

# B I C 2 0 1 6



## Building Information Modelling: **Industry Collaboration**

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Editors: António Aguiar Costa, Paula Couto and António Ruivo Meireles





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# BIM Execution Plan for the New International Airport in Mexico City (BEP for NAICM)

**Alan Enríquez Arias**

*Grupo Sacmag*

## 1. INTRODUCTION

The Nuevo Aeropuerto Internacional de la Ciudad de México (NAICM) is to be a world-class airport offering exceptional quality of service and availability to a wide range of international and domestic destinations. The NAICM is currently the most important airport infrastructure ongoing project in the west hemisphere & the first LEED Platinum v.4 Airport in the world. The project consists in more than 5000Ha (51.53Km2), therefore creating a BIM model for the whole site consisted of a huge effort and determination of a large team located in 3 different places in 2 different countries and the delivery time consisted in 1 year & 4 months. TASANA Scope was to design through a BIM process all the auxiliary buildings, roads, aprons, runways and utilities for the NAICM.

## 2. Experience

Setting up the basis for the model from the beginning was a very important task in order to have a clear process for each member of the team and to achieve easier our goal which consisted in creating an integrated Building information model for the whole project from the Schematic Phase to the Construction Documentation. The first step was to create a simple and clear BIM Execution Plan (BEP) for internal purposes and to establish the Common Data Environment, the scope of every model by discipline including what to expect in the different phases of the project. Also, the software choice and how the integration between these will needed to be address to avoid extra time consuming and extra costs.

The project was divided into 2 teams, Netherlands (NACO), & Mexico (SACMAG), each with different specific tasks and scopes.

|                           | <b>Phase 1<br/>10% Design</b> | <b>Phase 2<br/>30% Design</b> | <b>Phase 3<br/>60% Design</b> | <b>Phase 4<br/>100% Design</b> |
|---------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------------|
| <b>Buildings</b>          | NACO/ SACMAG                  | NACO/ SACMAG                  | SACMAG                        | SACMAG                         |
| <b>Civil</b>              | NACO                          | NACO                          | NACO                          | SACMAG                         |
| <b>Structures</b>         | NACO                          | NACO                          | SACMAG                        | SACMAG                         |
| <b>Utilities</b>          | NACO                          | NACO/ SACMAG                  | SACMAG                        | SACMAG                         |
| <b>Subsurface studies</b> | NACO                          | NACO                          | n/a                           | n/a                            |

## 3. BEP

Setting up a BIM Execution plan was one of the most decisive duties for the team. The purpose was to clarify for everyone the complex combination of civil structures, systems, aprons and buildings. It requires a structured approach and clear processes. The aim of this BIM Execution Plan (BEP) is to ensure a unified way of working for the execution of the project in the four phases of design: 10%, 30%, 60% and 100% with regard to all BIM and CAD applications and documents. Besides producing drawings of the design, it is desirable to enhance comprehension and to give insight in these complex situations and interfaces, especially when time is limited. Therefore it is decided to use 2D & 3D modelling. Since the complexity of the project was so broad we decided that the document will be a live document that will be adapted as needed throughout the project. Therefore each discipline created its own internal BEPs to state its own standards and process that needed to be reliable in one same source that can be shared to the other disciplines if needed. The BIM Execution plans described the processes and conventions on how to produce the deliverables; the

technical content was determined by the lead engineers. Although the steps are presented as sequential, developing a BEP is an iterative process and the BEP is a living document that needs to be flexible in order to cater for changes in the design, new insights and other developments.

### 3.1 Common data environment

Working with many parties on different disciplines and phases for all deliverables involves a lot of data exchange and results in a high risk of using incorrect information, therefore 'single source' is important. The PMO operates Aconex for document and information exchange & TASANA and partners can use their own 'bubble' within Aconex for their information and document management, including BIM. But for internal purposes we decided to use Autodesk Vault to attend this topic, before uploading to Aconex.

### 3.2. Software

The choice for the software is one of the main issues to establish from the beginning however the complexity of such a large project drove us to pick 2 platforms for 2 types of information that needed to be delivered: Architectural Design (including Structure & MEP) / Civil





Design / Model Checker. The decision was made taking in consideration the following factors: Type of information to be delivered / Team Experience Using the Platform/ Interoperability/ Labor Market for future expansion.

### 3.3. LOD

The Level of Definition was an essential to understand by each member in order to work strictly in the quality of the detail & information their model needed and no more. To establish a clear LOD for each of the disciplines we needed understand what information we needed to take from the model. Quantity Takeoffs, Clash Detection, 2D Documentation, Energy Information etc., were taken into consideration at the different phases.

### 4. Process

The first phase for the project regarding BIM was the 30% in which the design consisted in the Basic Design and established the bases in which the rest of the model will be developed. During the first phase each discipline started to develop their own models based on the BEP without any regards on the correlation with the rest of the disciplines. No Clash detection simulation was run. This gave the possibility to each member to focus on their design concept and solution more than the documentation generated. This part was developed mainly in the Netherlands by NACO. This stage consisted in the creation of LOD 200 models without a Clash Detection process due to the nature of the phase. Also the development of MEP was still under a very conceptual phase that was unable to provide models. The integration of the models came after the 30% phase. Then this was when the real action started. For the integration of the model we decided to divide the information into sub groups established in the contract by "Conceptos". For example "Concepto" 11 consisted in all the maintenance buildings, surface design and roads for the Maintenance Facility Area. The BEP established the clash revision meetings every week for the more than 50 different buildings and utilities that were designed. 1 day before every meeting, a report was delivered in order to update the team. Each modeler was responsible to assist to the BIM meetings to understand the complexity of the problems found and to bring a possible solution. To have the most effective meetings we asked to bring highly experienced modelers that can have the knowledge and criteria to decide if any of their models can be moved or relocated if needed without compromising the design intent. This was one of the most important statements that were

established in the BEP and helped to finish the project on time.

### 5. Benefits Obtained

In my experience, many clients and stakeholders that ask for a BIM process contractually, but do not understand what they are asking for. They have just heard or read about how BIM helps out the AEC industry to save a large amount of money and time however they don't understand what is "under the hood" of the process or even worse, they don't know it is a process involving not only the designer but the construction company, the Project Manager, the contractors, subcontractors, facility managers and owners. On the other hand, many BIM implementations that I have seen, lack of a clear path to aim in the correct direction. Therefore, it is hard to achieve the established goal on time and budget. This may be the result of a deep analysis and a real use of BIM for the specific project. The BIM Execution Plan more than a document, is a tool that provides the clarity that everyone involved in a project needs. It opens the eyes of the people that don't understand technical issues or have any CAD/Modeling/ BIM background. Links the information created by a highly specialized team to the uneducated audience that at any given moment can perceive the significance of the BIM process. It puts at any stakeholders fingertips the value of BIM and gets everyone involved in an easier way. Throughout this process and with the BEP we cleared that gap. We found out that the client got more engaged and involved in the decisions for the project. Furthermore, they were able to explore different scenarios and took on time those decisions, plus it didn't represent more cost for us. The benefit not only was exclusively for the client and us, it was also quite beneficial for the Terminal Designers, Foster+Partners+FREE, which allow them to explore different solutions for specific design areas, since they were able to merge our models to theirs, creating a seamless coordination like working in the same office. The BIM managers should understand the importance of creating this document as a "must" due to the benefits for everyone. Not only is a matter of cost and time but also for legal purposes. The BEP for NAICM established with certainty the responsible and their responsibilities for each of the members involved, took out any risk of misunderstanding or misinterpretations by different criteria. It was our insurance that enabled us to explain from day one the feasibility of the project in time and budget.



## 6. Conclusions

RHDVH

The AEC Industry has been bombed by the marketing of the BIM software sellers, BIM consultancy firms, BIM specialist, and a series of propaganda showing how BIM is almost a one click solution for all the industry problems. However, this bombing of information and marketing most of the time has a lack of clarity and doesn't explain the problems that any given firm might find in their way into BIM implementation. The common practice is that the firms start hiring Modelers (as old draftsmen), experts in the software they only have heard about, without consider the benefits they want to get from BIM. On the other hand, also the clients are staring to listen to all this marketing industry, talking about BIM and the "magic solution" that it is for all the AEC industry, hence they start asking for BIM models, also with total ignorance of what they really need. Therefore in our experience, we found out the solution with this amazingly large project and this tight calendar was the BIM Execution Plan. A project of this size should have not only one BEP but 2 BEP's. The internal BEP should be a live document which adapts to the process of design and states the way in which the we relay in the information, how its transmitted (Internal Common Data Environment); and who and how is involved in all the process(meetings and decisions). This document may even be part of your Quality Management System (QMS) such as ISO 9001. The external BEP is the one we can include as an appendix of the contract and should state what the scope for the BIM process is, for the client and the designer. The LOD's for each phase and each discipline. Common Data Environment with standards for how the information is shared such as formats (.ifc, rvt, .nwd .pla .dwg .xls, .docx, .bimx, etc.) and at what point the responsibility of the models relay on a different stakeholder. It may also include a program for meetings and critical paths. Finally, an instructive should be added (as a Lego model) so anyone can understand how the models were split, and how they can be built all together and what to expect from them. In the NAICM case we had more than 400 models, so this was essential for project revision by the client and the PMO. At the end the documents should transcend into legal terms in order to provide confidence for everyone involved and clear idea for what BIM will mean for the project.

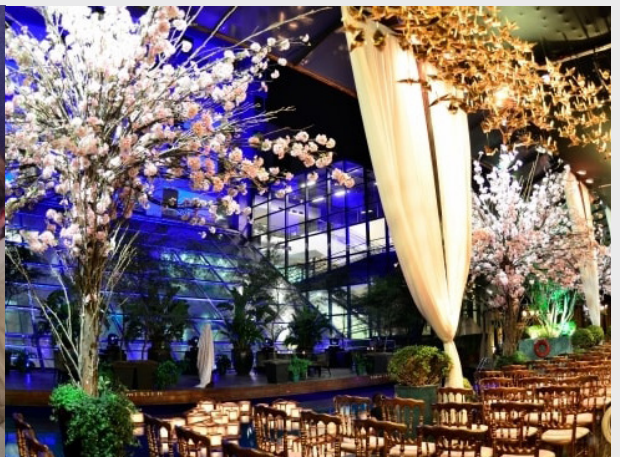
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## SAO PAULO Espaço L'Atelier







## Pestana Palace LISBON





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