



# Practical Strategy and Workflow for Large Projects: A Realistic Solution

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## SE3193

This class presents a strategy for development of structural projects using Autodesk® Revit® Structure, Autodesk® Vault, Autodesk® Navisworks, Autodesk® Design Review, and Autodesk® Robot™ Structural Analysis software. Learn about every step of a workflow for large projects, including setting up the LAN environment, creating Revit central files, generating links among architectural and MEP files, defining the stakeholder groups, and drawing and model reviews. This class also brings up some best practices, limitations, advantages, and tips for designers and BIM managers.

## Learning Objectives

At the end of this class, you will be able to:

- Manage large engineering projects using Revit Structure, Vault, Navisworks, and Design Review software
- Identify and describe a project's lifecycle stages from LAN settings until delivery to construction firms
- Explain the BIM process reality for engineering office
- Identify best practices for worksharing in Revit

## About the Speaker

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*Diego is a Technical Specialist for Frazillio & Ferroni, an Autodesk Gold Partner located in São Paulo, Brazil. He holds a Bachelor of Engineering (Chemical Engineering) and specializes in Autodesk Revit MEP, AutoCAD Plant 3D, AutoCAD P&ID, and BIM management. He provides support for BIM implementation and training for engineering companies. Having participated in several multidisciplinary projects, Diego has faced many challenges requiring him to create tailored workflows for each companies' needs, and he is always interested in enhancing workflows with new product features.*

## 1 Introduction

This document contains a suggested workflow elaborated from practical experiences in BIM methodology implementations in Architectural and Engineering companies, aiming to enhance project quality and team productivity, besides the incorporation of BIM in those companies itself.

Despite the fact this procedure can be applied to projects of any size, its main application is in big projects, due to the fact these projects involve large working teams.

To meet the market's demand for projects elaborated in BIM, many companies need to adequate their way of developing projects. Projects created in Revit allow the integration between different disciplines (Architecture, Structure, and MEP), therefore, the building's model can be designed in parallel by all these disciplines. This results in better communication between the designing teams and consequently, less rework and greater compatibility. Another characteristic of Revit is allowing users to work in the same project file, at the same time.

Many projects are elaborated by different companies, in such way that each company is responsible for a certain discipline (or disciplines). In these cases, it's usual that different software are used, or even that part of the project isn't designed in a BIM software at all. On the other hand, there are some cases where the whole project is designed by a single company. The workflows described in this paper are focused in cases where all of companies (or a single company) developing the project use Revit, or another BIM software.

## 2 Overview

Presented below are the project phases that will be discussed and explained in this paper:

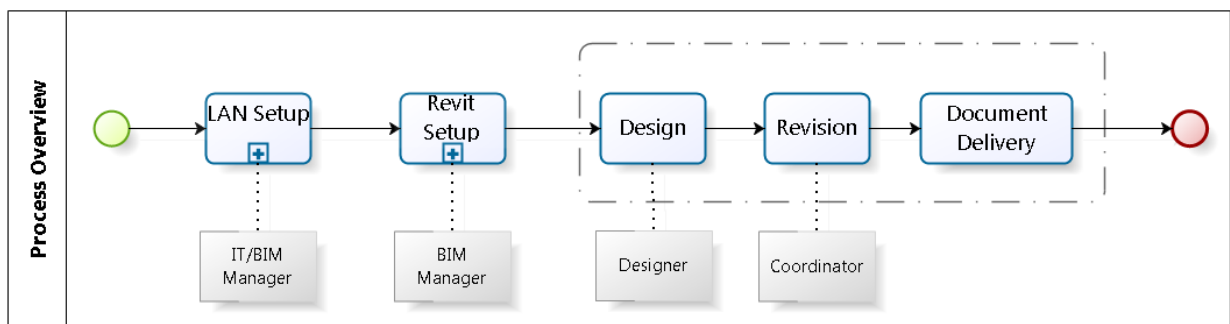


Figure 1: Process Overview.

The procedure is divided in five distinct phases:

- Lan Setup;
- Revit Setup;
- Design;

- Revision;
- Document Delivery.

The first two steps must be completed before the project development starts and are essential to guarantee that the company's standards are used correctly and that designers can work in a collaborative way from the beginning.

The pre-requisites for this workflow are:

- The company must already have annotation standards and an adequate Revit library
- A server that can be accessed by all the designers involved in the project

### 3 Workflow

#### 3.1 Lan Setup

This is the first step of the project and should be accomplished by the BIM Manager.

On this phase, the server environment is prepared: project folder structure is created, users are given permission to access those folders and network drives are mapped (Figure 2).

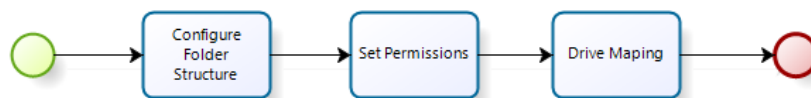


Figure 2: Lan setup diagram.

Configure Folder Structure: all folders in the server should be previously configured. The structure that's most adopted is the discipline and area division. So there should be a main folder for the project, followed by individual folders for each discipline, each of those containing folders for each area of the project. The area division structure is arbitrary, usually by buildings. Additionally, sub-areas may need to be used in very large projects. In each of the areas (or sub-areas) folders, there should be folders to store Revit models, DWF files, external references and reference documents, such as text documents or spreadsheets (Figure 3).

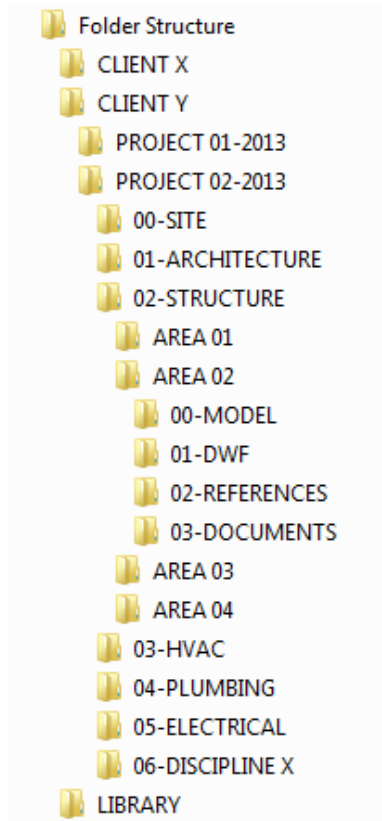


Figure 3: Folder structure.

Set Permissions: the control of the access to the folders should be done using the built-in folder security tools of MS Windows, but it's essential that the users of a specific discipline get the read and write access to their working folders, otherwise, they won't be able to save their files.

Drive Mapping: the drive mapping of the network drives may be done in any way the company is used to. But it is crucial that it is done the same way for every user involved in the project, so that the drive letters are the same throughout all the computers.

### 3.2 Revit Setup

On this phase, Revit files will be created and configured for all disciplines (Figure 4).

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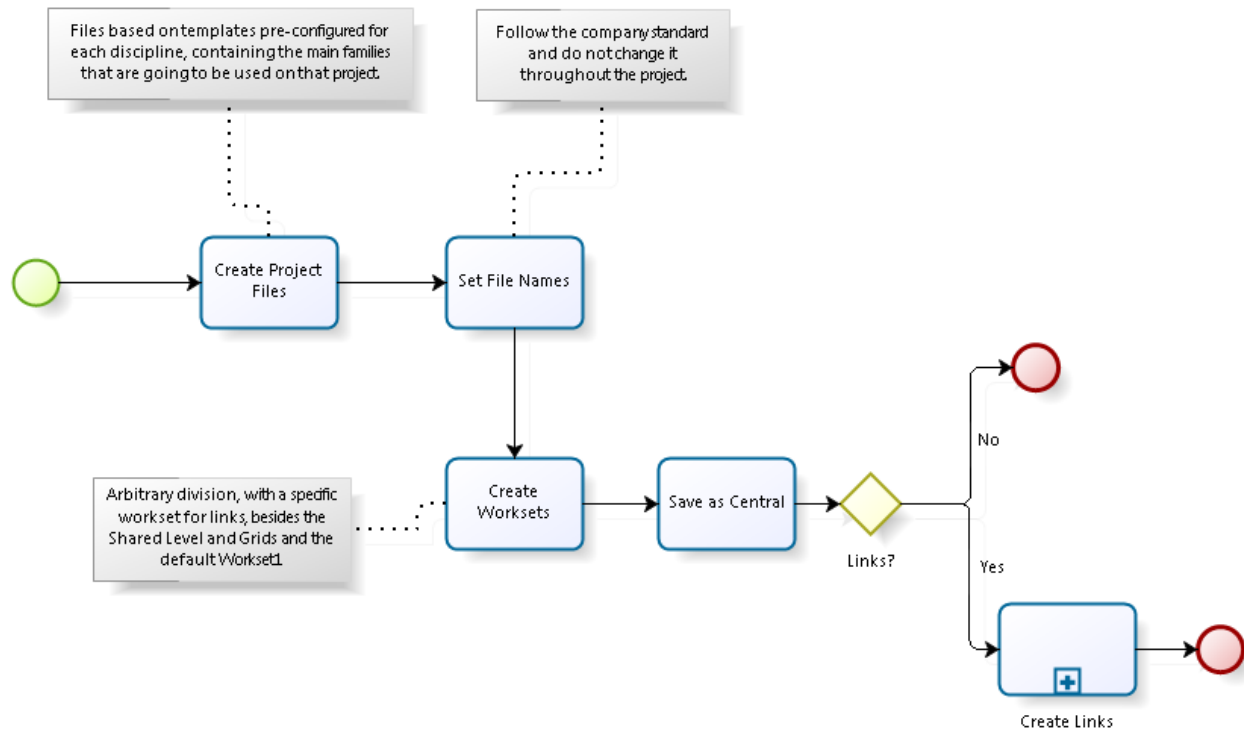


Figure 4: Revit setup diagram.

Create Project Files and Set Files Names: the project files must always be created from the company template. This template should contain all of the annotation standards, project and shared parameters and discipline related libraries. Each file should be named according to that project's specification, that's usually assigned by the project coordination. This name should not change throughout the project.

Create Worksets: workset creation is mandatory when enabling worksharing for a file, so multiple users can work on it at the same time. Worksets can be divided in any way, usually by system, sub-discipline or even usernames. The idea is that users working on that project can benefit from the worksets and use them correctly. The BIM Manager should also create a Links workset to store the links, and the default Shared Levels and Grids and Workset1 may be renamed.

Create Links: all discipline files should be linked to the other files of the same area (or sub-area) so designers can collaborate in real time. Each linked project must use Shared Coordinates and be assigned to the Links workset created in the previous step. The link process is demonstrated in Figure 5.

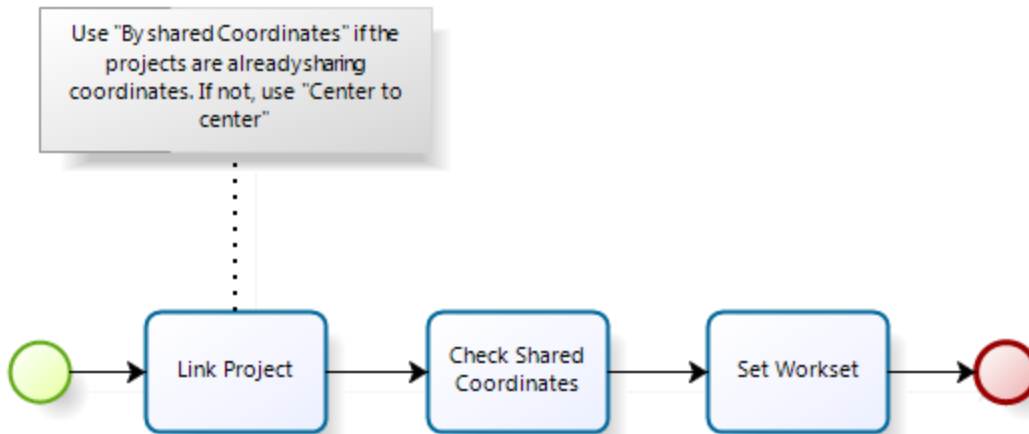


Figure 5: Link creation diagram.

Once the environment is prepared, users can be invited to start the design process.

### 3.3 Design

For the Revit model development stage, all users must be capacitated to use the software and must understand the design process workflow.

The design practices are different for each discipline. For structural discipline, in order to speed up the delivery process in large projects, where there are large amounts of documentation, it's recommended that tasks are divided among the discipline. This way, as indicated in Figure 10, the process can be divided in two teams, one for model design and another for documentation (sheet creation, annotation, viewport creation and placement, formwork documentation, and so on). The documentation team should only start their work once the 3D model gets the green light from the design team.

The structural engineer is usually the first one to start working on the model based on the Architectural project or on the other reference disciplines. The analytical model must be created correctly. After this task, the Revit model can be developed by other professionals, for instance, the structural engineer builds the calculation model with loads, supports and member releases while the designers prepare the preliminary documentations. In this phase, analysis in Robot may be done in parallel, but it shouldn't be brought back to Revit just yet. The updates must be communicated to the designers, who will update the model.

After the Revit model is reconciled, the next step is the RC or steel code design. All tasks in this step are done in Robot and by the end of the process, the Revit model is updated and the fabrication drawings are prepared for delivery according to Figure 6.

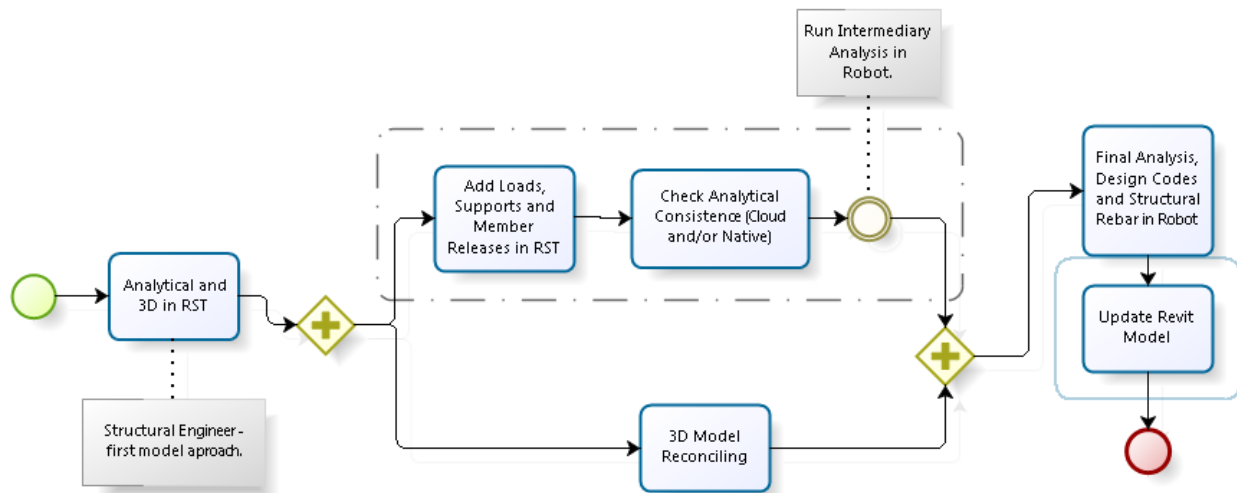


Figure 6: Model design process diagram.

### 3.4 Revision

The revision phase can be divided into two parts, model revision and documentation revision.

The model revision occurs in the design review meetings where architects, engineers and coordinators participate. On this meeting, clashes should be verified and assigned to the adequate design teams, so they can be resolved. The software used for this task is Navisworks Manage (to identify and assign the clashes) and Navisworks Freedom (so users can check where are the clashes they need to resolve). The Navisworks Switchback tool is a great time saver on this stage.

Documentation revision is the process of reviewing the deliverables from the model to guarantee that everything is correct and according to the company standards before it gets to the construction site. For this task, Design Review is used to markup the documentation.

When it comes to storing all these project files that are being created and revised, the value of Vault stands out.

Vault is a very powerful data management and collaboration tool from Autodesk. Its power is leveraged by the native integrations it has with Autodesk's software, such as Revit, Navisworks, AutoCAD and even the Microsoft Office. For this reason, Vault is the preferred tool to manage data in this suggested workflow.

The focus of this paper is not to describe step by step configurations, but to give an overview of the available functionalities.

Vault's main purpose is data management. Therefore, there are plenty of tools for security, project lifecycles, revision control, advanced file search and more. Those tools can be used for all kinds of files, including design files from AutoCAD, Revit and Navisworks.

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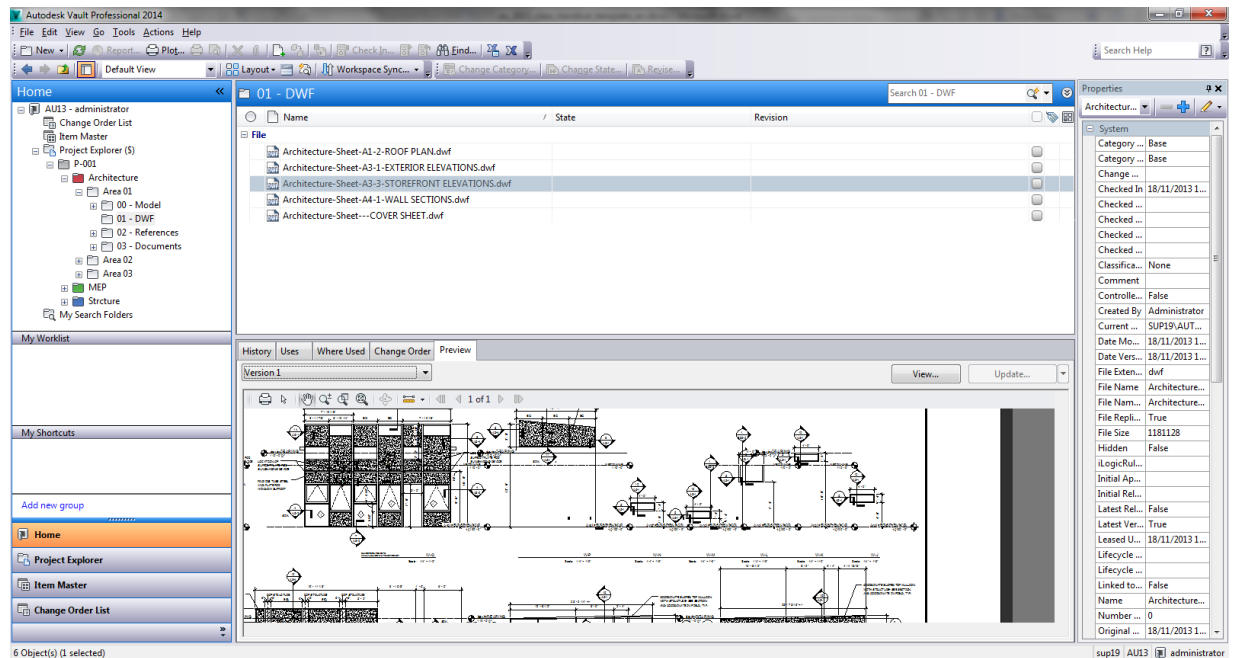


Figure 7: Vault client overview.

Vault integration with Revit has many benefits such as, Revit Server support, family indexing, file linking from Vault and DWF creation and review workflow. Since the use of Vault in this workflow is for document delivery and revision, the DWF related functionalities will be highlighted.

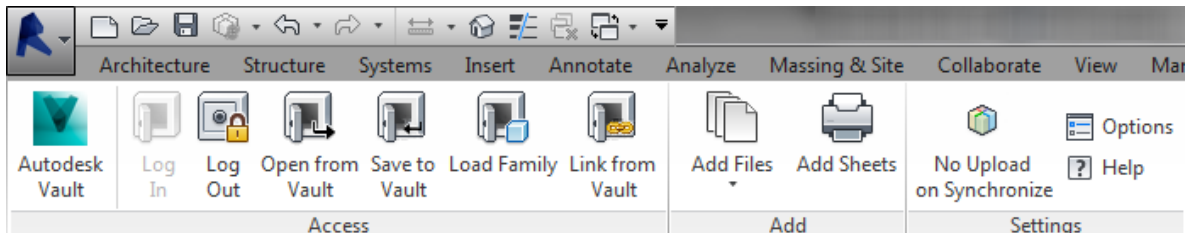


Figure 8: Vault ribbon in Revit.

Vault can create DWF files from the existing sheets in a project using the resources of the local machine and using a job server, thus, using the resources of the server machine (Figure 9).



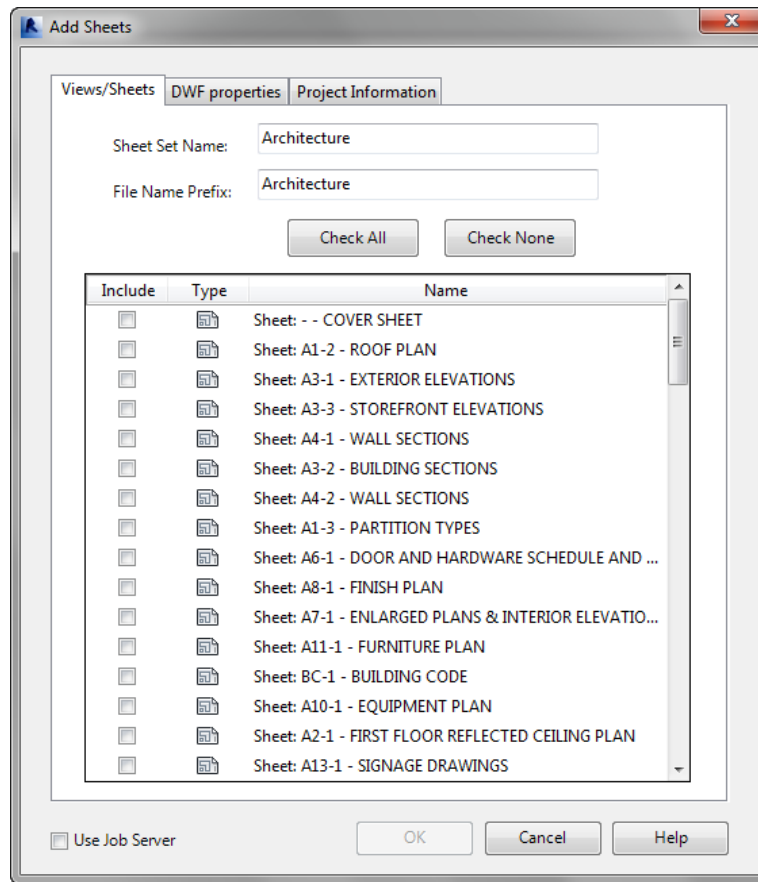


Figure 9: DWF creation screen.

The DWF files can also be generated in batch and sheet sets should be created to accelerate the selection process. Once the DWFs are generated, they will immediately enter Vault's lifecycle and the coordinators should be notified there's a pending document revision. The DWF file gets checked out of Vault for the review, which should take place in Autodesk Design Review, and later on, gets checked back into Vault. Another notification should be sent for the appropriate designers so they can use the Link from Vault functionality to import the DWF into Revit and review the model. This cycle goes back and forth throughout the entire document review process until there are no more revisions pending for the DWF, when that document's state is changed in Vault to an approved for construction status, for instance.

As stated previously, there are numerous great functionalities associated with the use of Vault and other Autodesk software that shouldn't go overlooked, this is just an example of the use of the tool that is applied to our customers' workflows.

### 3.5 Document Delivery

All files that are going to be delivered (and their formats) must be defined in the project contract. Usually, they will be delivered as DWG, DWF, NWD, RVT, IFC and PDF.

Revit allows documentation to be delivered in different file formats, according to the client's demand. The export process to DWG and DWF is configurable and some time should be spared to adjust all the layer, color and other settings. It is also very important to discuss with the customer about the DWF and its benefits when faced to the DWG, if they don't know them already.

### **3.6 General Workflow**

The diagram presented in Figure 10 illustrates the task division between Designers, BIM Manager and Coordinators.

Workflow is divided in two levels, the **Project** level and the **Coordination** level.

Tasks that contain a "+" symbol indicate that there's a sub-task for that specific task. All tasks and sub-tasks are presented in this document.

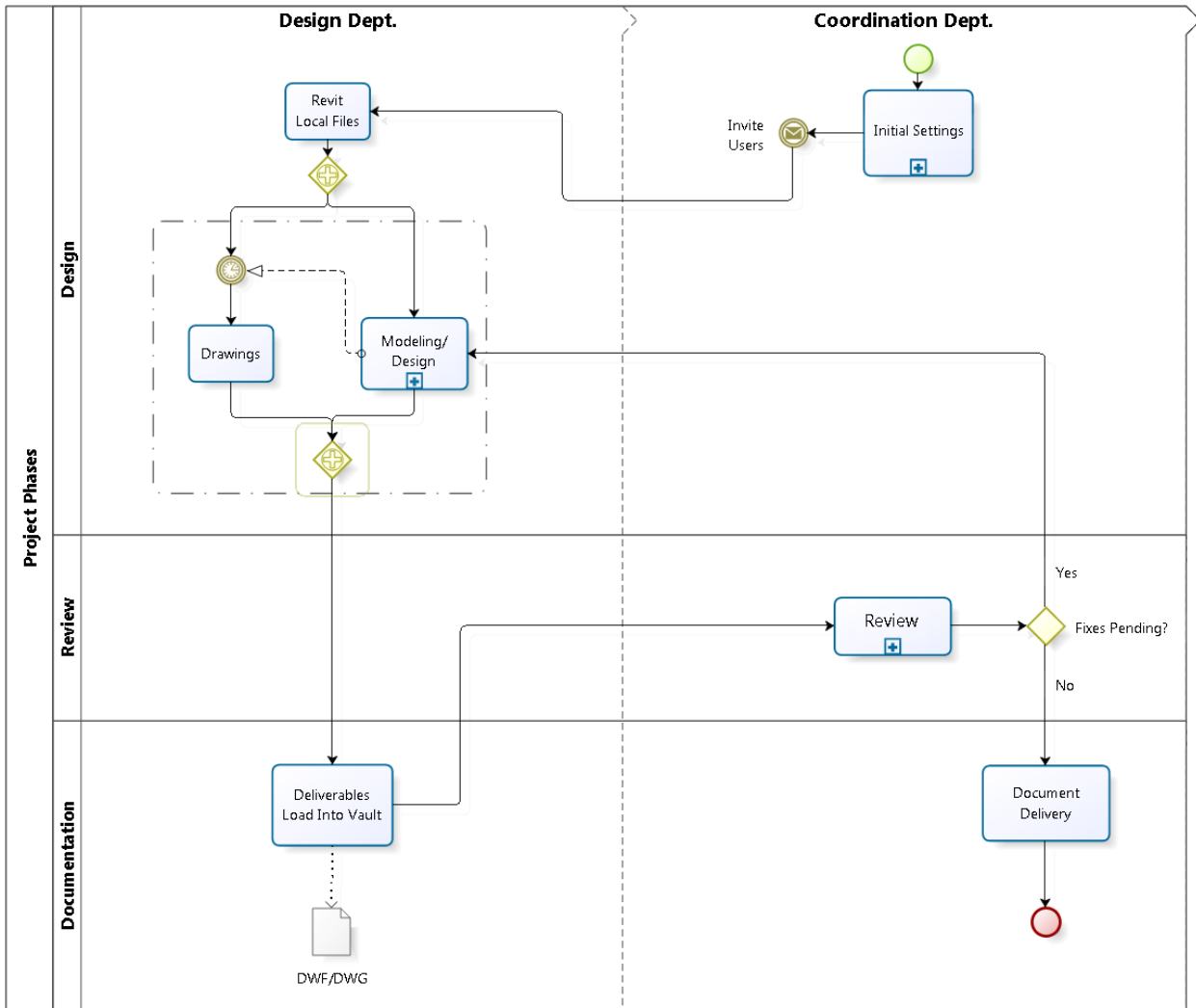


Figure 10: General workflow diagram.

## 4 General Advice

For a greater control over the project files, it's important that the BIM Manager locks with his user the Links workset. The BIM Manager can do that by setting the Links workset to Enabled and not releasing it when synchronizing the model to the central. This guarantees that users will not be able to make any kind of change to the links (willing or unwilling).

It's also important that the BIM Manager centralizes technical support, family library development, maintenance and update. He's also responsible to monitor if the best practices are being followed by the users.

Some of the best practices are:

- Create a new local file everyday
- Use the Worksharing Monitor add-in to coordinate synchronizes
- Follow the workset strategy adopted
- Use the Specify Workset option when opening a file (only the selected workset will open, making the process much faster)