

FIG

# FIG WORKING WEEK 2017

Helsinki Finland

29 May - 2 June 2017

Presented at the FIG Working Week 2017,  
May 29 - June 2, 2017 in Helsinki, Finland

Monitoring and Control Progress of Task Times in Construction  
Projects with UAV And BIM Models:

Case-Of-Study: UNIVERSIDAD DE LA SABANA, BOGOTÁ  
COLOMBIA

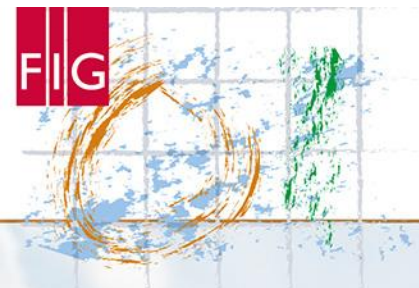
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HOLMAN LATORRE BOSSA  
Universidad de los Andes

CÉSAR ARANGO GÓMEZ  
Universidad de los Andes



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HOW MANY OF YOU HAVE TRIED TO CALCULATE  
THE TIME YOU ARE GOING TO SPENT BETWEEN  
WAKING UP FROM BED TILL GETTING TO OFFICE?

6:00 Am I Will Wake Up  
Take a bath: 10 Min  
Get Dressed: 2 Min (Men) Ladies..???  
Breakfast: 5 Min  
Brush my teeth: 3 Min  
Walk to bus/train station: 7 Min  
Wait till bus/train arrive: 5 Min ... If it delays?  
While I get to the destination: 10 Min  
Walk to office: 5 Min

At what time will I be at Office?



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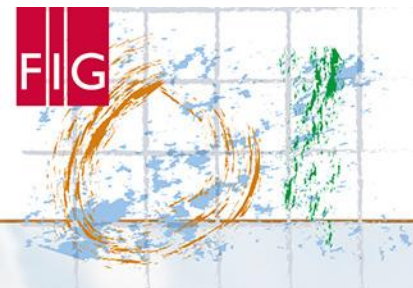
6:47 Am  
With No Delays

HOW CAN YOU OPTIMIZE TIME?  
WHY DO I NEED TO OPTIMIZE IT?



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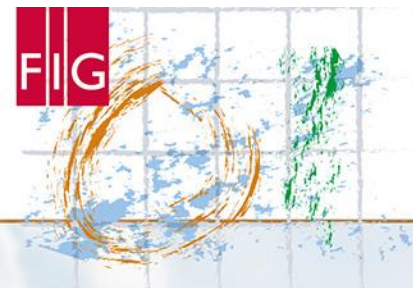
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## TIME IS MONEY



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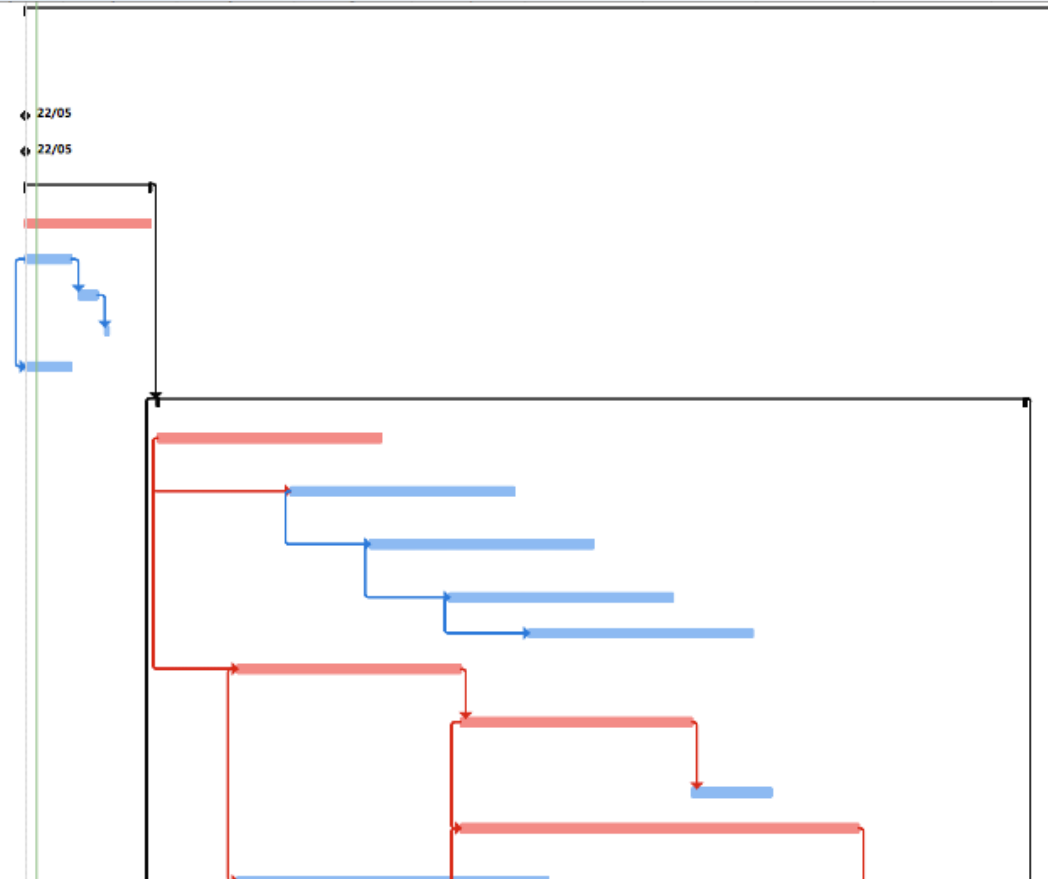
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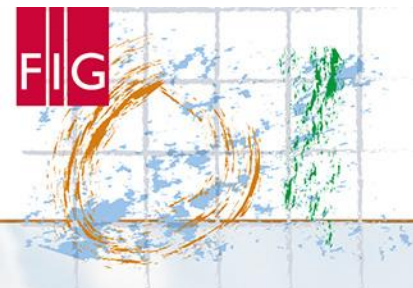
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1	ESTUDIO, DISEÑO Y CONSTRUCCIÓN DEL RE-CERCADO FASE II DEL AEROPUERTO INTERNACIONAL DE TOCUMEN	195 días	lun 22/05/17	vie 16/02/18	\$ 1.261.682,00
2	Inicio del Proyecto	0 días	lun 22/05/17	lun 22/05/17	\$ 0,00
3	Orden de Proceder	0 días	lun 22/05/17	lun 22/05/17	\$ 0,00
4	Preliminares	25 días	lun 22/05/17	vie 23/06/17	\$ 45.000,00
5	Fianzas, seguros, pólizas, permisos	25 días	lun 22/05/17	vie 23/06/17	\$ 40.000,00
6	Estudios y desarrollos de planos	10 días	lun 22/05/17	vie 02/06/17	\$ 1.000,00
7	Aprobación de planos	5 días	lun 05/06/17	vie 09/06/17	\$ 1.000,00
8	Planos a/built	1 día	lun 12/06/17	lun 12/06/17	\$ 1.000,00
9	Levantamiento topográfico	10 días	lun 22/05/17	vie 02/06/17	\$ 2.000,00
10	Construcción	165 días	lun 26/06/17	vie 09/02/18	\$ 879.995,00
11	Excavación y relleno de cimientos y pedestales	43 días	lun 26/06/17	mié 23/08/17	\$ 42.600,00
12	Bloques de 6 rellenos de hormigón para fundaciones	43 días	lun 31/07/17	mié 27/09/17	\$ 73.500,00
13	Bloques de 6 rellenos de hormigón sobre el nivel de TN	43 días	lun 21/08/17	mié 18/10/17	\$ 68.250,00
14	Banda de amarre de 0.10 x 0.10	43 días	lun 11/09/17	mié 08/11/17	\$ 130.000,00
15	Repello en bloques rellenos y caras vistas	43 días	lun 02/10/17	mié 29/11/17	\$ 58.800,00
16	Tubos de 1 1/2 galv. Escala 40 para columnas	43 días	lun 17/07/17	mié 13/09/17	\$ 141.400,00
17	Tubos de 1 1/2 galv. Escala 40 (horizontales y diagonales)	43 días	jue 14/09/17	lun 13/11/17	\$ 105.440,00
18	Brazos sencillos para tubos galv. Cal. 20	15 días	mar 14/11/17	lun 04/12/17	\$ 31.500,00
19	Pintura anticorrosiva para tubos áreas con soldadura	75 días	jue 14/09/17	mié 27/12/17	\$ 13.000,00
20					\$ 46.500,00



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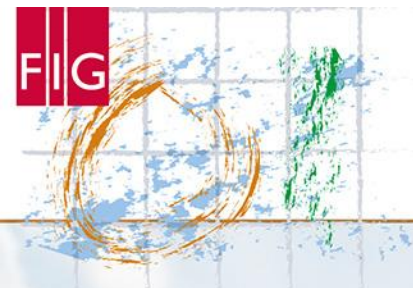
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## WHAT IS BIM?



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## ANSWER:

BUILDING INFORMATION MODELING IS AN INTELLIGENT 3D MODEL-BASED PROCESS THAT GIVES ARCHITECTURE, ENGINEERING AND CONSTRUCTION PROFESSIONALS THE INSIGHTS AND TOOLS TO MORE EFFICIENTLY PLAN, DESIGN, CONSTRUCT AND MANAGE BUILDINGS AND INFRASTRUCTURE  
(AUTODESK)



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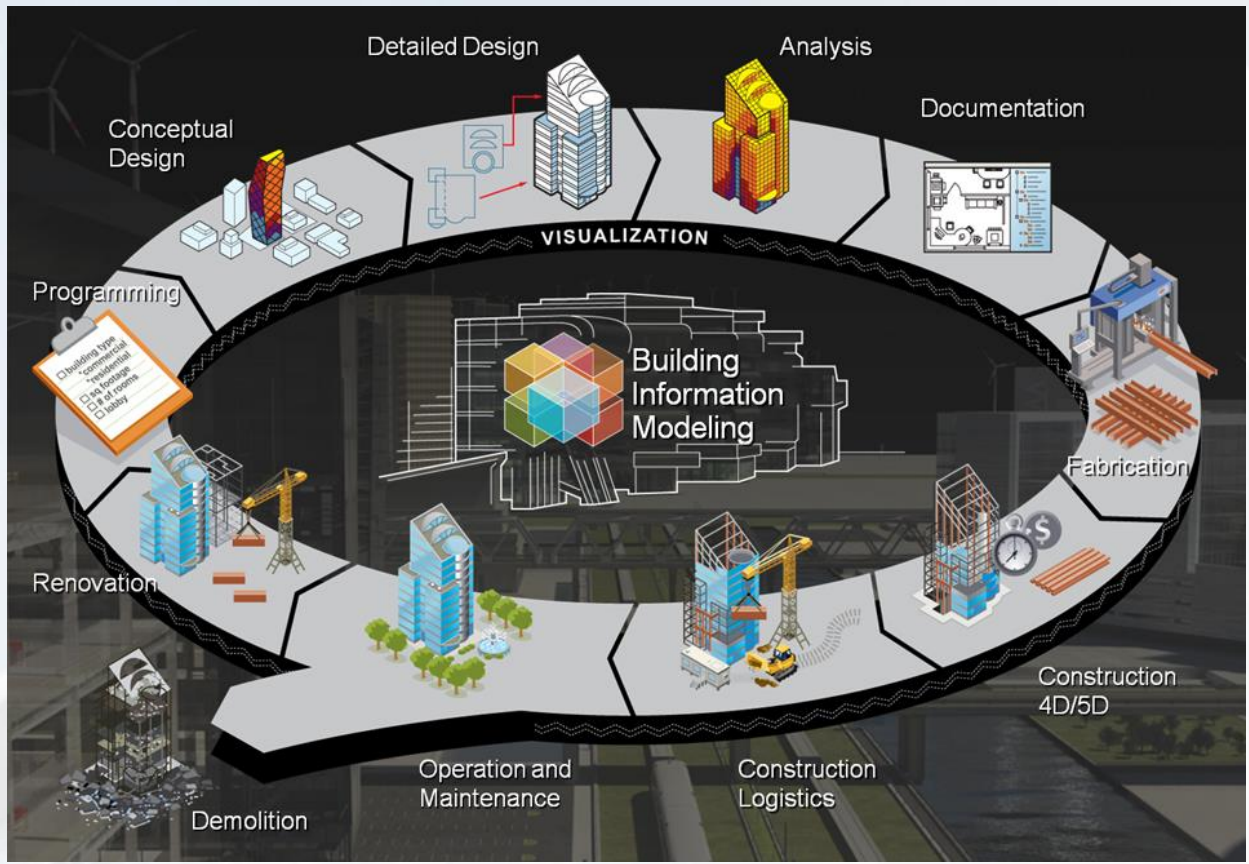


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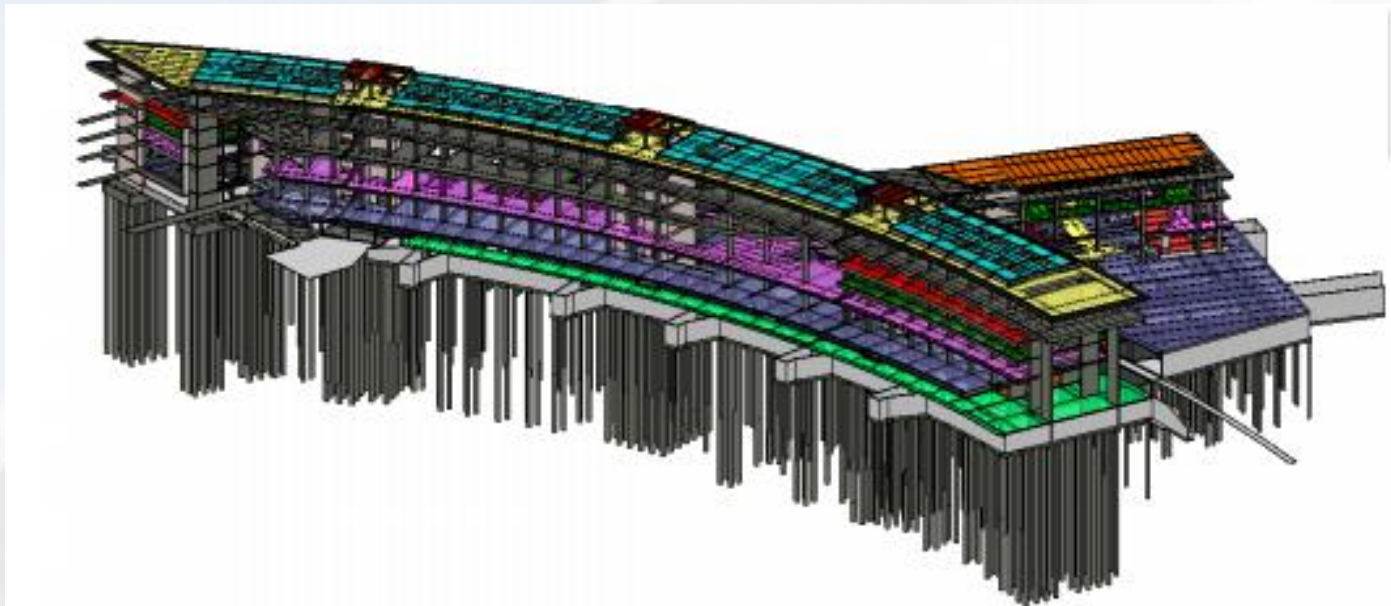
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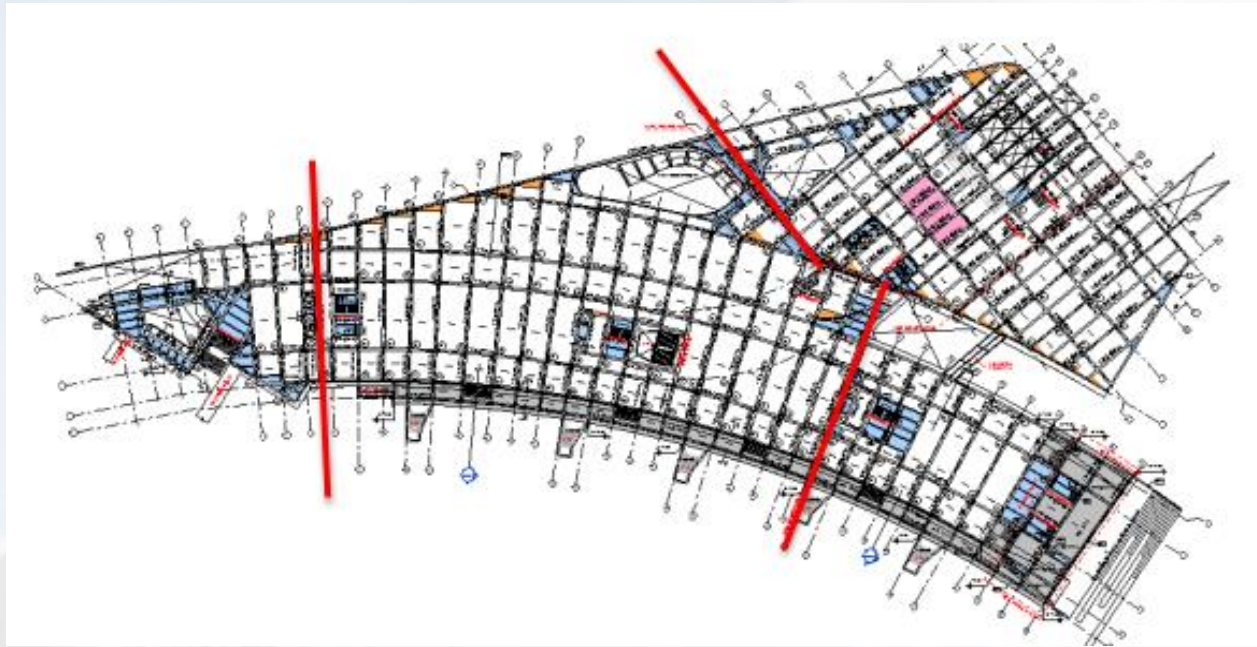


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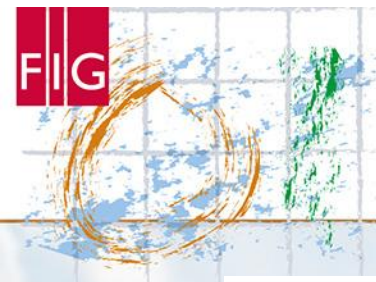
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PROGRAMA GENERAL EDIFICIO AD PORTAS	503,88 días	lun 16/05/16	vie 29/12/17
<b>FRENTE AULARIO</b>	370 días	lun 16/05/16	jue 27/07/17
<b>CIMENTACION Y ESTRUCTURA</b>	217 días	lun 16/05/16	mié 01/02/17
<b>CIMENTACIONES</b>	110 días	lun 16/05/16	vie 23/09/16
CIMENTACION	80 días	lun 16/05/16	sáb 20/08/16
CONSOLIDACION PISO	25 días	sáb 30/07/16	mar 30/08/16
PANTALLAS Y COLUMNAS PISO 1	45 días	mar 02/08/16	vie 23/09/16
<b>ESTRUCTURA PISO 1</b>	46 días	mar 06/09/16	lun 31/10/16
FORMALETA Y ARMADO VIGAS AEREAS PISO 1	35 días	mar 06/09/16	mar 18/10/16
FUNDIDA VIGAS AEREAS	28 días	sáb 17/09/16	jue 20/10/16
ALVEOLARES	29 días	mar 20/09/16	mar 25/10/16
CAPA DE COMPRESION Y LOZAS MACIZAS	30 días	mié 21/09/16	mié 26/10/16
PANTALLAS Y COLUMNAS	30 días	vie 23/09/16	lun 31/10/16
<b>ESTRUCTURA PISO 2</b>	40 días	vie 30/09/16	vie 18/11/16
FORMALETA Y ARMADO VIGAS AEREAS	28 días	vie 30/09/16	mié 02/11/16
FUNDIDA VIGAS AEREAS	28 días	mar 04/10/16	sáb 05/11/16
ALVEOLARES	29 días	jue 06/10/16	jue 10/11/16
CAPA DE COMPRESION	30 días	jue 06/10/16	sáb 12/11/16
PANTALLAS Y COLUMNAS	30 días	mié 12/10/16	vie 18/11/16

Nombre de tarea	Duración	Comienzo	Fin
<b>FRENTE CAPILLA</b>	460 días	mar 05/07/16	mar 26/12/17
<b>CIMENTACION Y ESTRUCTURA</b>	229 días	mar 05/07/16	mar 04/04/17
<b>CIMENTACIONES</b>	68 días	mar 05/07/16	vie 23/09/16
CIMENTACION	55 días	mar 05/07/16	jue 08/09/16
PANTALLAS Y COLUMNAS PISO 1	18 días	vie 02/09/16	vie 23/09/16
<b>ESTRUCTURA PISO 1</b>	44 días	vie 23/09/16	jue 17/11/16
PLACA NIVEL -4.025	17 días	vie 23/09/16	jue 13/10/16
FORMALETA Y ARMADO VIGAS AEREAS	25 días	vie 07/10/16	mar 08/11/16
FORMALETA Y ARMADO PLACA MACIZA CON VIGAS DESCOLGADAS	25 días	vie 07/10/16	mar 08/11/16
FUNDIDA VIGAS AEREAS	26 días	lun 10/10/16	vie 11/11/16
ALVEOLARES	26 días	jue 13/10/16	mié 16/11/16
CAPA DE COMPRESION	25 días	sáb 15/10/16	jue 17/11/16
PANTALLAS Y COLUMNAS	18 días	mar 25/10/16	jue 17/11/16
<b>ESTRUCTURA PISO 2</b>	33 días	vie 04/11/16	jue 15/12/16
PLACA MACIZA Y VIGAS DESCOLGADAS	18 días	vie 04/11/16	lun 28/11/16
PANTALLAS Y COLUMNAS	18 días	jue 24/11/16	jue 15/12/16
<b>ESTRUCTURA PISO 2A</b>	29 días	jue 10/11/16	jue 15/12/16
PLACA MACIZA Y VIGAS DESCOLGADAS	18 días	jue 10/11/16	jue 01/12/16
PANTALLAS Y COLUMNAS	18 días	jue 24/11/16	jue 15/12/16

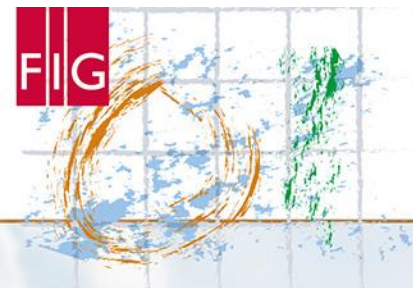
Nombre de tarea	Duración	Comienzo	Fin
<b>FRENTE AUDITORIO</b>	415 días	mié 31/08/16	vie 29/12/17
<b>CIMENTACION Y ESTRUCTURA</b>	209 días	mié 31/08/16	vie 05/05/17
<b>CIMENTACIONES</b>	53 días	mié 31/08/16	mar 01/11/16
CIMENTACION	40 días	mié 31/08/16	sáb 15/10/16
CONSOLIDACION PISO	12 días	mar 04/10/16	mié 19/10/16
PANTALLAS Y COLUMNAS PISO 1	28 días	mié 28/09/16	mar 01/11/16
<b>ESTRUCTURA PISO 1</b>	41 días	jue 20/10/16	sáb 10/12/16
FORMALETA Y ARMADO VIGAS AEREAS	30 días	jue 20/10/16	sáb 26/11/16
FUNDIDA VIGAS AEREAS	32 días	lun 24/10/16	vie 02/12/16
ALVEOLARES	31 días	mié 26/10/16	sáb 03/12/16
CAPA DE COMPRESION Y LOZAS MACIZAS	31 días	vie 28/10/16	mar 06/12/16
PANTALLAS Y COLUMNAS N=0.30 AL 3.15 Y 5.25	21 días	mar 15/11/16	sáb 10/12/16

Nombre de tarea	Duración	Comienzo	Fin
<b>FRENTE OFICINAS</b>	479 días	mar 31/05/16	jue 14/12/17
<b>CIMENTACION Y ESTRUCTURA</b>	220 días	mar 31/05/16	vie 17/02/17
<b>CIMENTACIONES</b>	89 días	mar 31/05/16	mié 14/09/16
CIMENTACION	75 días	mar 31/05/16	lun 29/08/16
CONSOLIDACION PISO	28 días	lun 08/08/16	vie 09/09/16
PANTALLAS Y COLUMNAS PISO 1	32 días	sáb 06/08/16	mié 14/09/16
<b>ESTRUCTURA PISO 1</b>	47 días	jue 08/09/16	mié 02/11/16
FORMALETA Y ARMADO VIGAS AEREAS PISO 1	32 días	jue 08/09/16	vie 14/10/16
FUNDIDA VIGAS AEREAS	32 días	jue 15/09/16	sáb 22/10/16
ALVEOLARES	31 días	vie 16/09/16	lun 24/10/16
CAPA DE COMPRESION Y LOZAS MACIZAS	31 días	mié 21/09/16	jue 27/10/16
PANTALLAS Y COLUMNAS	25 días	mar 04/10/16	mié 02/11/16
<b>ESTRUCTURA PISO 2</b>	37 días	mié 05/10/16	lun 21/11/16
FORMALETA Y ARMADO VIGAS AEREAS	26 días	mié 05/10/16	sáb 05/11/16
FUNDIDA VIGAS AEREAS	27 días	lun 10/10/16	vie 11/11/16
ALVEOLARES	28 días	mar 11/10/16	mar 15/11/16
CAPA DE COMPRESION	28 días	mié 12/10/16	jue 17/11/16
PANTALLAS Y COLUMNAS	23 días	lun 24/10/16	lun 21/11/16
<b>ESTRUCTURA PISO 2A</b>	38 días	lun 24/10/16	vie 09/12/16
FORMALETA Y ARMADO VIGAS AEREAS	26 días	lun 24/10/16	jue 24/11/16
FUNDIDA VIGAS AEREAS	27 días	jue 27/10/16	mié 30/11/16
ALVEOLARES	28 días	vie 28/10/16	vie 02/12/16
CAPA DE COMPRESION	28 días	lun 31/10/16	lun 05/12/16
PANTALLAS Y COLUMNAS	23 días	jue 10/11/16	vie 09/12/16



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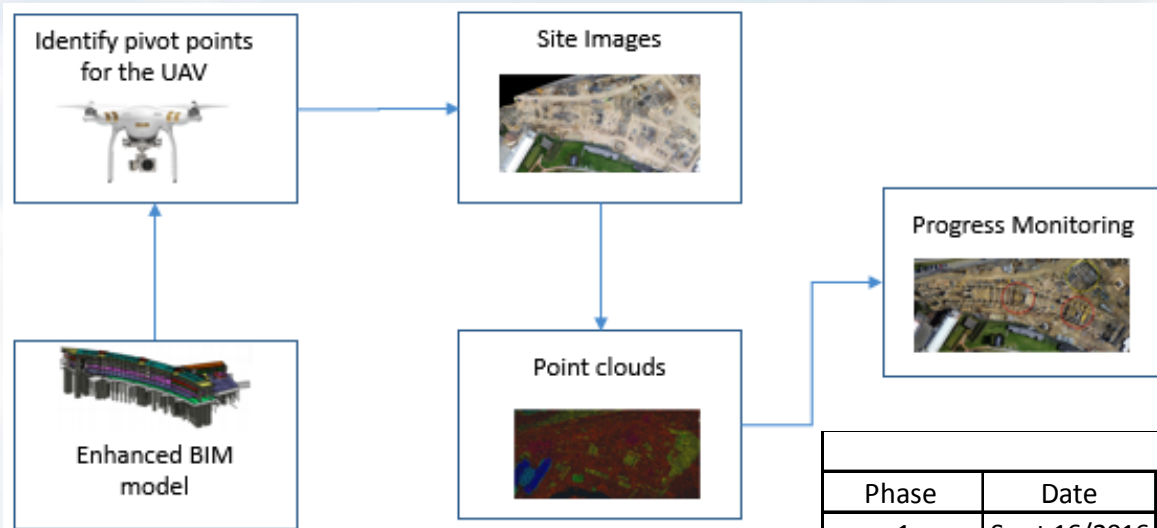
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## METHODOLOGY

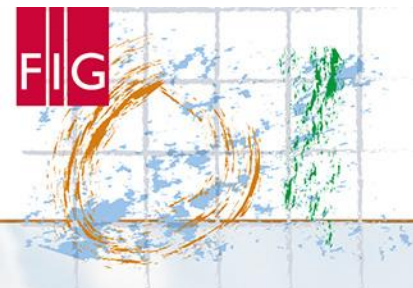


Timetable			
Phase	Date	Activity	Analysis
1	Sept 16/2016	Data adquisition	
2	Sept 24/2016	Data adquisition	Advance compared with phase 1
3	Oct 01/2016	Data adquisition	Advance compared with phase 2
4	Oct 07/2016	Data adquisition	Advance compared with phase 3
5	Oct 15/2016	Data adquisition	Advance compared with phase 4
6	Oct 22/2016	Data adquisition	Advance compared with phase 5
7	Oct 28/2016	Data adquisition	Advance compared with phase 6
8	Nov 5/2016	Results	Comparision with General Program



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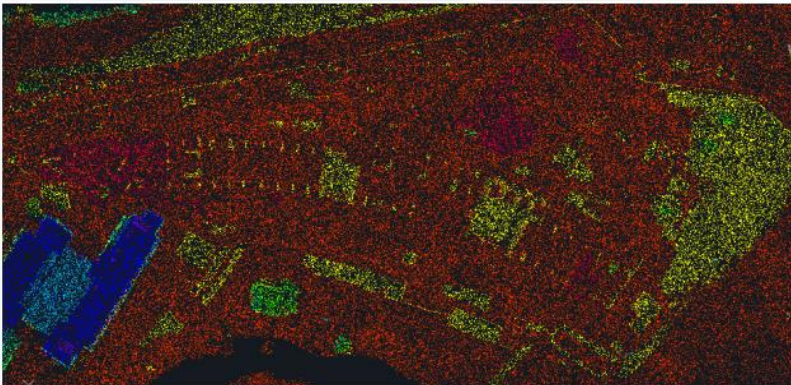


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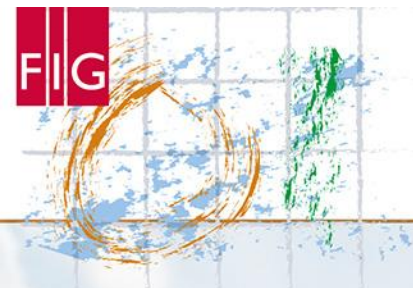
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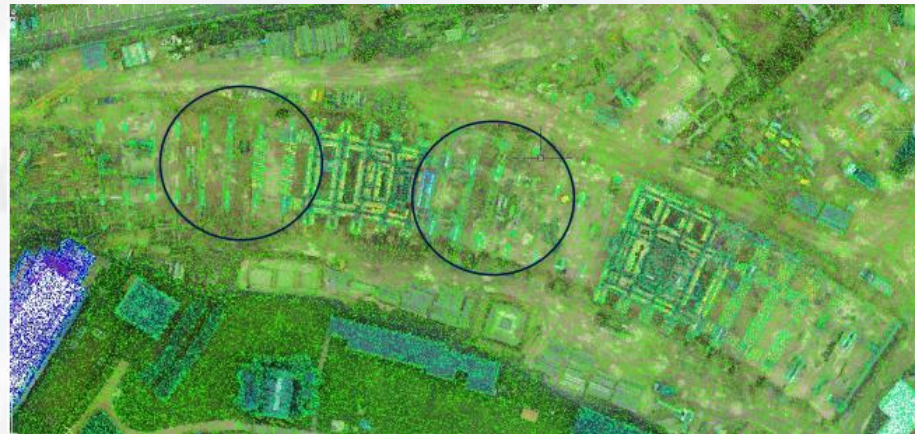


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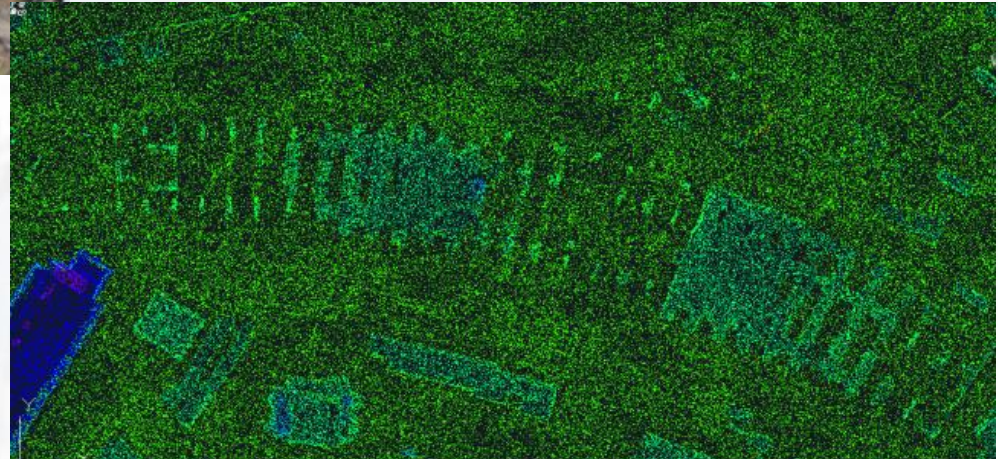


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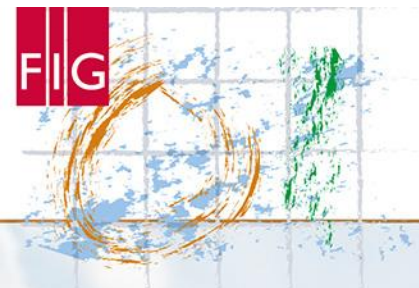
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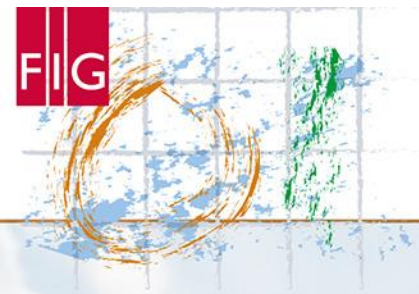
## DID IT WORK?

- Yes.
- Most of the delays were caused by administrative and burocratic authorizations.
- It takes too much time to process information.
- We must have a constant communication between all project participants



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## WHAT'S NEXT?

- CREATE 3D REAL TIME MODELS
- OCCLUSION BETWEEN 3D BIM MODEL AND 3D REAL TIME MODEL
- IMPROVE PROCESSING SPEED



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## THANK YOU!



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