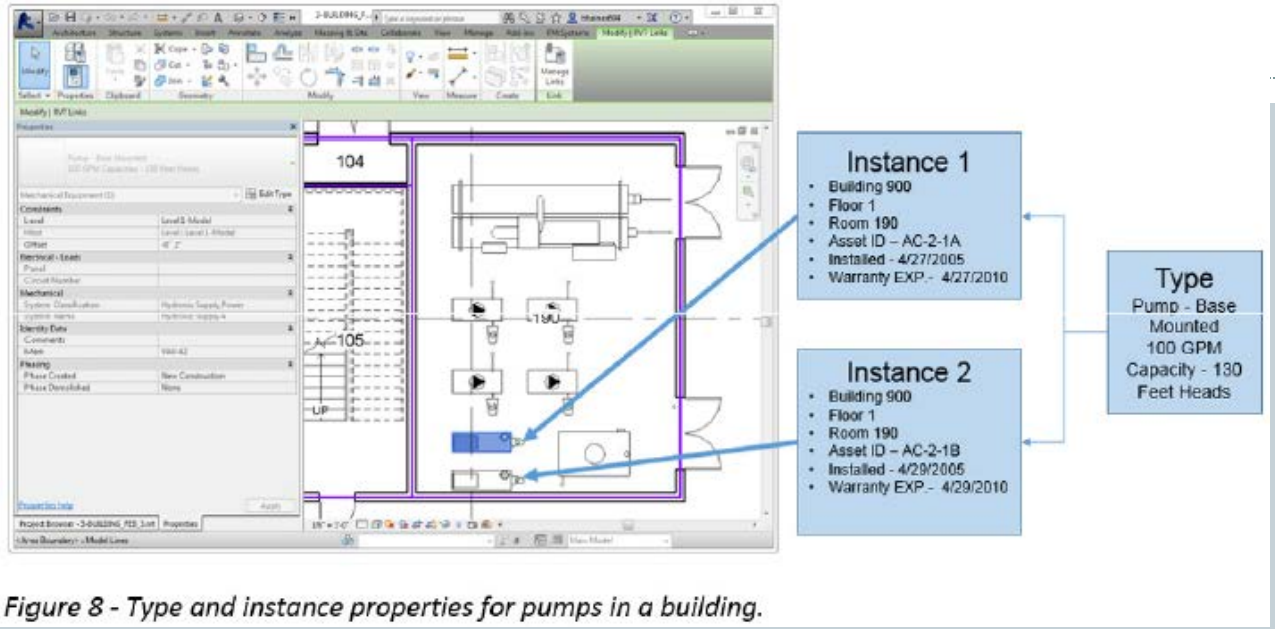


Figure 8 - Type and instance properties for pumps in a building.

BIM FM System Integration "Authoritative Source" Concept

BIM Model	**Facility Management System**
Building Structure	Real Estate Information
Walls, Windows, Doors	Leases
Mechanical Systems	Occupants
Electrical Systems	Occupancy
Rooms	Move Management
Materials	Work Orders
Equipment	Service Agreements
	Repair History
	Capital Budgeting

Jadual 6.2 : Penggunaan perisian BIM

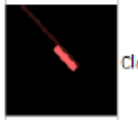
Disiplin / Bidang Tugas	Perisian	Tujuan
Jurutera Struktur	Revit	Penyediaan model dan lukisan struktur
	Orion	Penyediaan model, analisis, rekabentuk dan lukisan struktur
	AutoCAD	Penyediaan lukisan struktur
	AutoCAD Structural Detailing	Penyediaan lukisan struktur
	Navisworks	Koordinasi model rekabentuk dan visualisasi 3D
	Design Review	Rujukan model dan lukisan pembinaan
Arkitek	Revit	Penyediaan model, analisis kemampanan, rekabentuk dan lukisan arkitek
	Autocad Civil 3D (C3D)	Penyediaan lukisan tapak
	AutoCAD	Penyediaan lukisan arkitek
	Showcase / 3Ds Max / Lumion	Penambahbaikan kualiti persembahan model 3D bagi tujuan pembentangan rekabentuk
	Integrated Environmental Solutions (IES) / Ecotech	Analisis kemampanan dan analisis pengurusan bencana (Opsyen)
	Navisworks	Koordinasi model rekabentuk dan visualisasi 3D
	Design Review	Rujukan model dan lukisan pembinaan
Jurutera Elektrik/ Mekanikal	Revit	Penyediaan model, analisis kecekapan tenaga dan lukisan mekanikal/elektrik
	AutoCAD	Penyediaan lukisan elektrik /mekanikal
	Integrated Environmental Solutions (IES) / Ecotech	Analisis kecekapan tenaga (Opsyen)
	Navisworks	Koordinasi model rekabentuk dan visualisasi 3D
	Design Review	Rujukan model dan lukisan pembinaan
Pengurus Tapak	Navisworks	Simulasi pembinaan bagi membantu verifikasi jadual kerja pembinaan dan visualisasi 3D
	Microsoft Project	Penyediaan jadual kerja pembinaan
	Design Review	Rujukan model dan lukisan pembinaan
Pengurus Projek	Navisworks	Koordinasi model rekabentuk dan visualisasi 3D
	Design Review	Rujukan model dan lukisan tender/pembinaan
Pengurus Penyenggaraan	MySpata	Pengurusan rekod aset
	Design Review	Rujukan model dan lukisan siap bina.
Jurutera Sivil	Autocad Civil 3D (C3D)	Penyediaan model keadaan tapak sedia ada, analisis tapak, model kerja tanah, laporan pengiraan kuantiti potong dan tambak serta lukisan kerja tanah
Jurukur Bahan	CostX	Penjanaan kuantiti

ANALISA KOORDINASI (CLASH DETECTION)

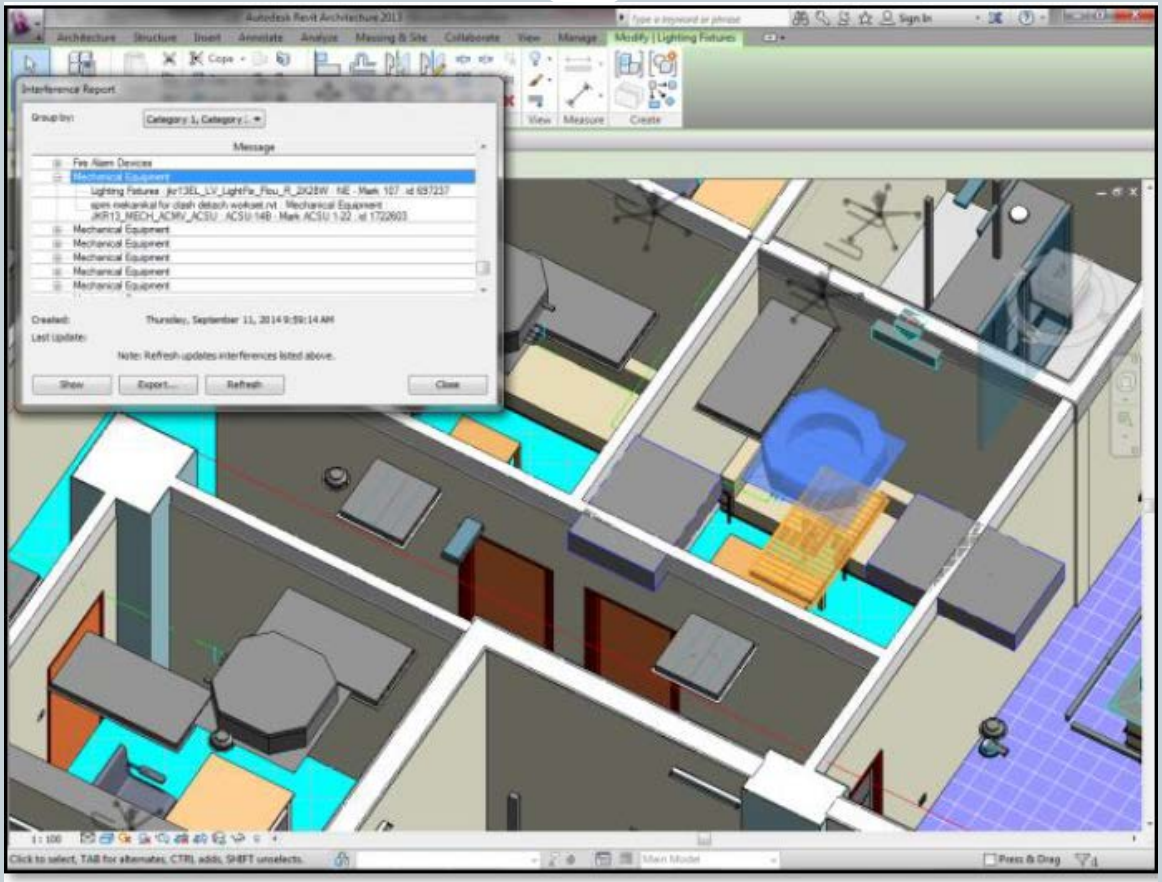
Nama Cawangan	KEMENTERIAN KESIHATAN MALAYSIA

PROJECT'S NAME:	CADANGAN MEMBINA & MENYIAPKAN KLINIK KESIHATAN JENIS 5 (KK5) DI SRI JAYA, MARAN, PAHANG DARUL MAKMUR
REVIT MODEL(S) INVOLVED:	2014-01-07a_jkr14AR6_(BMkk5a_14-001)_A1_W-01_C_(CA_ 2014-10-01a).rvt
NAVISWORKS(S) INVOLVED:	2014-07-16a_jkr14AR2_(BMkk5a_14-001)_A1_W-01_C_(CA_ 2014-10-01a).nwc 2014-07-16a_jkr14PP6_(BMkk5a_14-001)_A1_W-01_C_(CA_ 2014-10-01a).nwf 2014-07-16a_jkr14PP6_(BMkk5a_14-001)_A1_W-01_C_(CA_ 2014-10-01a).nwd
PHASE OF PROJECT:	CONSTRUCTION PHASE
REPORT'S TITLE:	Clash Analysis for Architecture
NO. OF CLASH ANALYSIS CONDUCTED:	1
PREPARED BY:	NOORWIDHAYU
DATE:	5/12/2014

Tahap 3-Furnitures vs Walls	Tolerance	Clashes	New	Active	Reviewed	Approved	Resolved	Type	Status
	0.001m	44	6	0	0	38	0	Hard	OK

							Item 1			Item 2			
Image	Clash Name	Status	Distance	Grid Location	Date Found	Assigned To	Item ID	Layer	Path	Item ID	Layer	Path	Comments
	Clash1	New	-0.450	G2-2 : Foundation	2014/12/5 04:17:12	Architect	*Element ID:* 1117543	Aras Lantai	File > File > 2014-07-16a_jkr14AR2_(BMkk5a_14-001)_A1_W-01_C_(CA_ 2014-10-01a).nwc > Aras Lantai > Casework > Jkr13AR_casework_FiC(3)_Filing Cabinet > FiC > Jkr13AR_casework_FiC(3)_Filing Cabinet > FiC > Composite Part	*Element ID:* 213381	Aras Lantai	File > File > 2014-07-16a_jkr14AR2_(BMkk5a_14-001)_A1_W-01_C_(CA_ 2014-10-01a).nwc > Aras Lantai > Walls > Basic Wall > jkr13A_Wall - 150 > Basic Wall > jkr_Plaster & Paint (Birch)	*#0 - Nuridayu - 2014/12/5 07:15.27* Assigned to Architect Move the cabinet out from wall
	Clash3	New	-0.015	J-1 : Foundation	2014/12/5 04:17:12		*Element ID:* 1473538	Aras Lantai	File > File > 2014-07-16a_jkr14AR2_(BMkk5a_14-001)_A1_W-01_C_(CA_ 2014-10-01a).nwc > Aras Lantai > Casework > Jkr13AR_casework_Lc-L(3)_Leg Low Cabinet 850mm Hpl Finish > Lc > Jkr13AR_casework_Lc-L(3)_Leg Low Cabinet 850mm Hpl Finish > Lc > Composite Part	*Element ID:* 213374	Apron Level	File > File > 2014-07-16a_jkr14AR2_(BMkk5a_14-001)_A1_W-01_C_(CA_ 2014-10-01a).nwc > Apron Level > Walls > Basic Wall > jkr13A_Wall - 150 > Basic Wall > jkr_Plaster & Paint (Birch)	

Rajah 6.1 : Contoh laporan *clash analysis*



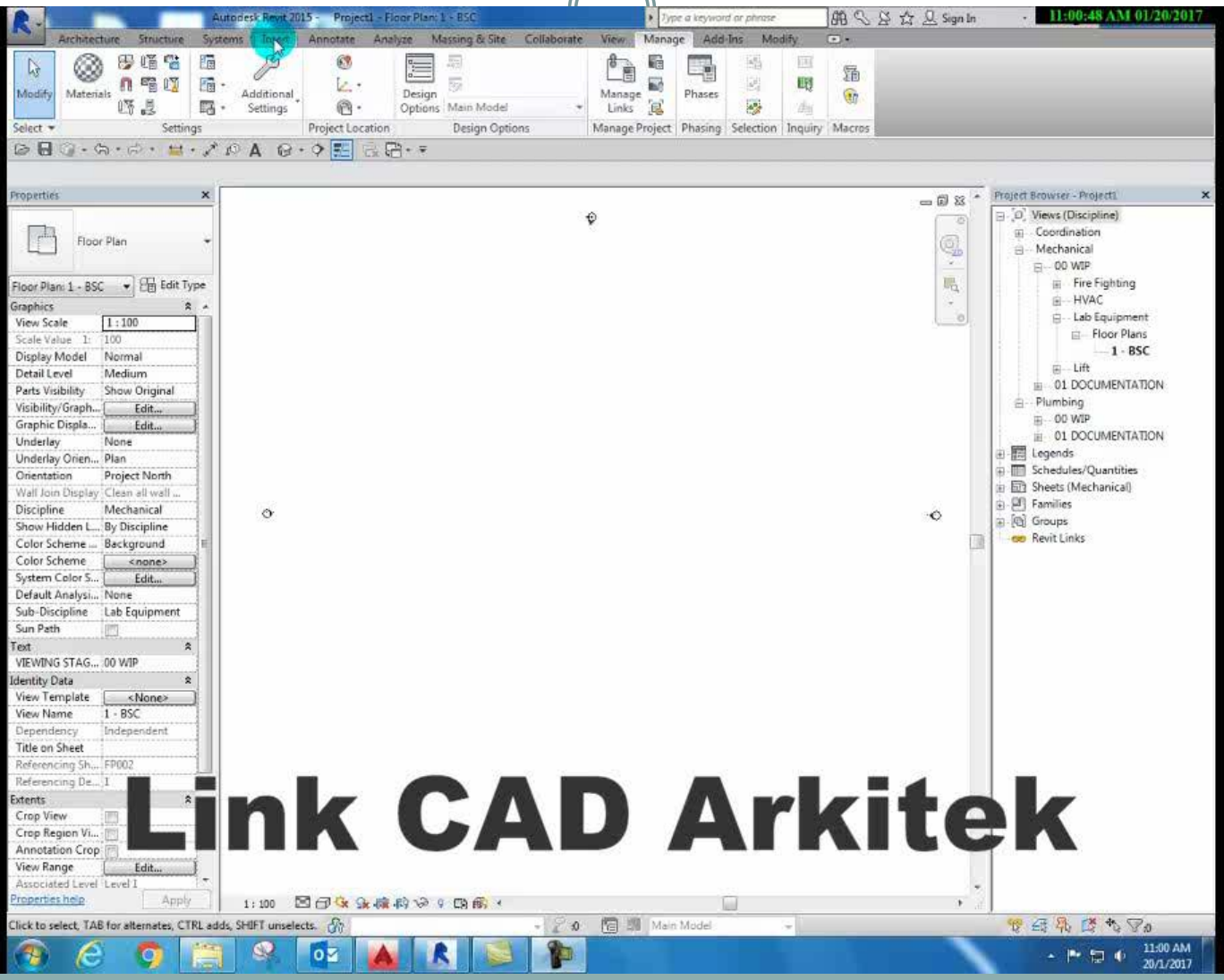
Rajah 2.10 : *Clash analysis*

JENIS – JENIS (CLASH ANALYSIS)

Ver. 2016 Appendix D 1

NO	CLASH TEST			CLASH CATEGORY	
				HARD	SOFT
24	Fire Alarm Devices	vs.	Lighting Devices	/	
25	Mechanical Equipment	vs.	Communication Devices	/	
26	Mechanical Equipment	vs.	Data Devices	/	
27	Mechanical Equipment	vs.	Electrical Equipment	/	
28	Mechanical Equipment	vs.	Electrical Fixtures	/	
29	Mechanical Equipment	vs.	Lighting Devices	/	
30	Mechanical Equipment	vs.	Telephone Devices	/	
31	Pipes	vs.	Communication Devices	/	
32	Pipes	vs.	Data Devices	/	
33	Pipes	vs.	Electrical Equipment	/	
34	Pipes	vs.	Electrical Fixtures	/	
35	Pipes	vs.	Lighting Devices	/	
36	Pipes	vs.	Lighting Fixtures	/	
37	Pipes	vs.	Telephone Devices	/	
38	Ducts	vs.	Conduit	/	
39	Pipes	vs.	Conduit	/	
40	Mechanical Equipment	vs.	Conduit	/	
41	Fire Alarm Devices	vs.	Conduit	/	
42	Sprinklers	vs.	Conduit	/	
43	Ducts	vs.	Cable Trays		/
44	Mechanical Equipment	vs.	Lighting Fixtures		/
45	Sprinklers	vs.	Communications Devices		/
46	Sprinklers	vs.	Lighting Fixtures		/
47	Sprinklers	vs.	Security Devices		/
MECHANICAL Vs. MECHANICAL					
1	Ducts	vs.	Ducts		/
2	Mechanical Equipment	vs.	Mechanical Equipment		/
3	Pipes	vs.	Pipes		/
ELECTRICAL Vs. ELECTRICAL					
1	Cable Trays	vs.	Cable Trays		/
2	Lighting Fixtures (Lighting)	vs.	Lighting Fixtures (Fan)		/

Video BIM



KESIMPULAN

EQUIP WITH KNOWLEDGE,

COMPETENCY WAY FORWARD


BIM ITU MUDAH,
BIM ITU MEMBANTU
BIM
IS
MAGNIFICENCE
TERIMA KASIH