



ArcGIS AIA Compliant CAD to LGIM GDB Tools

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1.0 Purpose of this Document

This document outlines the steps required to import AIA-Compliant CAD data for buildings into an ArcGIS Geodatabase. This step is the first in a series of steps for creating a Campus Viewer. The remaining steps are outlined elsewhere in the Campus Viewer Tools project folders.

2.0 Software Requirements

- ArcGIS Desktop 10.3.1 or 4.0
- Microsoft Excel or LibreOffice/OpenOffice

3.0 Getting Started

The *AIA CAD to LGIM* import tool supports the workflow of creating indoor geodatabase datasets for floor plans from CAD drawings that conform to the American Institute of Architects (AIA) specifications for indoor spaces. The current standard information model for storing indoor place information in the ArcGIS platform is the Esri Local Government Information Model (LGIM). These tools are designed to take CAD data that conforms to the AIA standard and import it directly into a prepared LGIM ArcGIS geodatabase.

4.0 AIA Compliant and Projected CAD Dataset

In order for the tool to run properly, the input CAD data needs to conform to the [AIA](#) standards for indoor spaces. This standard specifies certain labeling and data specifications for the CAD drawings. Many of the aspects of this standard help greatly in the transition to the ArcGIS Geodatabase. In addition, the CAD data should be referenced into a valid projection system prior to running the tool. For more information on defining the coordinate system for CAD data, see the [ArcGIS documentation](#).

5.0 Creating the LGIM GDB

In order to create a new, empty LGIM geodatabase, it is first necessary to download the [Local Government Information Model](#) from Esri.com. Inside the files that are downloaded, you will see the xml schema document – localgovernment.xml. Make a note of its location.

HINT: Now is a good time to think about what local coordinate system you would like your interior space data to be in. Once you have made a decision, it's important to be diligent through the process to make sure your data is in the correct coordinate system after import.

- To start, it might be easiest to find existing project or organizational data, and import the interior data in the same coordinate system for consistency. Also make a note of the location of a sample dataset that exists in the target coordinate system.
- To populate an empty GDB with the Local Government Information Model, the X-Ray add-in for ArcCatalog is helpful. This add-in can be found [here](#). Once the add-in is installed, can

point it to the localgovernment.xml and an empty GDB and it will populate the LGIM schema using your local coordinate system.

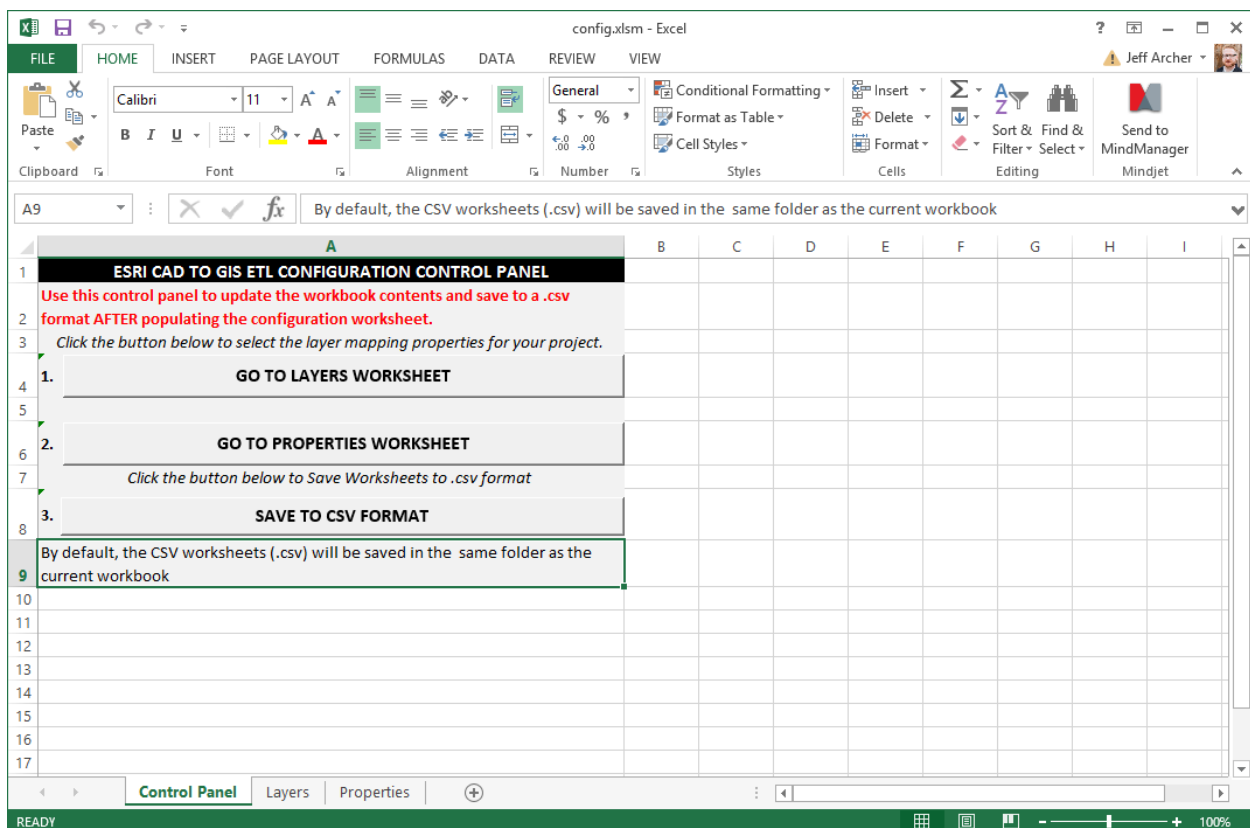
Caution: The xml schema for the LGIM defaults to StatePlane coordinate system for Illinois, as it's designed for the sample Naperville dataset. In order for this schema to work with your input data and the coordinate system you desire, you will need to change the default. Steps to perform this important step can be found [here](#).

6.0 Tool configuration file

One option for setting parameters for this tool is to fill out the values in the accompanying Excel macro configuration file—config.xlsm. In the first sheet of the workbook, there is a control panel that links to where the critical input parameters can be set.

Control Panel Worksheet:

The control panel is the source worksheet for the configuration workbook. Here you will find links to get to the other worksheets where you can define the CAD layers that map to output LGIM GIS layers, and specific input information for the CAD datasets in a sort of batch file. This can be much more convenient than manually inputting the information for each iteration of the import tool.

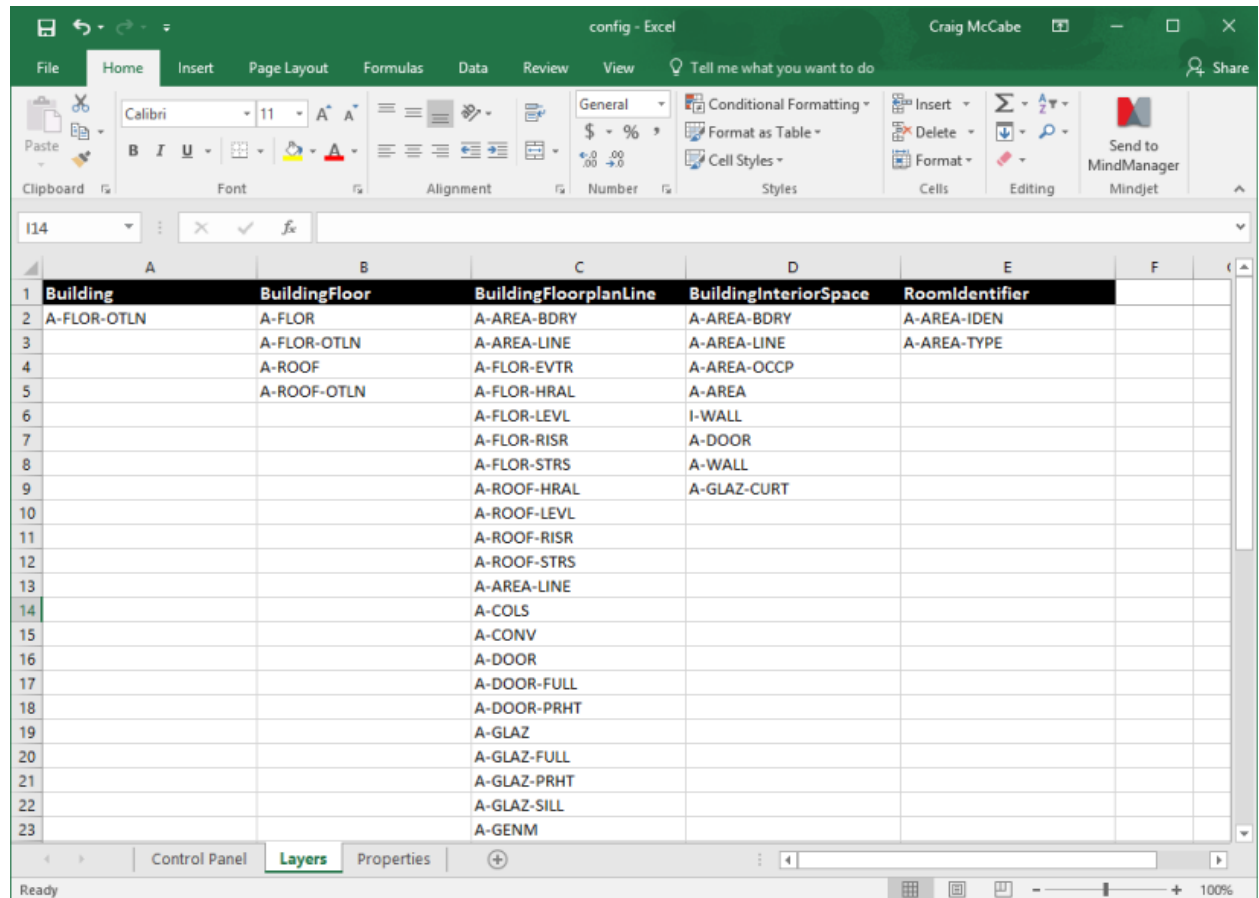


Layers Worksheet:

This worksheet documents the specific layers and properties of the CAD drawings that will be processed and appended to the resulting geodatabase layers and attributes. It's often

necessary to combine multiple layers in the CAD drawing to populate the output GIS feature – for example, *BuildingFloorplanLines*.

HINT: The configuration file makes it easy to append many CAD drawings for several buildings all in one batch process, but the CAD2LGIM tool is intended to process only one building at a time. Update the config file and run the tool again for each additional building, as needed.



	A	B	C	D	E	F
	Building	BuildingFloor	BuildingFloorplanLine	BuildingInteriorSpace	RoomIdentifier	
2	A-FLOR-OTLN	A-FLOR	A-AREA-BDRY	A-AREA-BDRY	A-AREA-IDEN	
3		A-FLOR-OTLN	A-AREA-LINE	A-AREA-LINE	A-AREA-TYPE	
4		A-ROOF	A-FLOR-EVTR	A-AREA-OCCP		
5		A-ROOF-OTLN	A-FLOR-HRAL	A-AREA		
6			A-FLOR-LEVL	I-WALL		
7			A-FLOR-RISR	A-DOOR		
8			A-FLOR-STRS	A-WALL		
9			A-ROOF-HRAL	A-GLAZ-CURT		
10			A-ROOF-LEVL			
11			A-ROOF-RISR			
12			A-ROOF-STRS			
13			A-AREA-LINE			
14			A-COLS			
15			A-CONV			
16			A-DOOR			
17			A-DOOR-FULL			
18			A-DOOR-PRHT			
19			A-GLAZ			
20			A-GLAZ-FULL			
21			A-GLAZ-PRHT			
22			A-GLAZ-SILL			
23			A-GENM			

Properties worksheet:

This worksheet allows you to pre-set the inputs to the GP tool to point to the CAD drawing file locations and populate some key attributes as it gets loaded into the GDB. Here is a description of the input parameters and what they do:

CAD File – The full path location to the input CAD file(s). Note that the tool is currently designed to process a single building at a time.

Building ID – A unique text identifier for the building.

Floor Number – The floor number corresponding to the CAD drawing file.

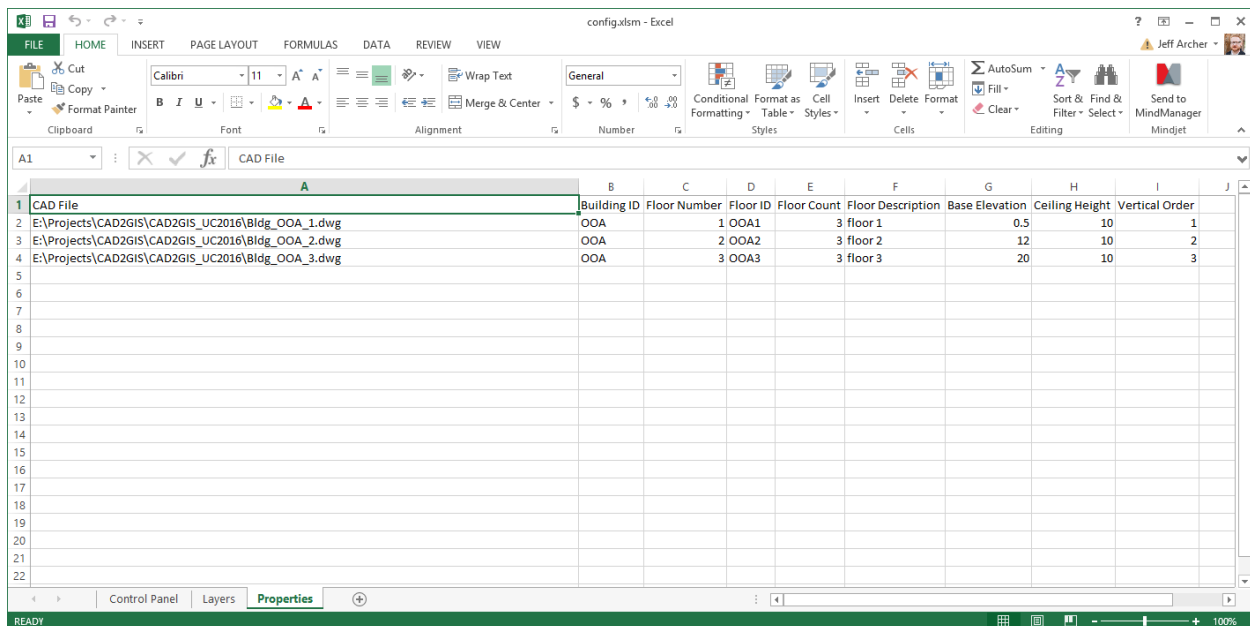
Floor ID – A unique text identifier for the floor. For example, this could be a combination of the building ID and floor number. This is used to easily query out or filter a specific floor of a specific building.

Floor Count – The total number of floors in the building. This value will be the same for all the participating floors’ CAD files, and will be added as an attribute in the LGIM Building footprint. **Floor Description** – A more descriptive name for the floor than the Floor ID provides. For example, “Floor 1” or “Mezzanine”.

Base Elevation – The elevation in map units of “base” of the floor itself. Units here correspond to the spatial reference of the input AIA CAD dataset(s). Simply put, this is the Z-value that’s assigned to each floor. It is up to the user to decide whether to use an *absolute* (height above sea level) or *relative* (height above ground, where ground = 0) measuring system. Floors are commonly separated by 10-15 feet or 3-5 meters in many commercial buildings.

Ceiling Height – Distance in map units of the ceiling above the Base Elevation. Units here correspond to the spatial reference of the input AIA CAD dataset(s).

Vertical Order – In some buildings, the vertical order might not correspond to the floor name. For example, if there is a terrace level or mezzanine. This is an integer field that specifies the specific vertical order starting with 1 for the bottom-most layer, and may include negative values for basement floor(s).

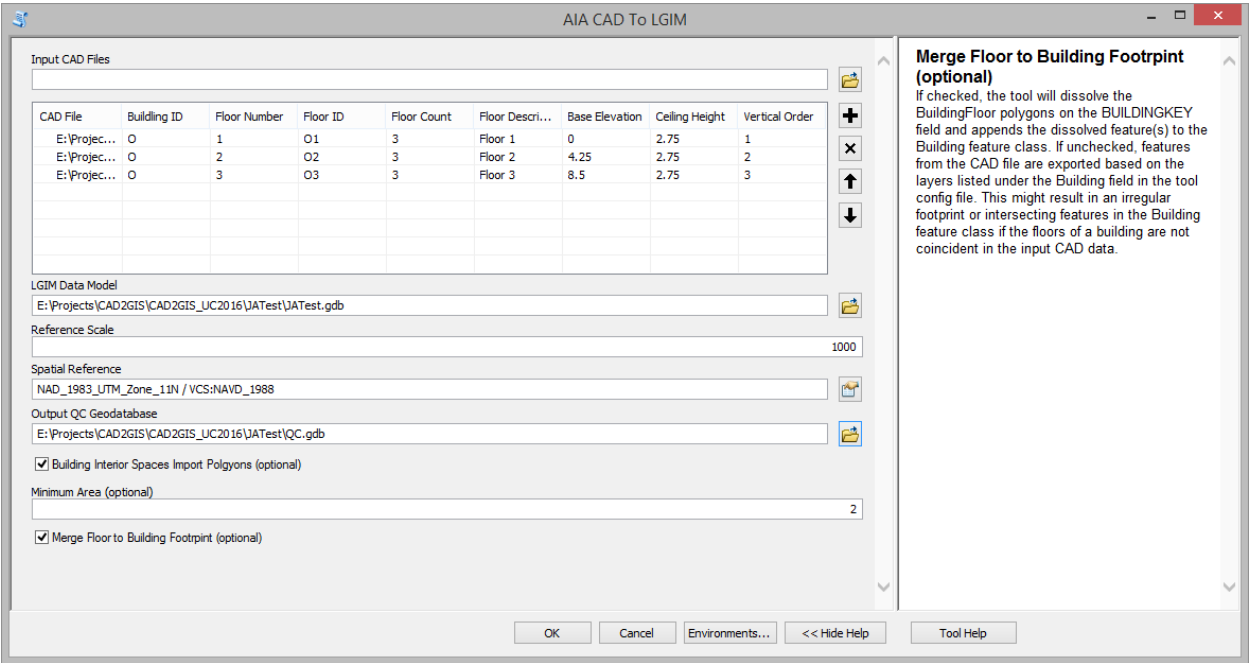


	A	B	C	D	E	F	G	H	I	J
	CAD File	Building ID	Floor Number	Floor ID	Floor Count	Floor Description	Base Elevation	Ceiling Height	Vertical Order	
2	E:\Projects\CAD2GIS\CAD2GIS_UC2016\Bldg_OOA_1.dwg	OOA	1	OOA1	3	floor 1	0.5	10	1	
3	E:\Projects\CAD2GIS\CAD2GIS_UC2016\Bldg_OOA_2.dwg	OOA	2	OOA2	3	floor 2	12	10	2	
4	E:\Projects\CAD2GIS\CAD2GIS_UC2016\Bldg_OOA_3.dwg	OOA	3	OOA3	3	floor 3	20	10	3	
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7.0 Run the Tool

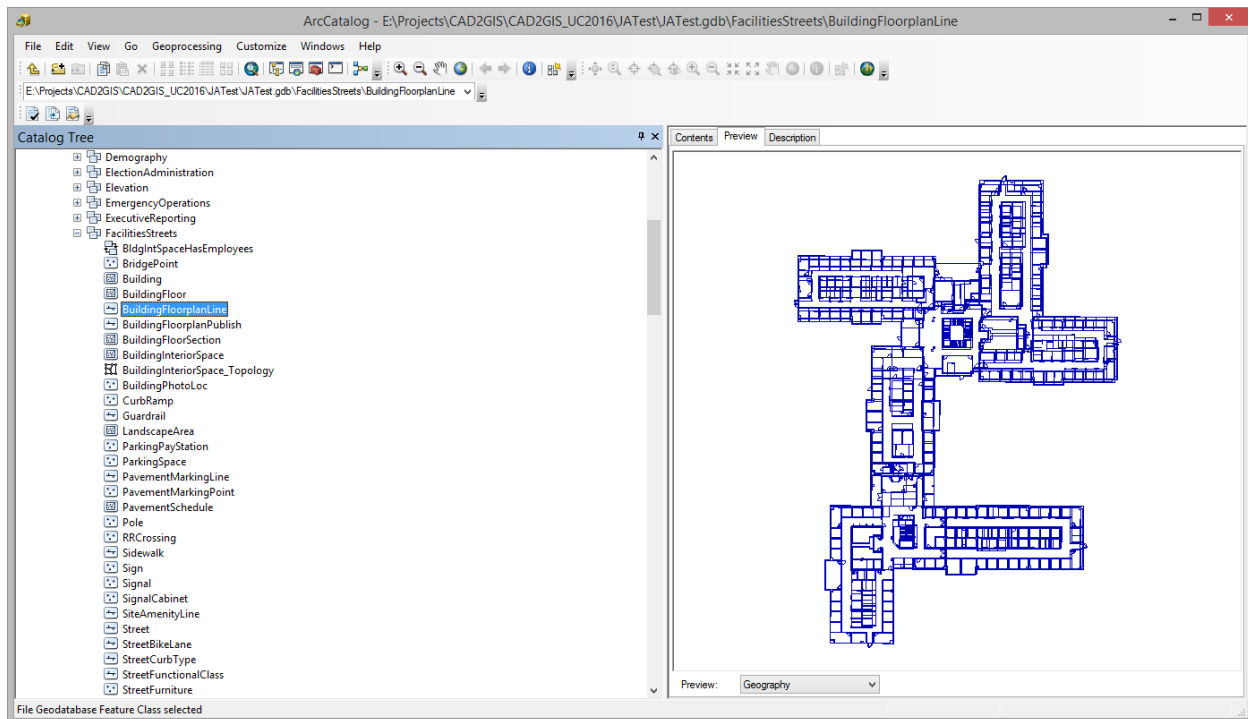
Understanding the input parameters

The CAD2LGIM tool has several inputs that need to be defined. These have been documented in the tool and can be accessed by clicking in the input area and opening the input description. There is also a tool configuration spreadsheet that can greatly speed up the use of the tool.



8.0 Tool Output

The tool will populate features in the “FacilitiesStreets” feature dataset within the Local Government Information Model. Within this dataset, you will find the output layers defined by the config.xlsm file – *Building*, *BuildingFloor*, *BuildingFloorplanLine*, and *BuildingInteriorSpace*.



This AIA CAD to Local Government Information Model tool provides you with the foundational layers for visualizing and analyzing building interior features. If you wish to use these foundational layers to build an indoor transportation network for 3D point-to-point routing, continue on to step 2: Indoor Network Creation Tools. If you simply want to go straight to publishing this new data in 3D scenes, skip to step 3: Style and Share Campus Layers.

9.0 Notes

CAD Attribution: Not all CAD data will have attribution for indoor spaces. The sample data that is provided with this tool does. For example, it is possible to have spaces labelled as an office, meeting room, closet, etc. in the CAD dataset. If this attribution is present, the import tool will respect it and move it to the output GDB. If this attribution is not present in your own input CAD data, it might be necessary to add this attribution in the GDB once the import is complete.