Implementación de BIM
Expansión del Canal de Panamá

AGENDA

- BIM
  - ALCANCE
  - BIM IMPLEMENTACIÓN
  - CANAL DE PANAMÁ

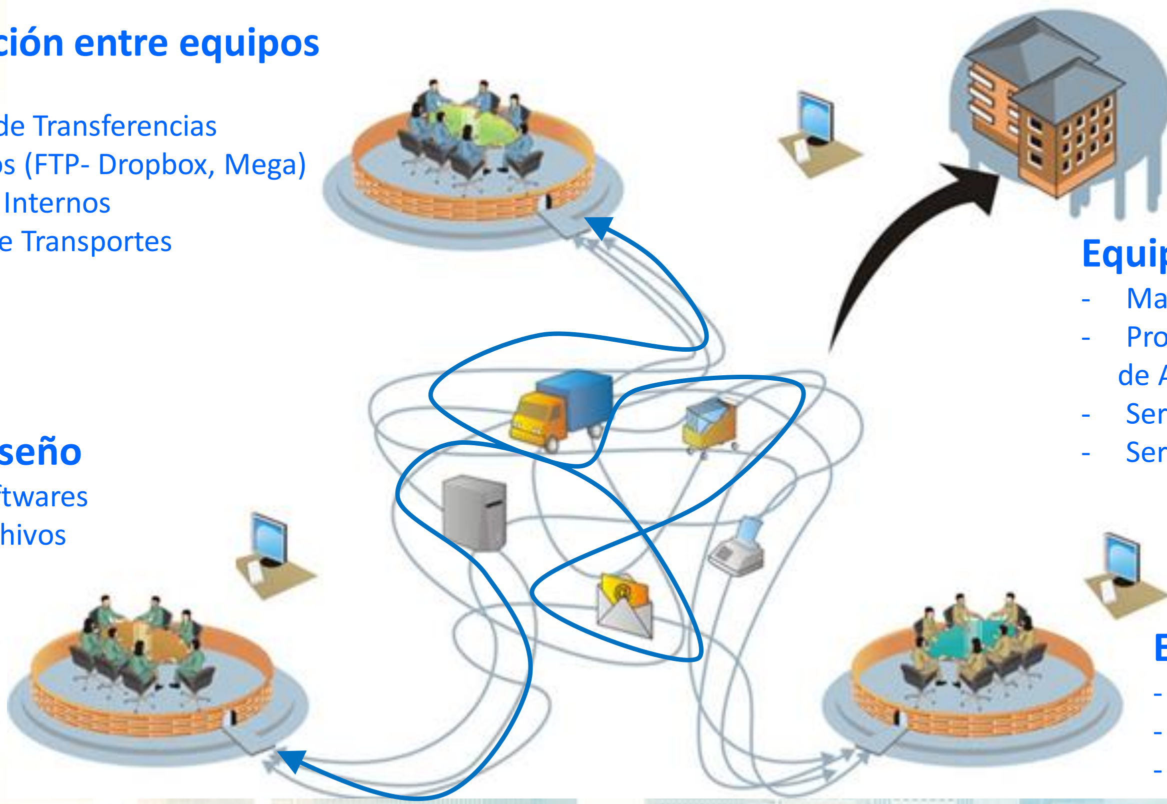
OBJETIVOS

- Comprender la importancia de la coordinación.
- De la Comunicación.
- Estrategias de un proyecto de Infraestructura de gran escala.

PRÁCTICA HABITUAL

Comunicación entre equipos

- Mail
- Protocolo de Transferencias de Archivos (FTP- Dropbox, Mega)
- Servidores Internos
- Servicios de Transportes



Equipo del cliente

- Mail
- Protocolo de Transferencias de Archivos (FTP- Dropbox, Mega)
- Servidores Internos
- Servicios de Transportes

Equipo de Diseño

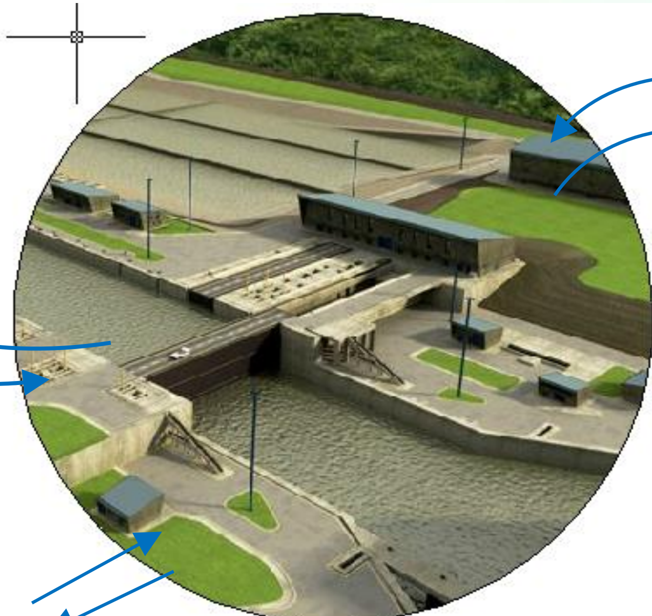
- Diferentes Softwares
- Diferentes archivos
- Versiones

Equipo de Construcción

- Problemas de Interferencias
- Falta de documentación
- Problemas sin resolver

¿CÓMO LO HACE?

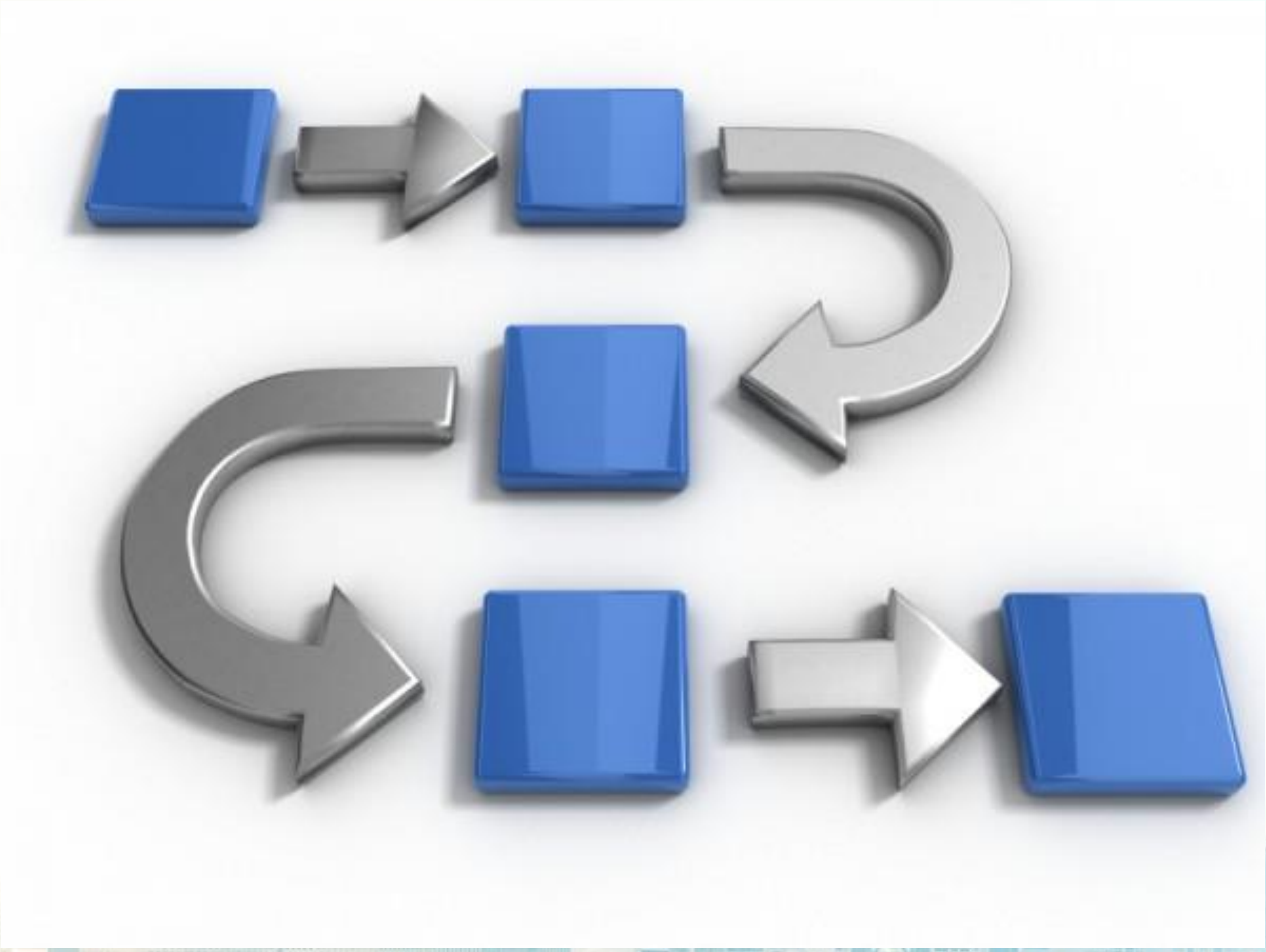
BIM, Reduce el número de transferencia de datos, y se basa en una sola fuente de información.
Minimiza errores



BIM, facilita el acceso a toda la información, permitiendo optimizar las decisiones en el proyecto.

BIM, Permite vincular los modelos de todas las disciplinas.
Proyecto completo en un entorno virtual

… PROCESOS



TípicaVisión
Visualización 3D & 4D
Coordinación
Cuantificación
Software
Hardware
Entrenamiento
METRICAS
ANÁLISIS
CONSTRUCTIBILIDAD
INFORMACIÓN
DATOS
COSTOS
ESTUDIO DE CAMPO
DATOS CONSISTENTES
PLANIFICACION DETALLADA
COLABORACIÓN
PROCESOS
WORKFLOWS
ESTÁNDARES
CAMBIOS DE GESTIÓN
INFORMACION DE GESTION
ENTREGABLES
BIM
BIM
REQUIERE

USO DE MODELOS RICOS EN DATOS

Simulación y Visualización

Coordinación y Colaboración

Procesos Inteligentes

SOLUCIÓN BIM

Flujo de Trabajo Eficiente

Mayor Previsibilidad

Mejores Resultados de Proyectos

Tomas de decisions a tiempo

PROCESO BIM


Planificación
Gestión
Construcción
Diseño
Diseño Preliminar

Es un proceso que comienza por la creación de un modelo de diseño 3D inteligente

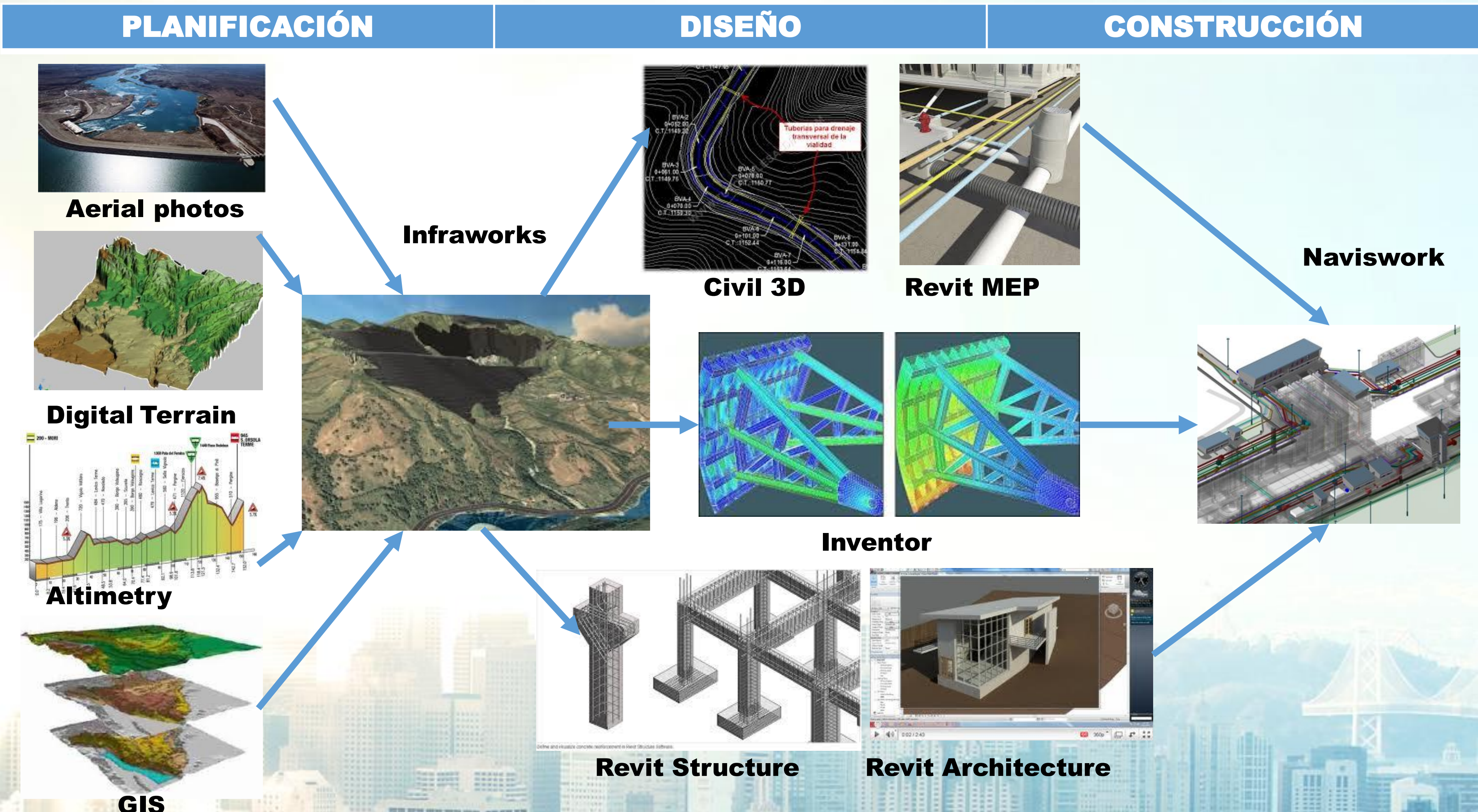
Posteriormente se utiliza ese modelo para facilitar

- la coordinación,
- simulación,
- visualización
- mejorar la manera de planificar,
- diseñar,
- construir y
- administrar los proyectos.

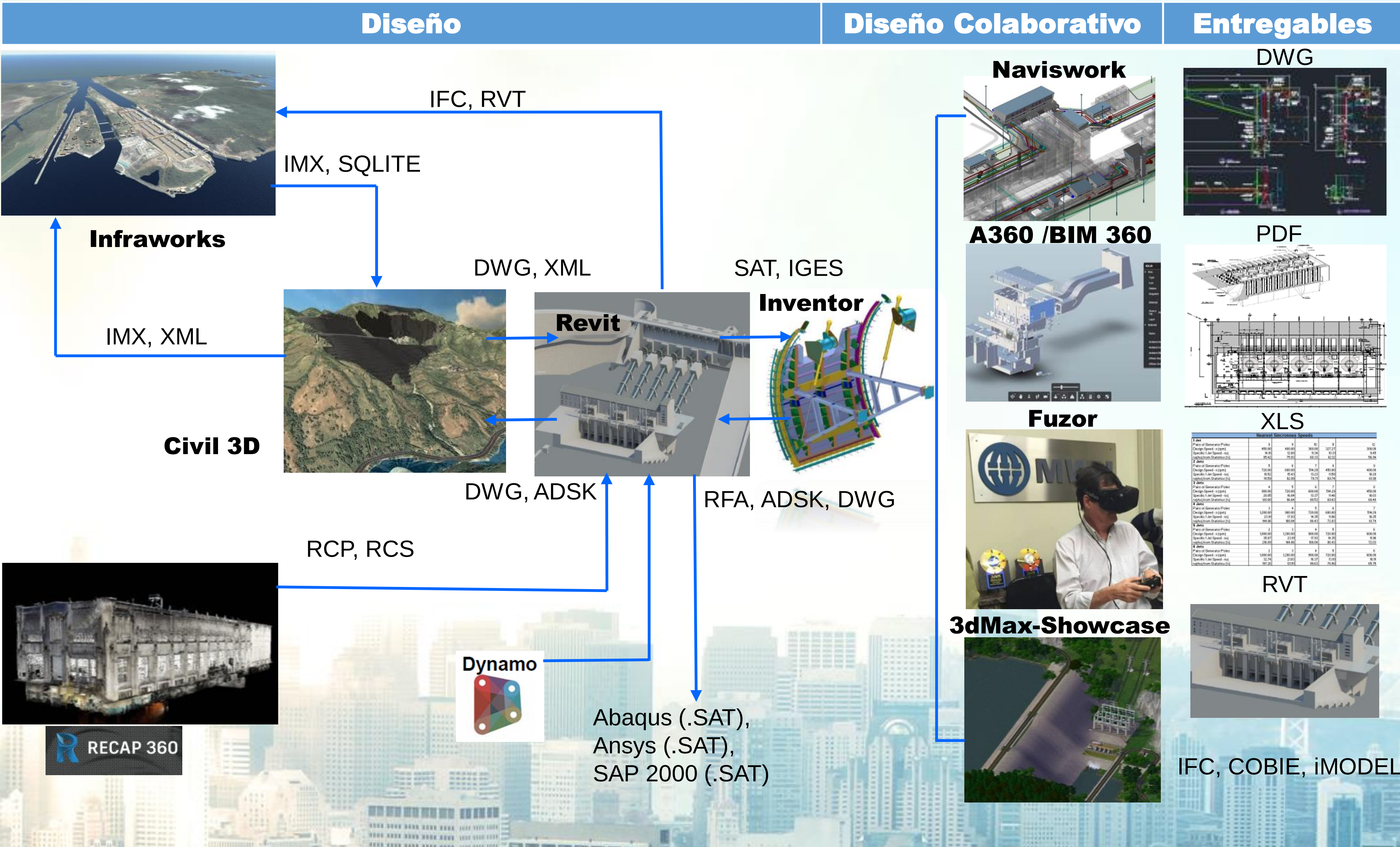
MANTENERNOS COMPETITIVOS

Podemos sobrevivir sin BIM?

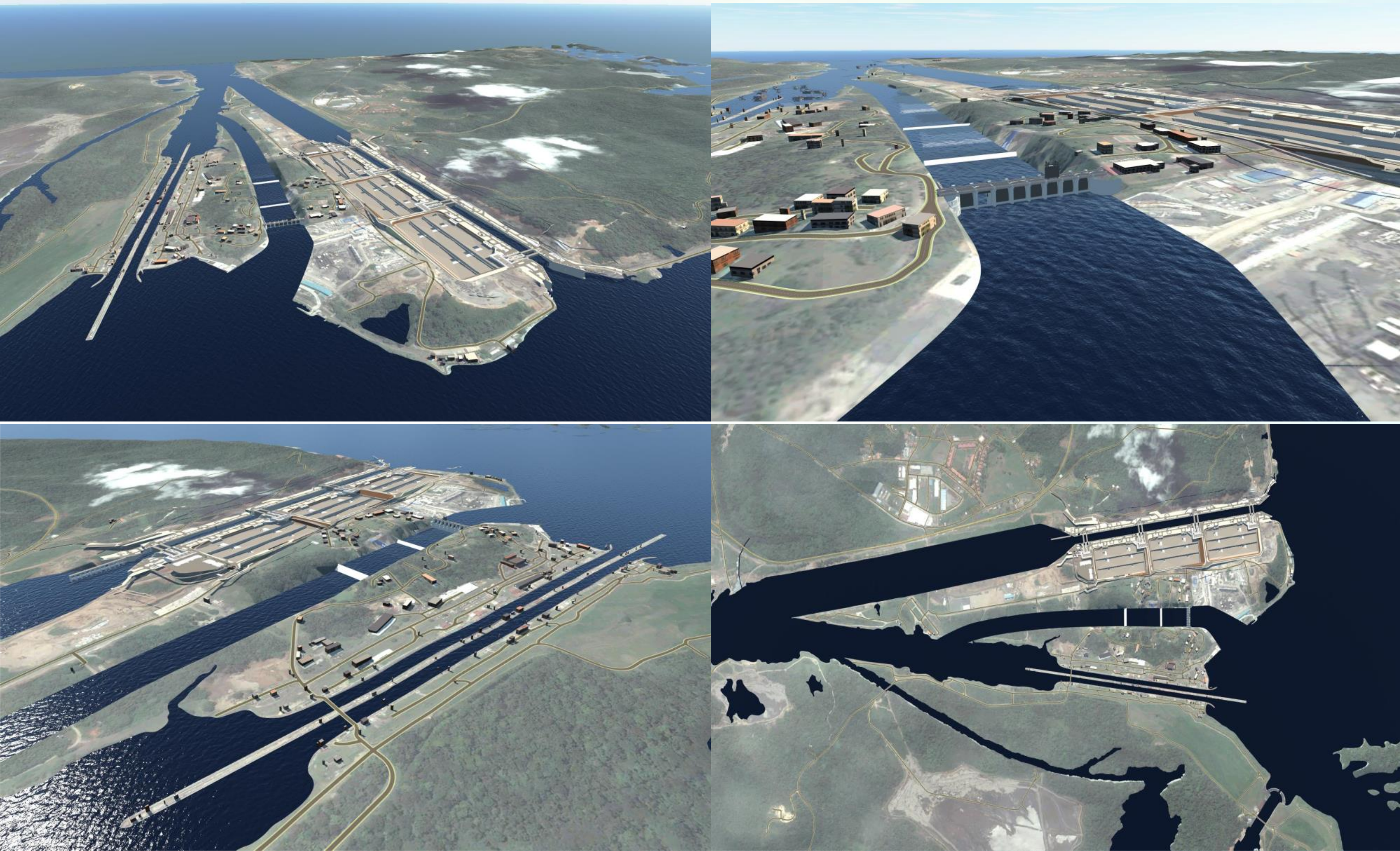
FLUJO DE TRABAJO



FLUJO DE TRABAJO



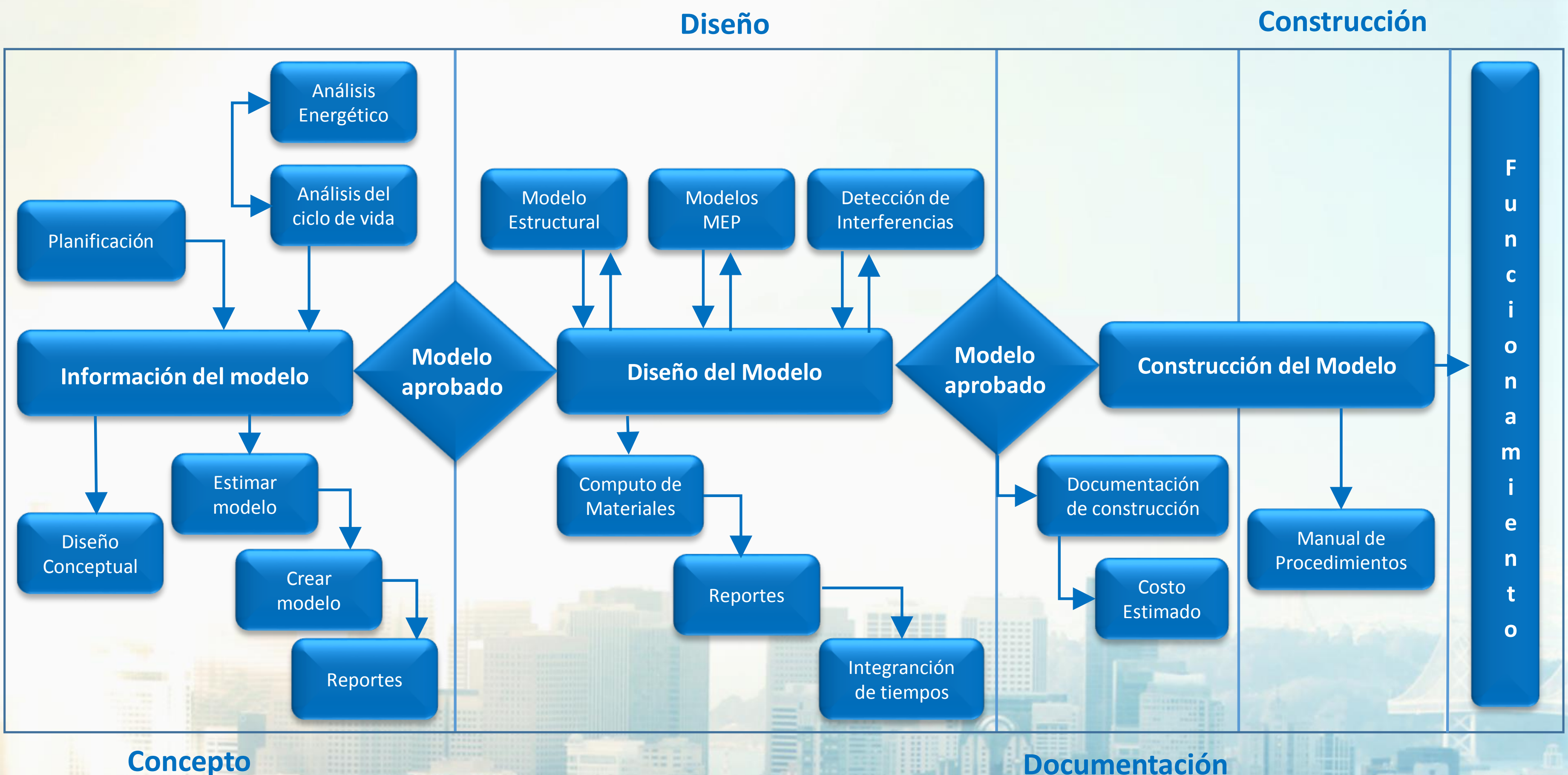
BIM – INFRAWORKS



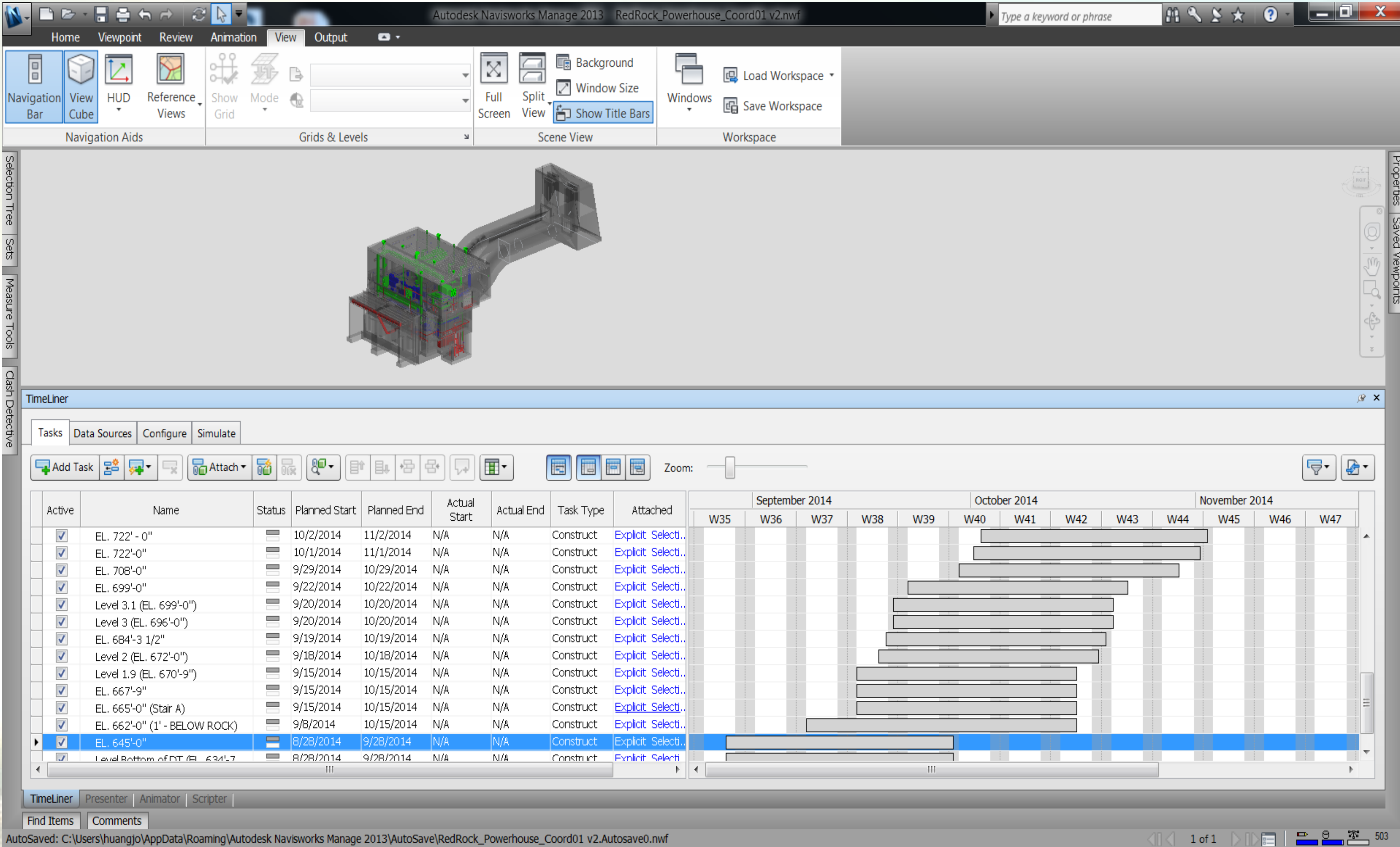
REUNIONES DE COORDINACIÓN

3D a 7D

3D Modelo
4D Programación
5D Control de Costos
6D Sustentabilidad
7D Mantenimiento



MODELO 4D (SEQUENCIA CONSTRUCTIVA)



BIM - PROTOCOLO

BIM - PROTOCOLO

AIA E202-2008: Building Information Modeling Protocol Exhibit

La parte clave de la E202 es la definición de dos conceptos fundamentales:

- Level of Development (LOD)
- Model Element Author (MEA)

AIA INTRODUCTION TO AIA CONTRACT DOCUMENTS

§ 4.3 Model Element Table

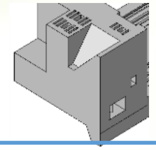
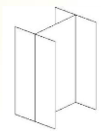
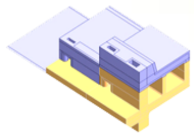
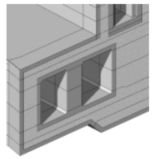
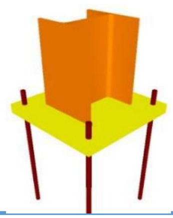
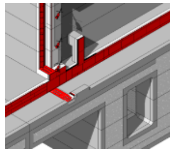
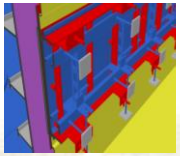
Identify (1) the LOD required for each Model Element at the end of each phase, and (2) the Model Element Author (MEA) responsible for developing the Model Element to the LOD identified.

Insert abbreviations for each MEA identified in the table below, such as "A – Architect," or "C – Contractor."

NOTE: LODs must be adapted for the unique characteristics of each Project.

Model Elements Utilizing CSI UniFormat™																
				Preliminary Design		Schematic Design		Design Development		Construction Documents		Post Construction				Note Number (See 4.4)
				LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	
A SUBSTRUCTURE	A10 Foundations	A1010	Standard Foundations													
		A1020	Special Foundations													
		A1030	Slab on Grade													
	A20 Basement Construction	A2010	Basement Excavation													
		A2020	Basement Walls													
B SHELL	B10 Superstructure	B1010	Floor Construction													
		B1020	Roof Construction													
	B20 Exterior Enclosure	B2010	Exterior Walls													
		B2020	Exterior Windows													
		B2030	Exterior Doors													
	B30 Roofing	B3010	Roof Coverings													
		B3020	Roof Openings													
C INTERIORS	C10 Interior Construction	C1010	Partitions	NA	NA	100	A	200	A	300	A	300	C	NA	NA	
		C1020	Interior Doors	NA	NA	NA	NA	200	A	300	A	300	C	NA	NA	
		C1030	Fittings													
	C20 Stairs	C2010	Stair Construction	NA	NA	100	A	200	A	200	A	200	C	NA	NA	
		C2020	Stair Finishes													
	C30 Interior Finishes	C3010	Wall Finishes													
		C3020	Floor Finishes													
		C3030	Ceiling Finishes													

NIVELES DE DESARROLLO – LOD (AIA)

		LOD 100 –Diseño Conceptual – Representación genérica
		LOD 200 –Diseño Esquemático
		LOD 300 – Forma, ubicación, tamaño, orientación.
		LOD 350 – Objetos específicos, interfaces con otros sistemas. Incluye información no gráfica
		LOD 400 –Documentos de Fabricación Shop Drawings
		LOD 500 – Modelo verificado sobre el terreno, con información no gráficapara Mantenimiento

Model Element Author (MEA) - Matriz

Project Name:			BIM Collaboration Matrix (last update 7/19/2011)				
Discipline / Model Name	**Company**	**Office Location**	**BIM/CAD Software**	**Software Version**	**Model Coordinator**	**Number of Models**	**Last Model Update**
	MWH	Buenos Aires	Revit Arch				
	MWH	Buenos Aires	Revit Arch				
	MWH	Buenos Aires	Civil 3D				
	MWH	Buenos Aires	Revit Structure				
	MWH	Buenos Aires	Revit Structure				
	MWH	Buenos Aires	Revit Structure				
	MWH	Buenos Aires	Revit Structure				
	MWH	Buenos Aires	Revit Structure				
	MWH	Chicago	Revit Structure				
	MWH	Chicago	Revit Structure				
	MWH	Chicago	Revit Structure				
	MWH	Chicago	Revit Structure				
	MWH	Chicago	Revit Structure				
	MWH	Chicago	Revit Structure				
	IV Group	Netherlands	Tekla Xsteel - IFC - RVT				
	IV Group	Netherlands	Tekla Xsteel - IFC - RVT				
	Tetra Tech	Bellevue	Revit Structure				
	Tetra Tech	Bellevue	Revit Structure				
	MWH	Chicago	Revit MEP				
	MWH	Chicago	Revit MEP				
	MWH	Buenos Aires	Revit MEP				
	MWH	Buenos Aires	Revit MEP				
	MWH	Chicago	AutoCAD Electrical				
	Sembenelli	Milan	MicroStation InRoads				
	Sembenelli	Milan	MicroStation InRoads				

BIM – CAD MANUAL

MWH®

BUILDING A BETTER WORLD

BIM/CAD Standards

No. de Documento:

[Keywords]

4.3 BIM PROJECT MANAGER

Discipline	Software - Autodesk	
Structural	Revit Structure	X
Process Mechanical	Revit MEP	X
Plumbing	Revit MEP	X
Electrical	Revit MEP	
Civil	AutoCAD Civil 3D	X
Process and Instrumentation Diagrams, Plant Flow Diagrams, and Process and Piping Schematics	Autocad P&ID	X
Standard 2D Drawings	Autocad	X
Visualization, Collaboration, Clash detection, 4D, 5D	NavisWorks 3D Studio Max	X
Contract submittal Documents	Portable Document Format (PD	X
Coordination	Naviswork	

10.0 COLLABORATION PROCEDURES

10.1 1. COLLABORATION STRATEGY:

Describe how the project team will collaborate. Include items such as communication methods, document management and transfer, and record storage.

10.2 2. MEETING PROCEDURES:

Meeting type	Project stage	Frequency	Participants	Location
BIM Requirements Kick-Off	At the Beginning of the project	1 only	All the people	Meeting Room – Santiago /Denver
BIM Execution Plan Demonstration	At the Beginning of the project	1 only	All the people	Meeting Room – Santiago /Denver
Design Coordination	From beginning to End of Project	1 x per week	Cad Leads / Discipline/ BIM Manager	Meeting Room – Santiago /Lync
Construction Over-The-Shoulder Progress Reviews	From beginning to End of Project	1 x per week	CAD Leads	Lync
Others				

3.0 BIM CONTACTS / ROLES AND RESPONSIBILITIES

Role	Name	Organization	Location
Project Manager	Lucrecia Real	MWH	Bs. As
Structural Lead	Jose Abbiuso	MWH	Bs. As
BIM Manager	Lucrecia Real	MWH	Bs. As
CAD QC Manager	Lucrecia Real	MWH	Bs. As
CAD Civil3D Desinger, Americas	L. Sassara	MWH	Bs. As
SCS CAD Designer	Lucrecia Real	MWH	Bs. As

TERACTIVE WORKSPACE

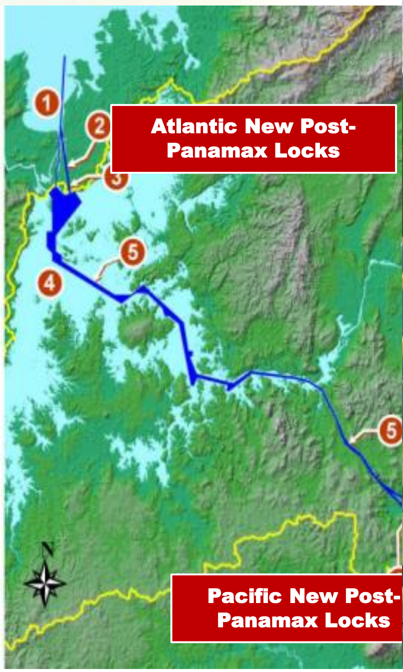
oject Team will use the following for sharing files and document management

	Document Management	Sharing Files	Comments
ivil 3D	Projectwise	Projectwise	
evit	Projectwise	Projectwise	
avisworks	Projectwise	Projectwise	
utoCAD P&ID	Projectwise	Projectwise	

BIM - IMPLEMENTACIÓN

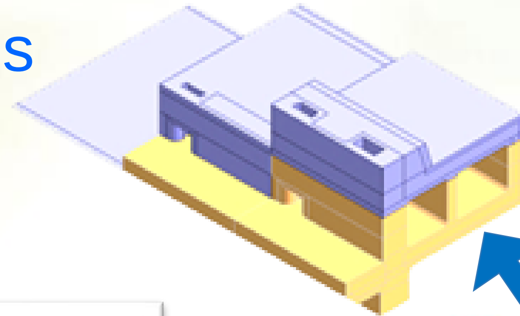
MWH now part of Stantec

BIM - IMPLEMENTACIÓN

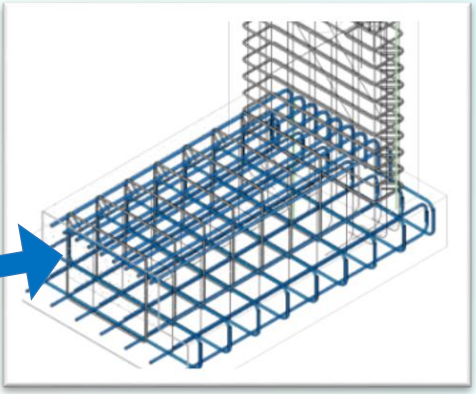


DESARROLLO DEL MODELO

Fases

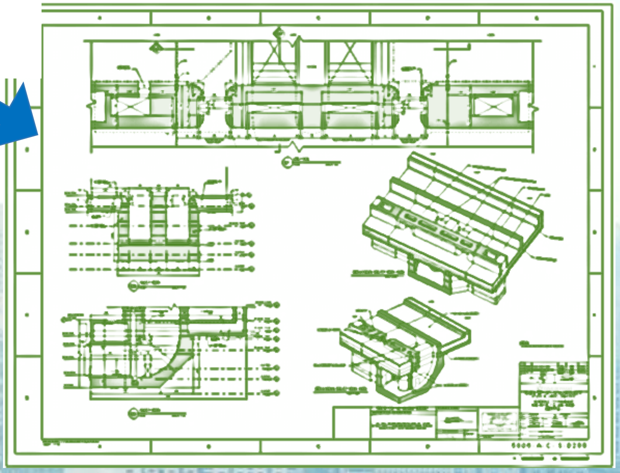


Armaduras



Planillas

Detalles

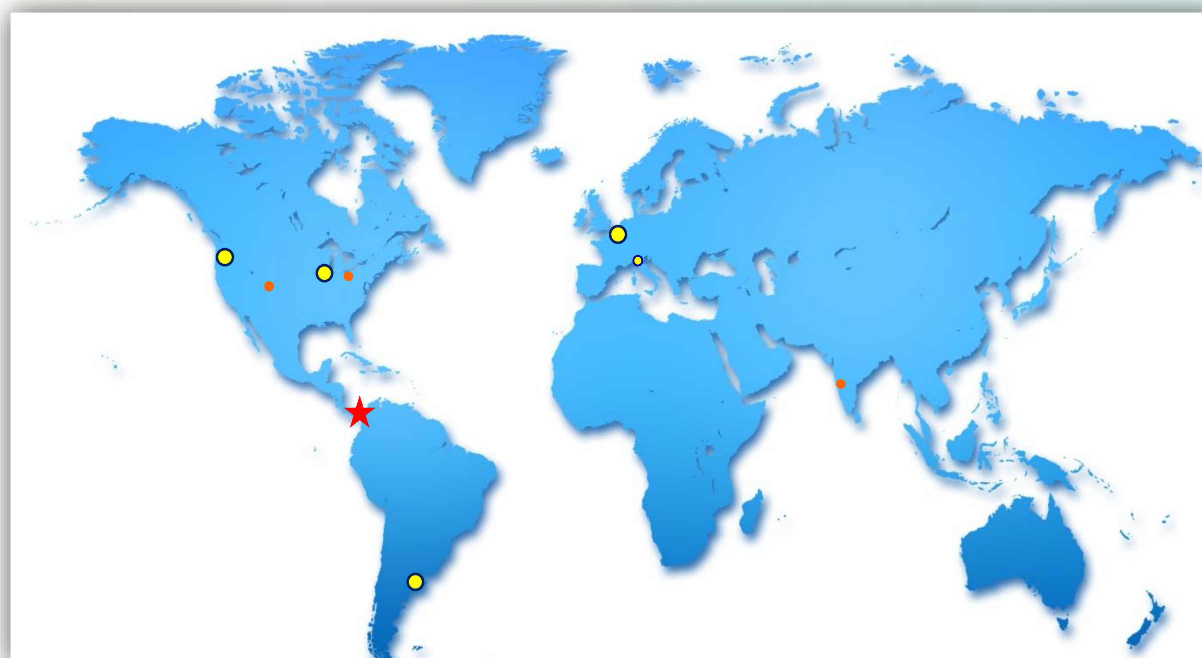


DATOS GLOBALES - ORGANIZACIÓN

Network Drive (P:) ▸ Panama ▸

Name

- CAD_BA
- CAD_CHI
- CAD_IV
- CAD_STANDARDS
- CAD_TT
- EXT_SUBMITTALS
- MWH
- PM
- PROJ_BA
- PROJ_CHI
- PROJ_IV
- PROJ_PA
- PROJ_TT
- QM Records and Working Documents
- QMS
- REVIT_BA
- REVIT_CHI
- REVIT_IV
- REVIT_TT
- Submittals

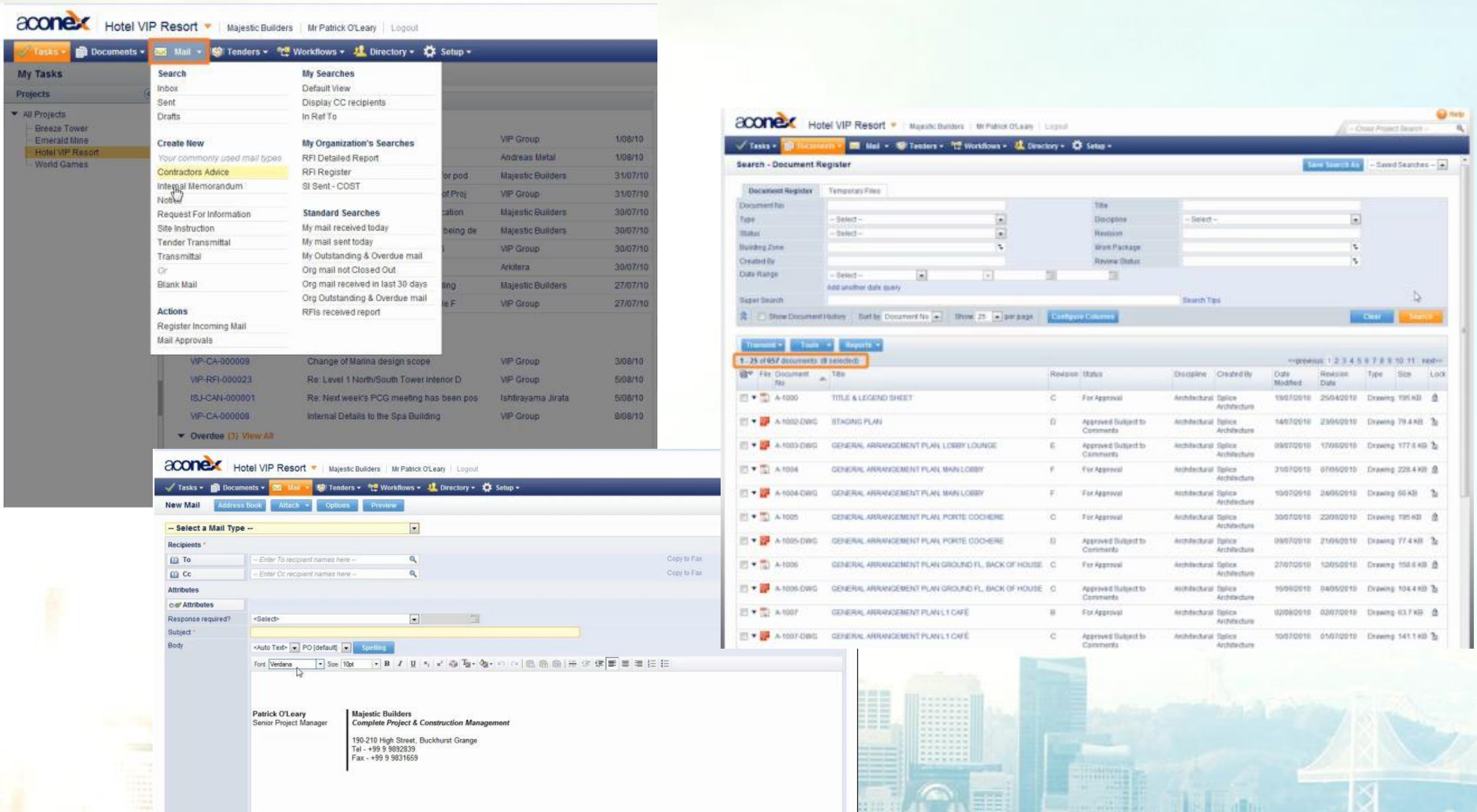


Name

- Atlantic
- Pacific

Name	Date mod
Str	6/15/2011
MEP	6/14/2011

INFORMACIÓN OFICIAL - ACONEX



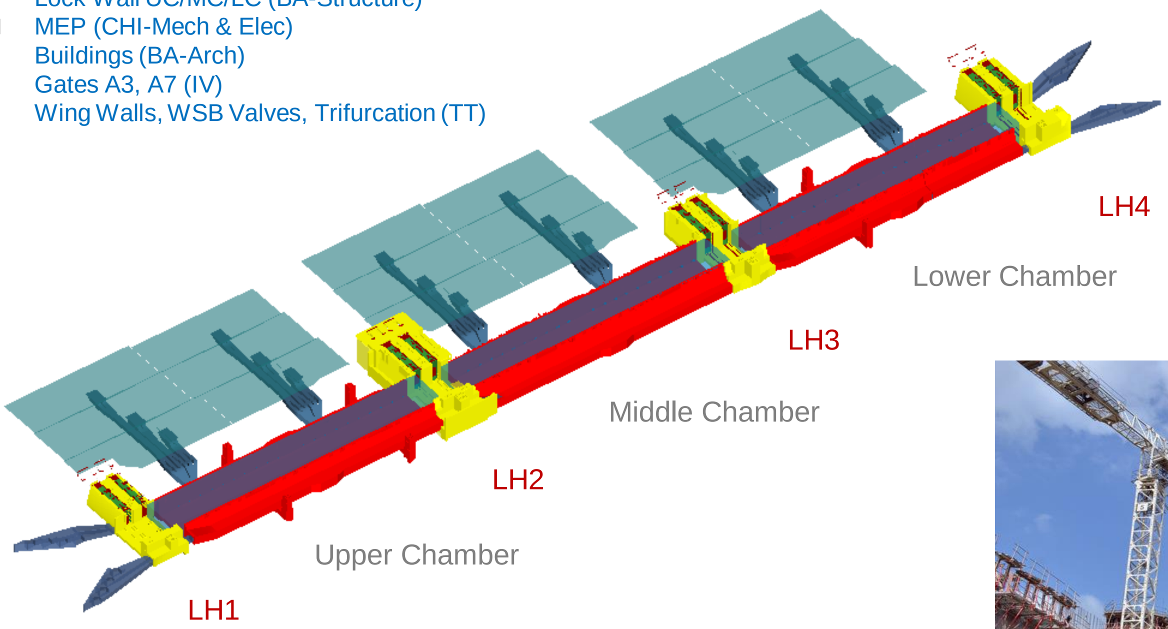
ORGANIZACIÓN DE MODELOS

Atlantic Locks Complex

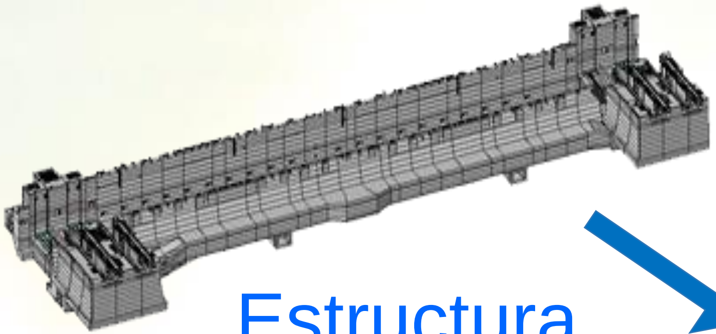
- Lock Heads 1, 2, 3, 4 (BA-Structure)
- Lock Wall UC/MC/LC (BA-Structure)
- MEP (CHI-Mech & Elec)
- Buildings (BA-Arch)
- Gates A3, A7 (IV)
- Wing Walls, WSB Valves, Trifurcation (TT)

Pacific Locks Complex

- Lock Heads 1, 2, 3, 4 (CHI-Structure)
- Lock Wall UC/MC/LC (CHI-Structure)
- MEP (CHI-Mech & Elec)
- Buildings (BA-Arch)
- Gates P1, P3, P7 (IV)
- Wing Walls, WSB Valves, Trifurcation (TT)

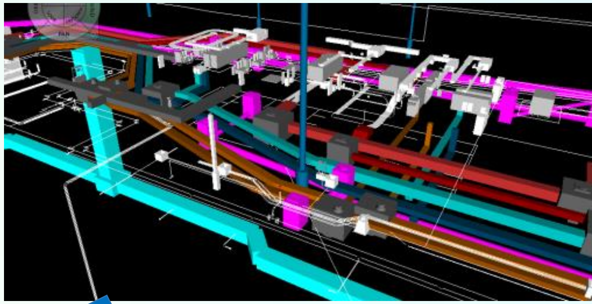


DISCIPLINAS



Estructura

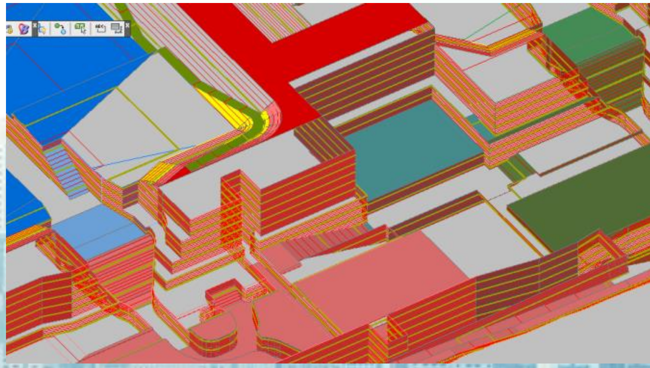
INTEGRACIÓN



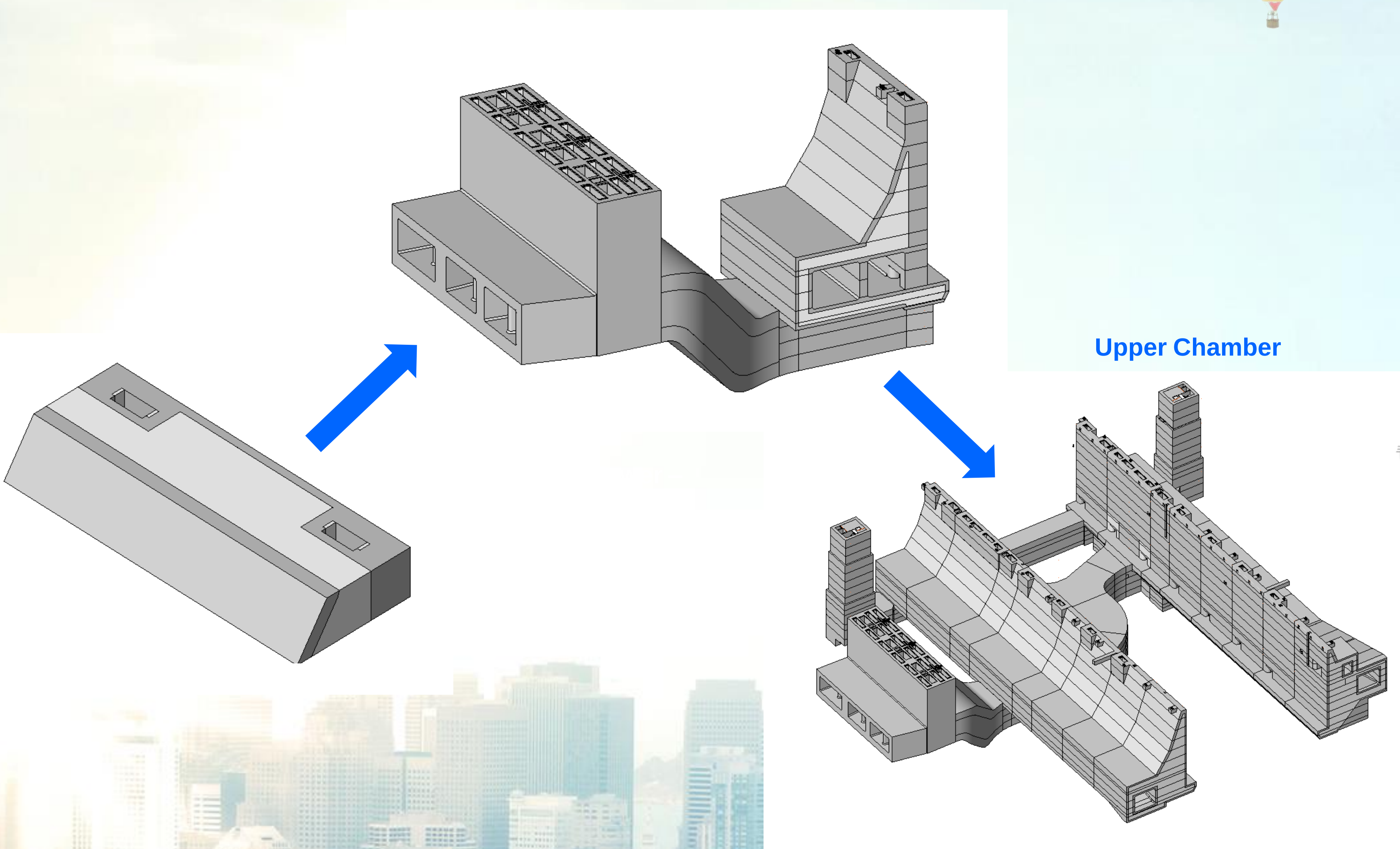
Piping

Arquitectura

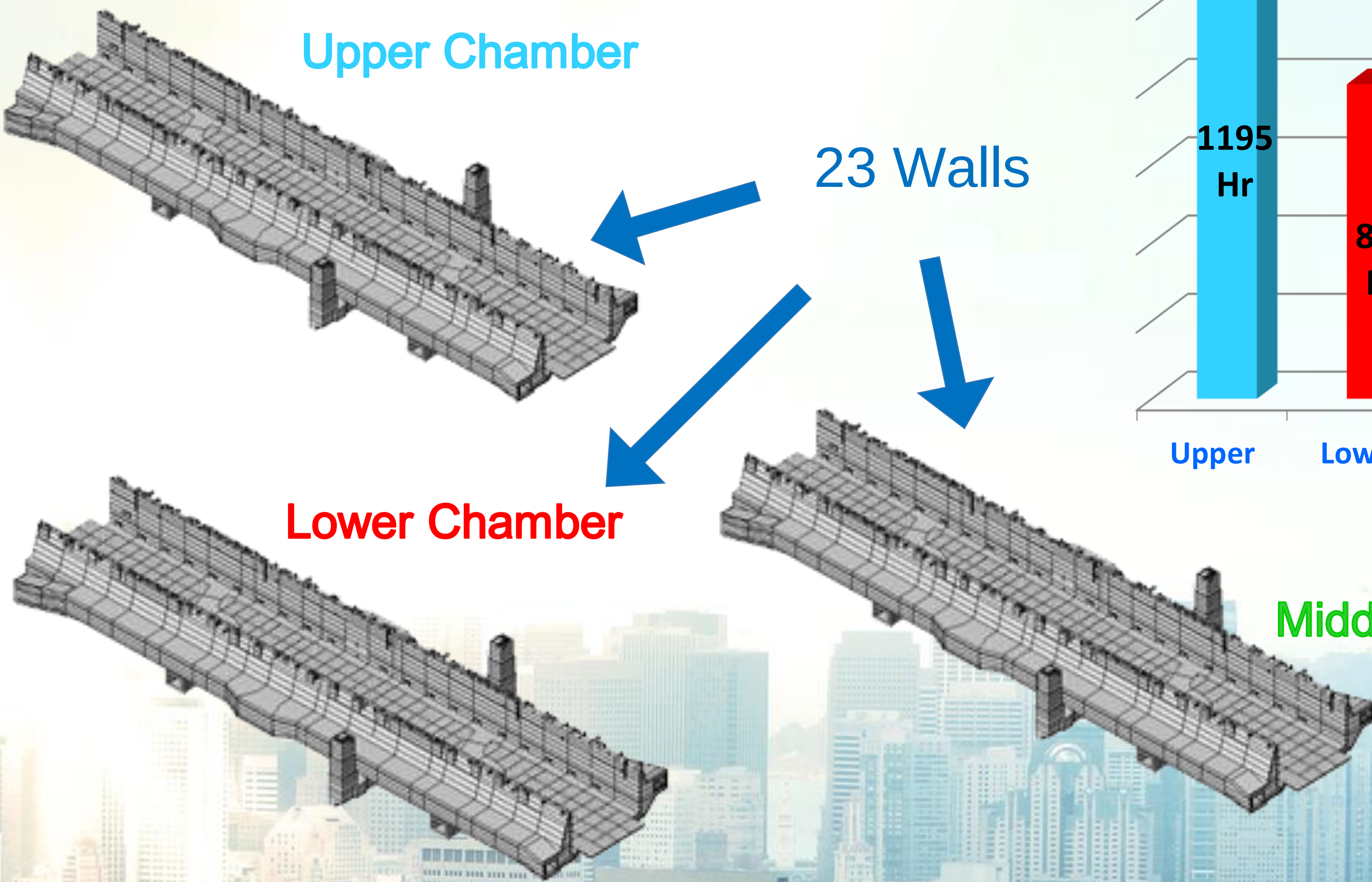
Excavación

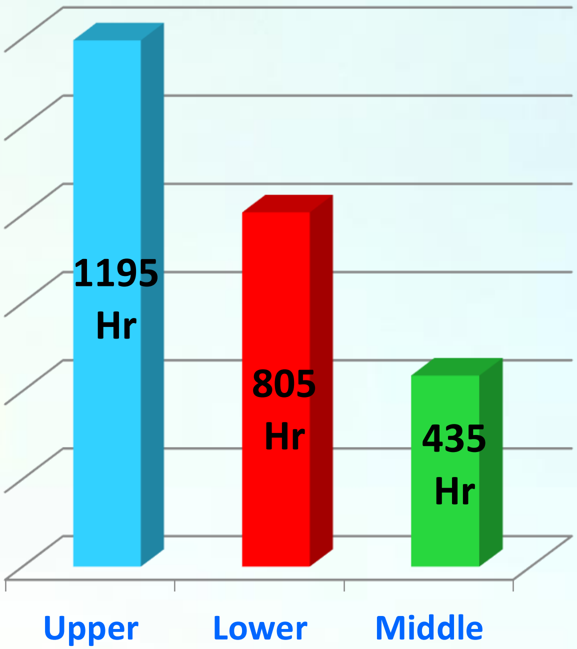


FAMILIAS - MODULO

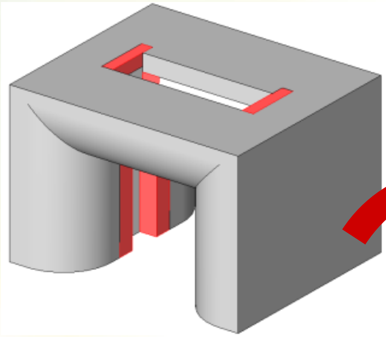


BENEFICIOS DE LA PRODUCTIVIDAD

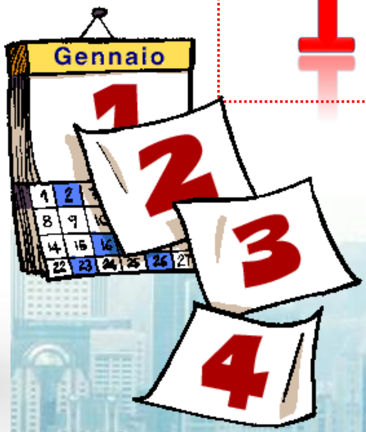




DISEÑOS DE CALIDAD + VENTAJA COMPETITIVA



Cambios!!

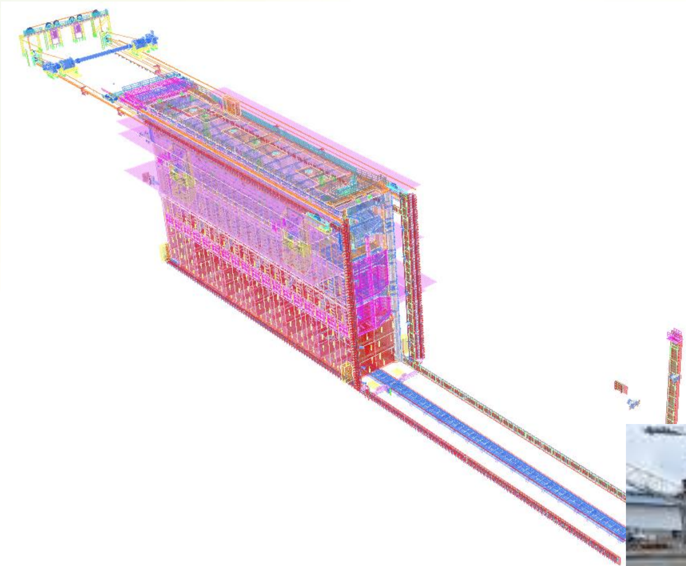


1 DAY

INTEROPERABILIDAD ENTRE DISCIPLINA

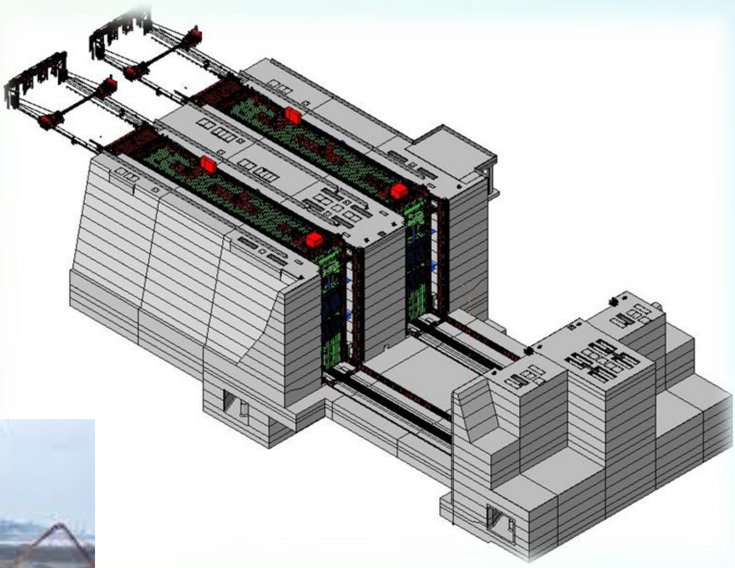
Tekla Structure

Revit Structure



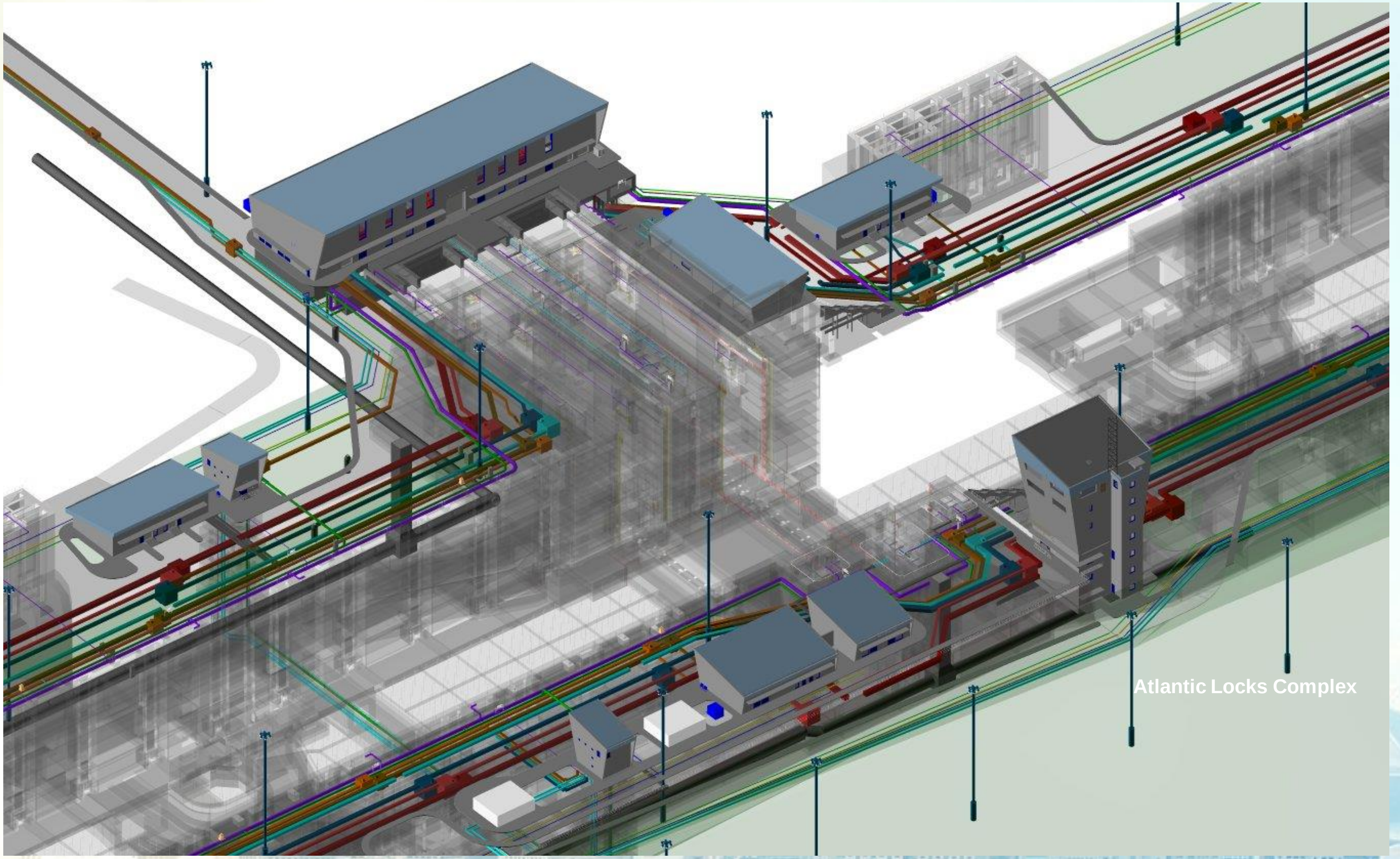
IFC

DWG

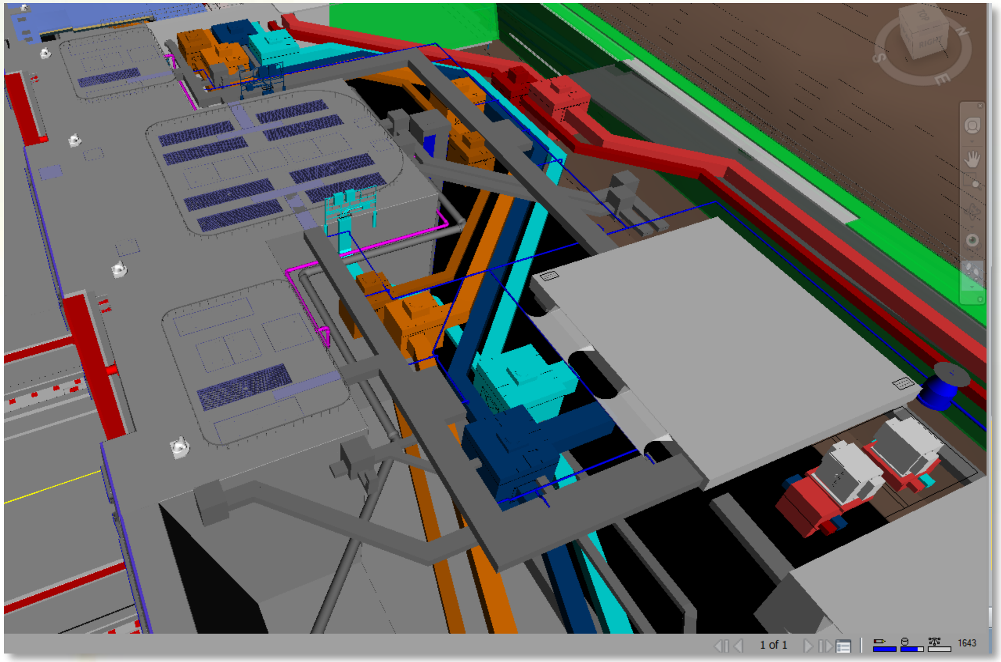


IFC= Industry Foundation Classes. Formato de archivo basado en objetos, desarrollado por buildingSMART.
IFC= Es un formato neutral e intercambiable para describir los datos de la industria de la construcción.

DISEÑO COLABORATIVO



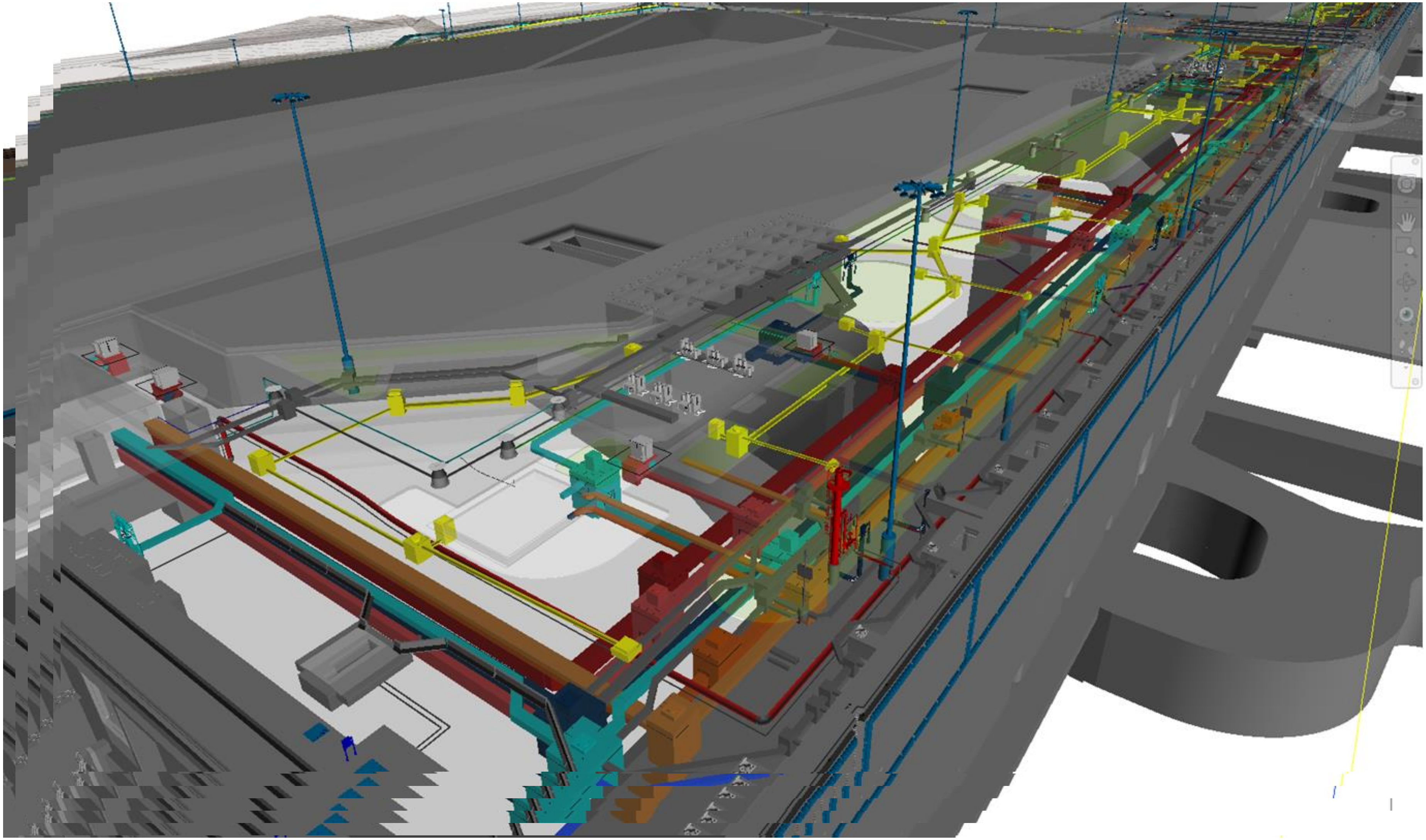
SISTEMAS



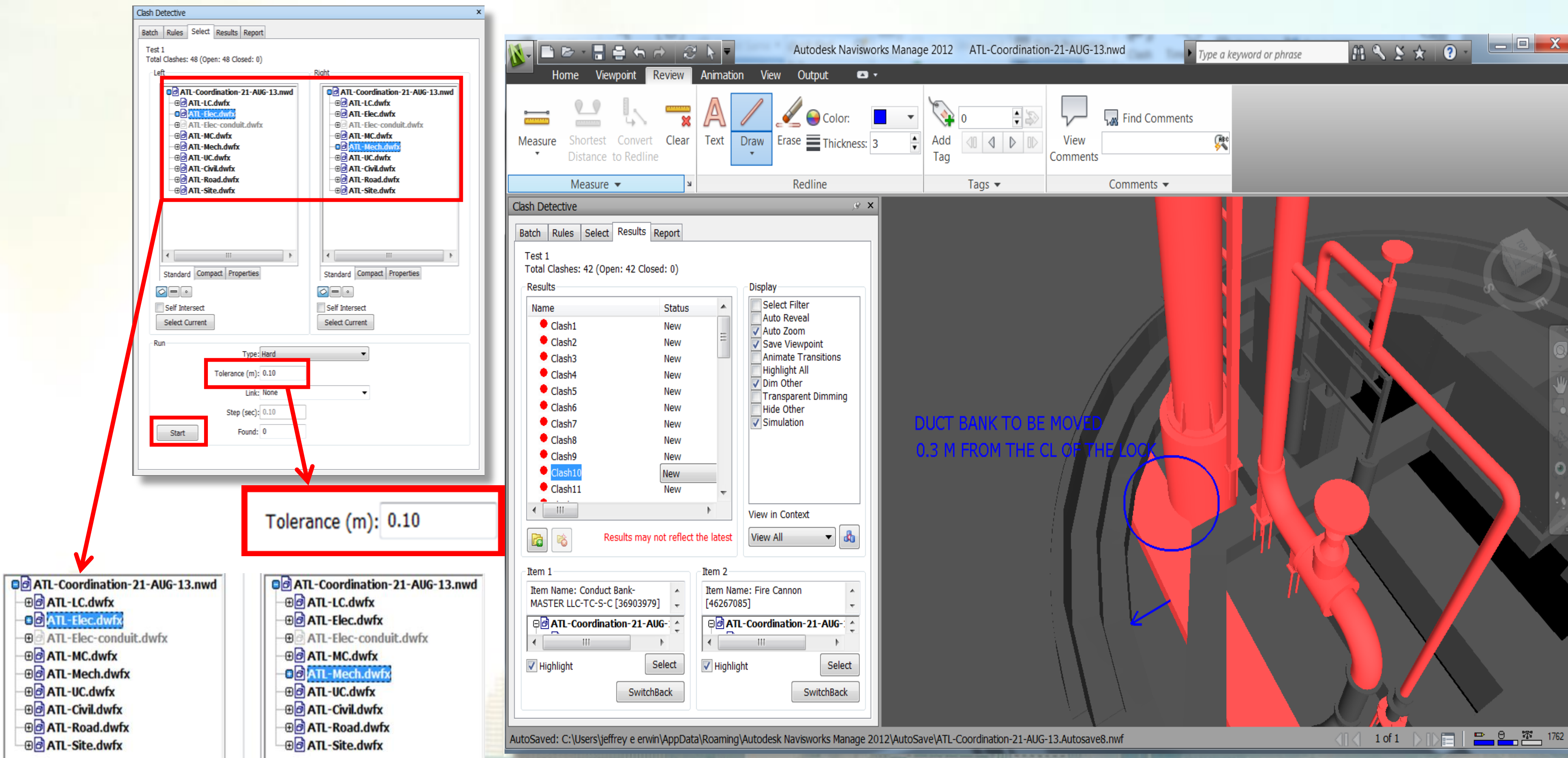
DISCIPLINAS

- SUPERFICIES
- MUROS DE HORMIGON
- ESTRUCTURAS DE COMPUERTAS
- TUBERÍAS MECÁNICAS
- DUCTOS ELECTRICOS
- DRENAJES PLUVIALES
- DRENAJES SUPERFICIALES
- POSTES LUMÍNICOS
- INFRAESTRUCTURA
- MUROS DE RETENCIÓN

Model Section – Upper Chamber



COORDINACIÓN - NAVISWORK



COORDINACIÓN - NAVISWORK

- REPORTE DE INTERFERENCIAS
  - AREA RESPONSABLE
  - ACCIÓN

Assigned To
Electrical
Elec
Civil

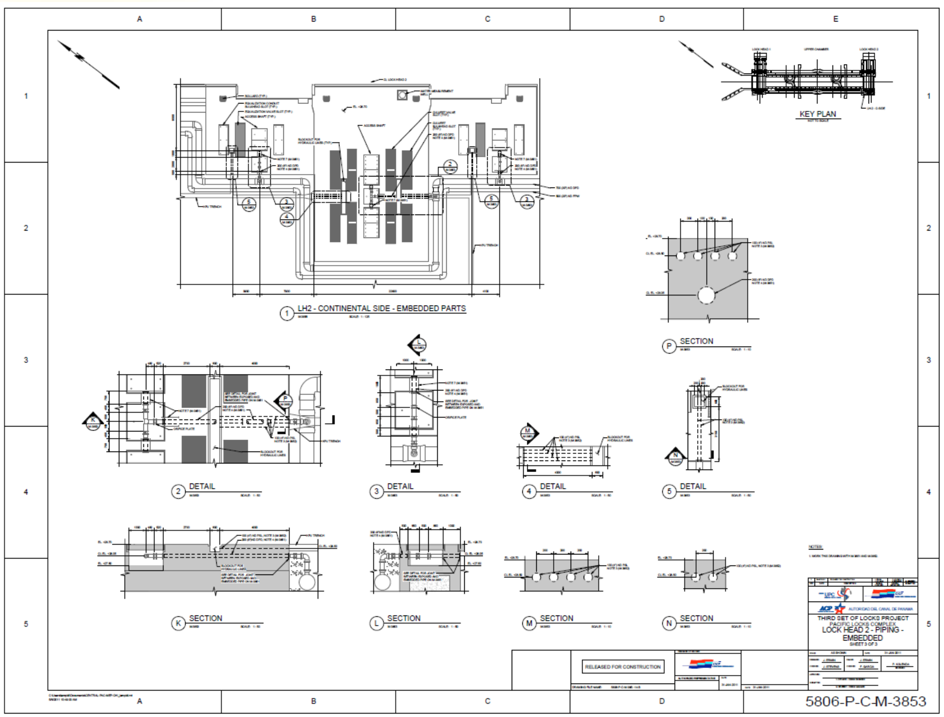
_ Trench alignment will be adjusted to accommodate ductbank

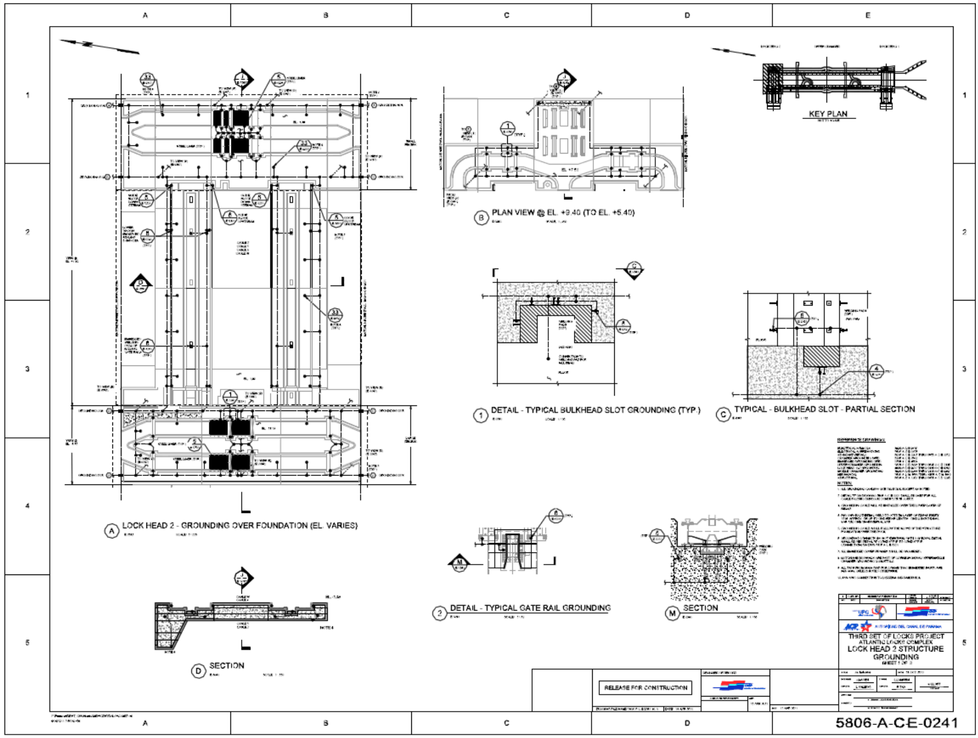
Autodesk® Navisworks® Clash Report

Elec/Civil	Tolerance	Clashes	New	Active	Reviewed	Approved	Resolved	Type	Status
	0.001m	11	0	7	0	0	4	Hard	Old

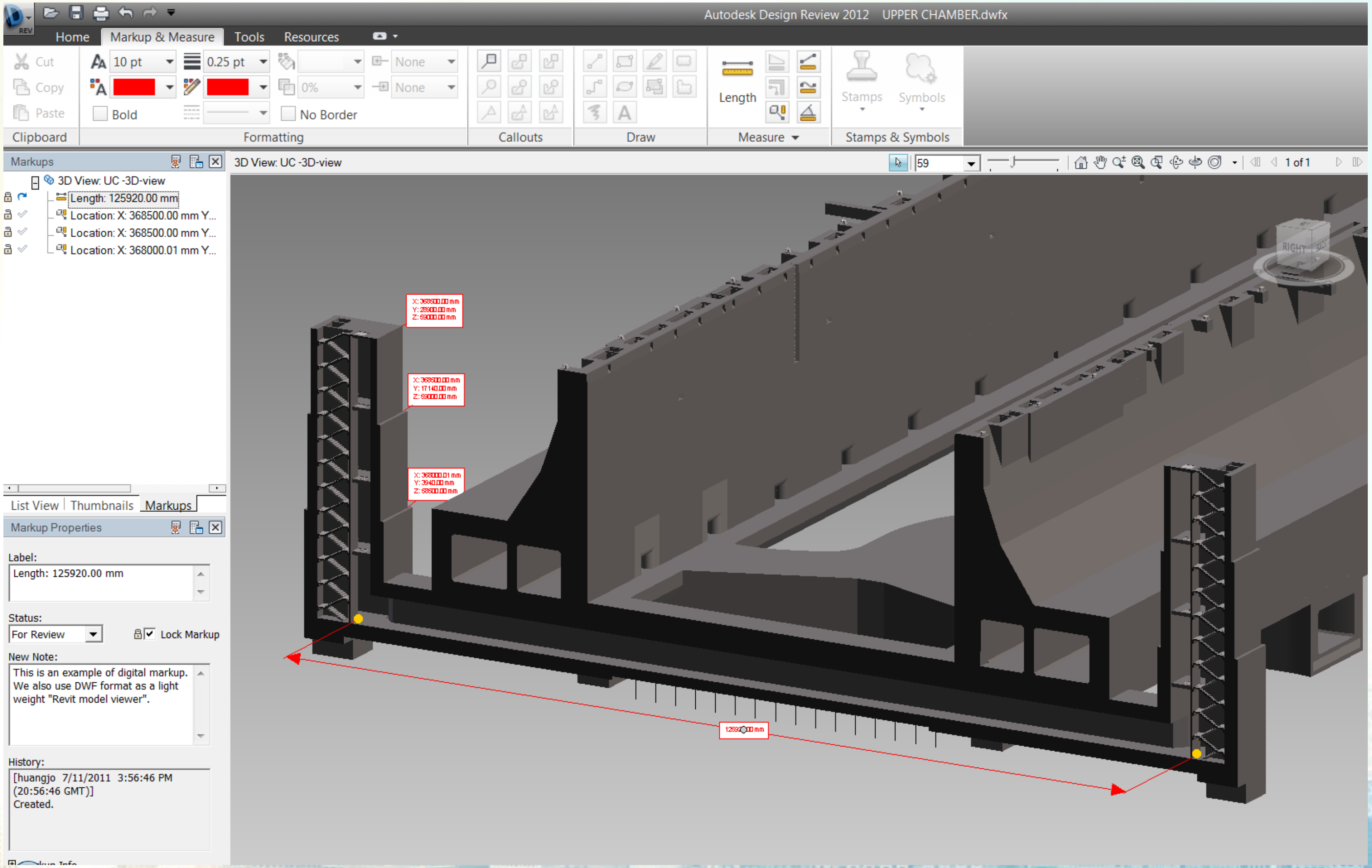
						Item 1		Item 2		
Image	Clash Name	Status	Description	Assigned To	Clash Point	Item Name	Item Type	Item Name	Item Type	Comments
	Clash2	Active	Hard	Electrical	x:263.94, y:28.05, z:171.36	Manhole Type E [33802479]	Shell	Surface Drainage From Civil3D [30883947]	Shell	#5 - Jeffrey E Erwin - 2012/10/11 14:54.58 Assigned to: Electrical ______________ Ductbank Manhole will move upstream of manhole
	Clash4	Active	Hard	Elec	x:84.17, y:27.54, z:153.50	SubPart 1	Segment	Surface Drainage From Civil3D [30883947]	Shell	#6 - Jeffrey E Erwin - 2012/10/11 15:03.07 Assigned to: Elec ______________ Coordinate with Surface Drainage, area will be adjusted. potential adjustment in size of manhole
	Clash5	Active	Hard	Civil	x:824.38, y:27.48, z:327.77	Master Manhole Type A_B_K [23745213]	Shell	Surface Drainage From Civil3D [30883947]	Shell	#7 - Jeffrey E Erwin - 2012/10/11 15:14.29 Assigned to: Civil ______________ Trench alignment will be adjusted to accommodate ductbank manholes
	Clash6	Active	Hard	Elec	x:835.47, y:27.47, z:331.47	Master 103 mm Conduits Only [23286669]	Segment	Surface Drainage From Civil3D [30883947]	Shell	#8 - Jeffrey E Erwin - 2012/10/11 15:17.18 Assigned to: Elec ______________ Duct banks to OSC will be lowered to clear trench by 0.3 m
	Clash7	Active	Hard	Elec	x:804.23, y:27.37, z:328.88	Master 103 mm Conduits Only [23286677]	Segment	Surface Drainage From Civil3D [30883947]	Shell	#9 - Jeffrey E Erwin - 2012/10/11 15:21.01 Assigned to: Elec ______________ See above
	Clash10	Active	Hard	Elec	x:47.40, y:15.36, z:154.85	High Mast Lighting Fixture Type B [27881605]	Shell	Surface Drainage From Civil3D [30883947]	Shell	#10 - Jeffrey E Erwin - 2012/10/11 15:22.48 Assigned to: Elec ______________ A review of all litghting location, coordinated with elec/mech and latest site layout

DOCUMENTACIÓN IMPRESIÓN A PDF - DWG

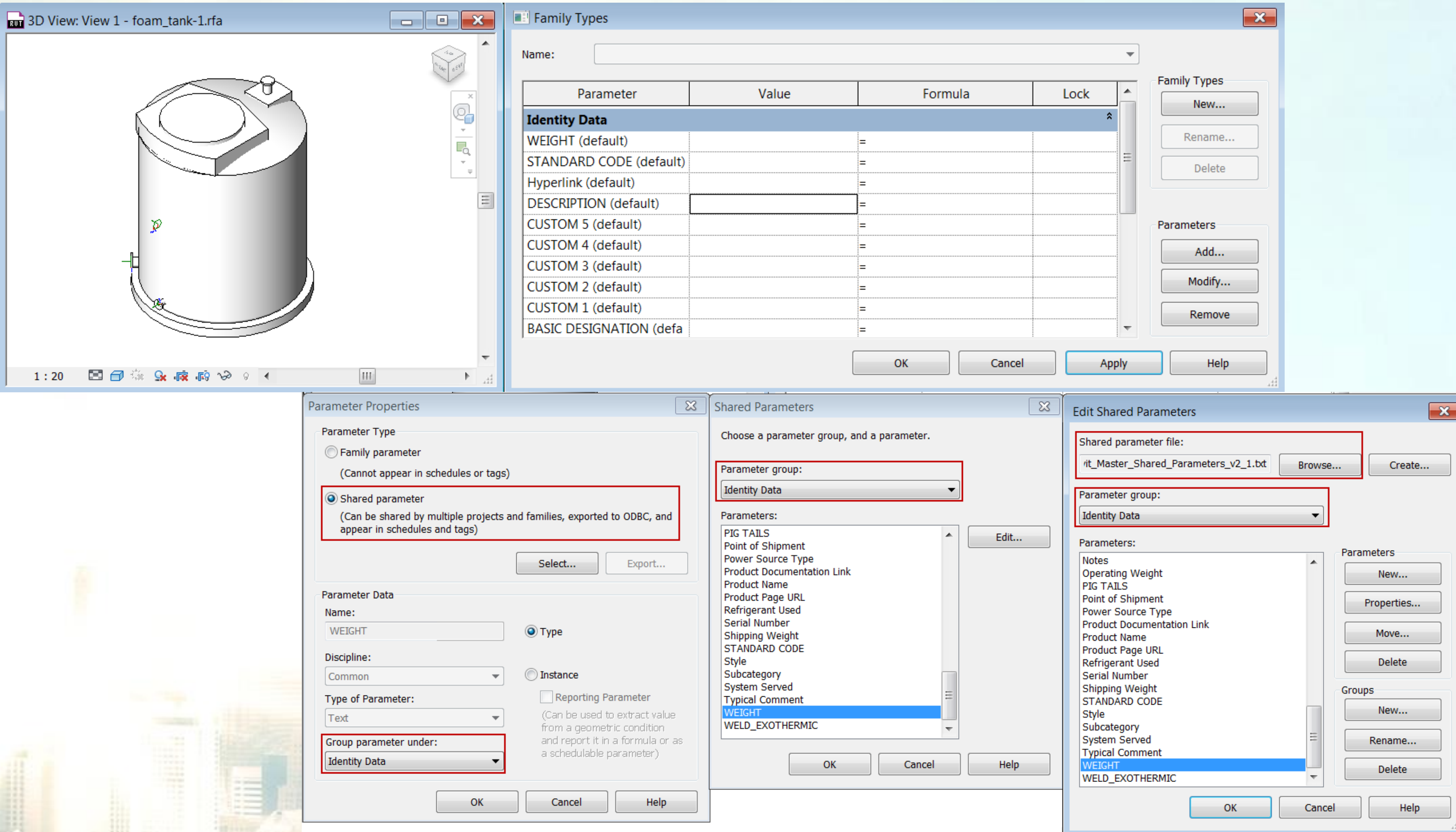




DOCUMENTACIÓN DWF DESDE REVIT

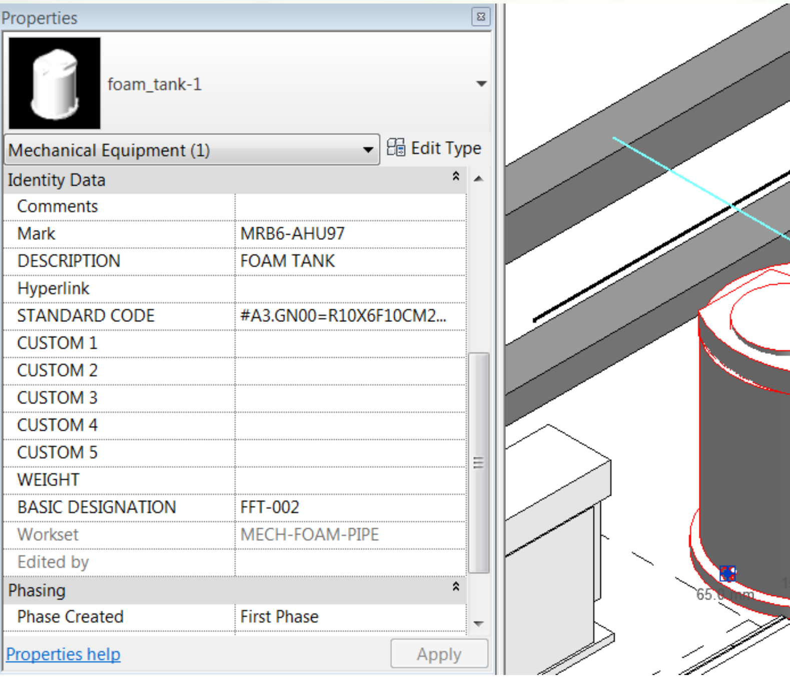


PARÁMETROS COMPARTIDOS



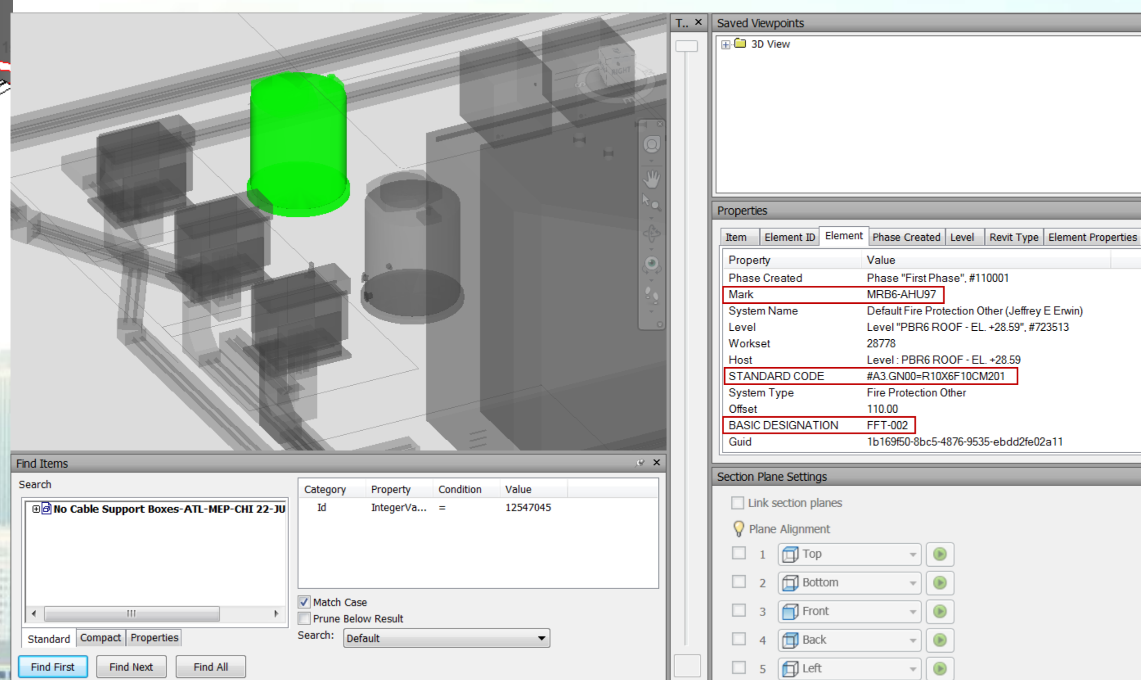
REVIT & NAVISWORK

Revit MEP



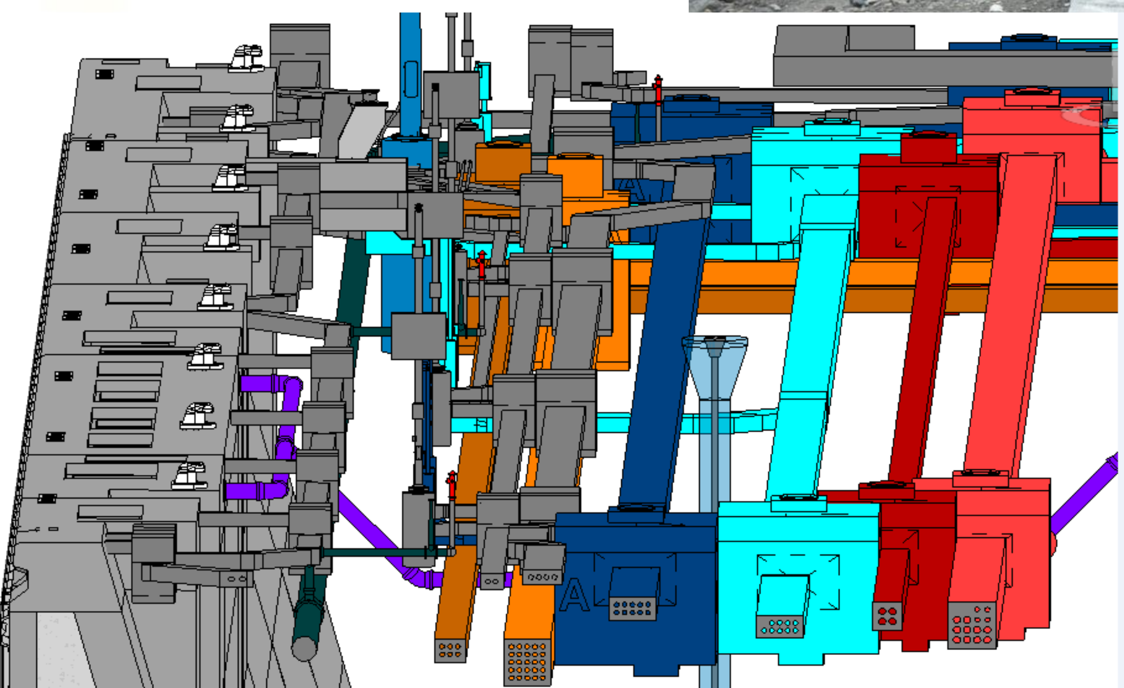
ID de elemento (será el mismo en Revit, Navisworks y base de datos de Access)

Navisworks Manage

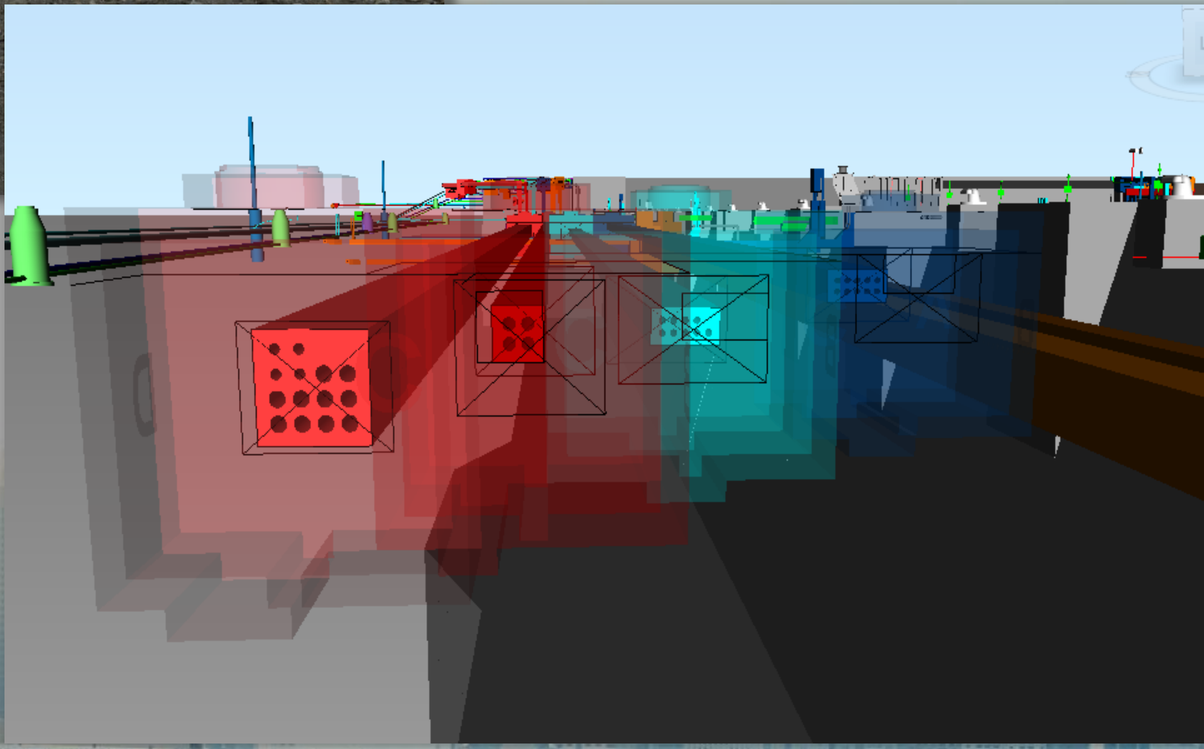


CANAL DE PANAMA

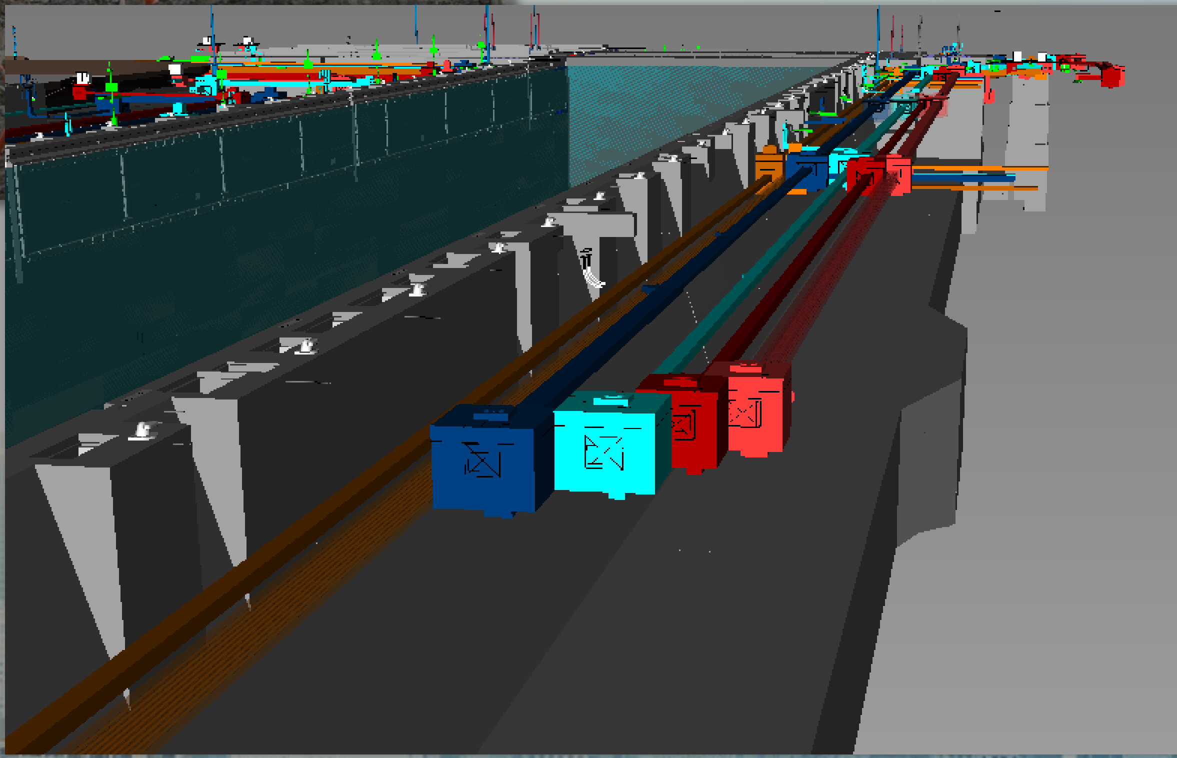
MODELO - CONSTRUCCIÓN



MODELO - CONSTRUCCIÓN

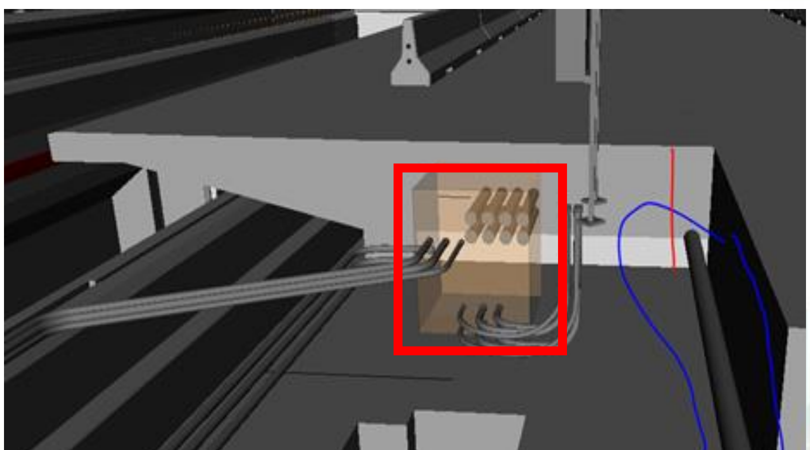
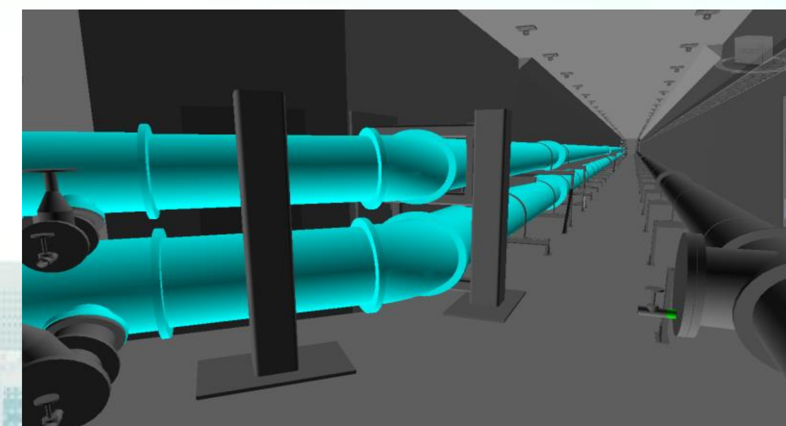


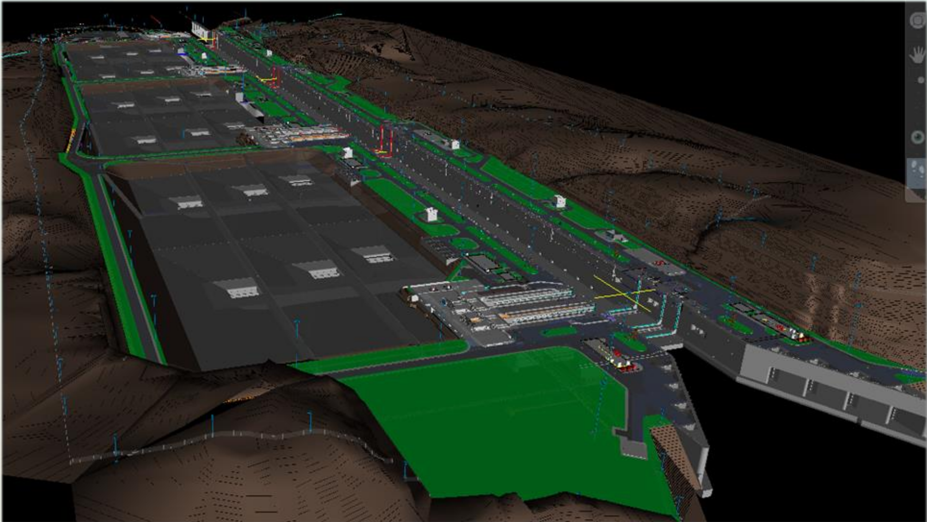
MODELO - CONSTRUCCIÓN



MODELO - CONSTRUCCIÓN






26.May.2016


TORRE DE CONTROL

La Transición a BIM

Es una decisión de negocios

Es una decisión de Gestión

Es un proceso de Cambio

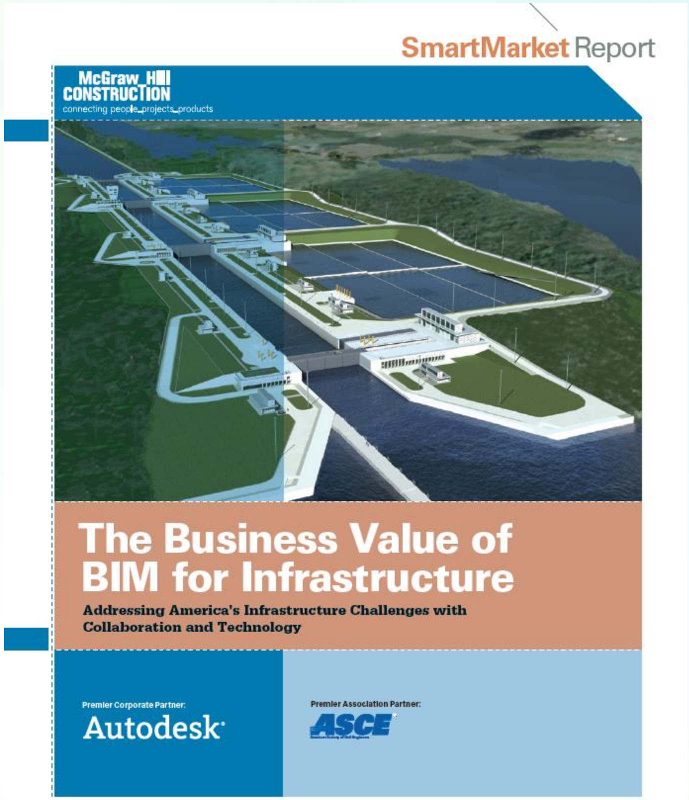
EL VALOR DE BIM

2012 Publicación deAutodesk.

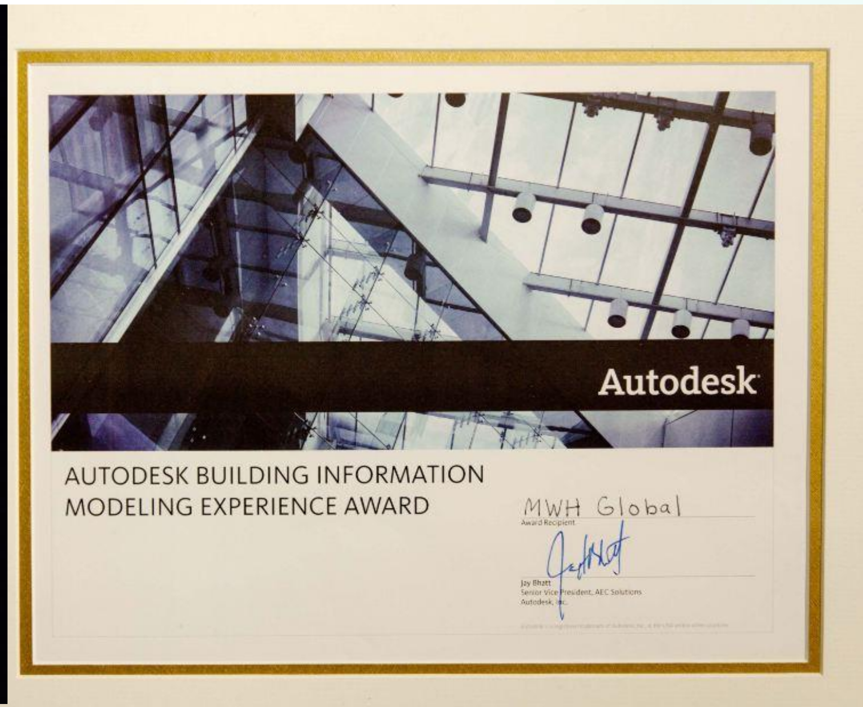
67% de todos los usuarios de la infraestructura reportar un ROI positivo, superior al 63%

Beneficios:

- La reducción de los conflictos y los cambios
- Mejora de la calidad del proyecto
- Mejor previsibilidad de los resultados del proyecto



EL VALOR DE BIM



EL VALOR DE BIM