

FENCEBUILDER . . . a Segmented Object Placement Tool for Ground-Hugging Fences and other Applications

FenceBuilder is a general purpose, graphical, segmented-object placement tool for use with FS9 and FSX. It was initially developed specifically to place ground-hugging Gmax fences for my FS9 and FSX add-on CYYJ (2009). However, it should be equally useful for placing, for example, bridge segments.

FenceBuilder allows placement of segments in any or three modes:

- manual - when precise geographic positions are manually entered
- sim-associated - when geographic information is derived from the user aircraft position, and
- profile - terrain profile along a baseline is plotted and segments are placed using a set of graphical, including an auto-fill feature that completely fills the baseline with ground-hugging segments.

FenceBuilder includes a ready-to-use library of Gmax fence segments for both FS9 and FSX representing a 8' high chain-link fence with bent top and the associated control files. You may, of course, develop your own libraries and control files (see below).

INSTALLATION - Unzip or copy all the files from the installation archive into the folder from which FenceBuilder is to be run.

The archive contains two versions of the FenceBuilder executable:

- *FenceBuilder (FSUIPC).exe* for use with either FS9 or FSX (FSUIPC also must also be installed to use this version), and
- *FenceBuilder (SimConnect).exe* for use only with FSX.

They are identical, save for the communications medium. In this manual, both are referred to simply as *FenceBuilder.exe*. Use the one most suitable for you.

If you plan to use the included libraries:

- make a copy of either *fbStyle_CLW_FS9.dat* and/or *fbStyle_CLW_FSX.dat* (as will be explained later, use the former if you plan to develop identical fences for both FS9 and FSX) and rename the copy *fbStyle.dat*, and
- copy *lib_Fence_CLW_FS9.bgl* and/or *lib_Fence_CLW_FS9.bgl* into the `\scenery` folder of the add-on(s) with which the fences placed with FenceBuilder are to be used.

You may now, but need not, delete from your FenceBuilder folder all files except:

- the selected executable,
- *FSUIPCCLient.dll* if you use *FenceBuilder (FSUIPC).exe*, and
- *fbStyle.dat* (either the one created above or that you may create later).

AUTOMATIC UPDATES - Each time you start FenceBuilder, it will check if a newer version is available. If so, you will be asked whether or not you wish to download that newer version, which will be placed in your FenceBuilder folder.

The new version is installed in the same manner as the original. However, to save time, you should read the readme.txt file. Unless it instructs you otherwise, only the executables will have been updated and there is no need to re-copy libraries or texture files into the add-on folders.

COMMUNICATION WITH FLIGHTSIM AND SLEWING - When FenceBuilder is started, it attempts to connect to FlightSim. If it fails, you may later connect to FlightSim by clicking on the Connect to FlightSim button. When connected, the Disconnect from FlightSim button is enabled and the Connect to FlightSim button is disabled.

The user aircraft position is continually updated when connected to FlightSim.

Once connected to FlightSim, you are able to slew the user aircraft from FenceBuilder's control panel by depressing the left mouse button while over one of the directional (N, S, E, W) buttons. Two slew speeds are available. The user aircraft continues to slew in the selected direction until the mouse button is released.

The user aircraft may be moved in small (1') increments by quickly clicking on one of the directional buttons.

When connected to FlightSim, whenever the Start Position is changed, the user aircraft is moved to that position if it is not already there.

POSITIONAL INFORMATION DISPLAYS - There are four major positional displays on FenceBuilder's control panel:

- User Aircraft - the latitude and longitude of, and the ground elevation under, the user aircraft;
- Start Position - the latitude, longitude and elevation of the ground at the start point of the next segment to be placed; you may manually override the elevation entry
- Baseline End - the end position of a line extending from the Start Position along which fence segments are placed; you may manually override the elevation entry
- Section - the heading, distance and elevation change between the Start Position and the User aircraft position; when a baseline is specified, Section Length will reflect the component along the baseline of the distance to the user aircraft position and the Section Heading will be the baseline heading. These values are updated whenever any of the other three positions change. (Section Heading is rounded to the nearest 0.1 degree, consistent with FlightSim operation.)

When in the manual mode, you may enter positional information directly into these fields. Such information will be treated identically as if that information were derived from a FlightSim connection.

The Use as Start and Use as Baseline End buttons copy the User Aircraft positional information to the indicated other positional display.

Latitude and longitude may be displayed in any of the popular formats. Elevations and distances may be displayed in either feet or meters.

FUNDAMENTAL OPERATION - Given a start and end position, FenceBuilder will progressively fill the distance between those two points with segments specified in the

fbStyle file in a manner controlled by the user, up to the point where the remaining distance to be filled is shorter than the shortest available segment.

The first segment begins at the Start Position. In the absence of a baseline specification, the segments will be placed along the line towards the user aircraft position. If a baseline is specified, the segments will be placed along the baseline to the user aircraft position projected onto the baseline.

To start placing objects:

- select the file in which the generated XML is to be saved,
- slew the user aircraft to the desired starting position and click the Use as Start button or enter the starting position manually,
- slew the aircraft to the end of the first straight line section to be placed or manually enter the end position parameters as the User Aircraft position and
- finally, click the Output XML button.

Once FenceBuilder generates the XML, it will update the Start Position to the end of the last-placed segment. The Section Heading, Length and Elevation Change fields will be updated accordingly – ready for the next section. Slew the user aircraft to, or otherwise specify, the next endpoint and repeat.

When a baseline is specified, the end position for the section is specified by User Aircraft position in the usual manner, but FenceBuilder projects that position onto the baseline at a right angle and uses only the along-the-baseline distance from the. For the section where the along-the-baseline distance exceeds the baseline length, you will be given the option to terminate that section at the previously-specified baseline end or at the currently-selected position (along the baseline). Once past the specified end-point, you may continue to place fence segments as if the baseline were extended.

You will notice that not all buttons on the control panel are enabled at any point in time. Generally, FenceBuilder buttons are only enabled when they can be meaningfully used.

SEGMENT MODELS and ASSOCIATED CONTROL FILES - FenceBuilder creates XML code which, when compiled using BGL_Comp (in the relevant FlightSim SDK), places Gmax models contained in a FlightSim *.bgl* library file (i.e., a file containing only model data). As is usual, library files must be placed in the *ls scenery* subfolder of a FlightSim Scenery Library-enabled item. Suitable texture file(s) must also exist and reside in the companion *ltexture* sub-folder.

The models (or segments) to be so placed are specified to FenceBuilder in user-created text files. FenceBuilder and this manual refer to those file as "fbStyle" files. FenceBuilder does not impose any naming restrictions on fbStyle files, but will automatically locate those whose names begin with "fbStyle". FenceBuilder looks for a default fbStyle file named *fbStyle.dat* on start-up. A different fbStyle file may be selected at any time using the New Style button.

The collection of segments must include one of a nominal length, (i.e., in the case of a fence, the nominal spacing between posts) and should also include:

- multiples of that length (to minimize the number of models that must be placed and, hence, the number of polys that must be drawn), and

- sub-multiples of that length to allow fence corners to be placed close as possible to the desired position.

The models need not be exact multiples or sub-multiples of the nominal length, but the closer they are, the better. The fbStyle file may also include a model specified as having a length of 0 which, in the case of a fence, would be treated as a post. The corresponding Gmax model would, of course, have a greater (presumably small) length.

The included fence libraries contain segment lengths as long as 300' and as short as 2', as well as a post. The nominal length is 10'. For FSX, each segment has three LOD levels – close-up, far away and nothing. Due to its different transparency characteristics, I was unable to make effective use of the middle LOD in FS9. The LOD scheme is such that every fence segment changes at approximately the same distance, regardless of its length. Each model requires a maximum of only 8 polys. (Generation of these multiple models in Gmax is a trivial process once the “nominal” model had been made.) “Outside” is to the right referenced to the start point.

Please note that the included fence models have a post at one end only. Thus, there won't be a post at the end of a section unless you put one there. You may place a post by selecting “Post” in the Segment Length listbox and clicking on the Output XML button before moving on to the next section.

fbStyle files have one line per model defining the simulated length of the segment and its Guid, in the format *nn.nU ddddd | guid* where:

- *nn.n* is a numeric quantity accurately specifying the length of the corresponding segment; a comma may be used as a decimal separator if permitted by the language setting for the user's computer;
- *U(nits)* is either “F” or “M” (length in feet or meters);
- *dddd* is an optional descriptive field containing any sequence of alphanumeric characters; FenceBuilder will insert this character string in the output XML file as a comment for each segment placed; in the absence of this field, the segment length will be noted except for 0-length segments which will be designated “Post”;
- a comma (,) or vertical bar (|) as a field separator; and
- *guid* is the Guid in standard format for the FlightSim version with which the models are to be used, including the curly brackets for FSX.

The length parameter in the line for the segment of nominal length (i.e., the segment length of which all other models are approximate multiples or sub-multiples) should be suffixed with “*” (e.g., *nn.nU**).

If the units of length are the same for each entry, the “F” or “M” may be omitted and, instead, a line in the form “Dim=F” or “Dim = M” added to the file. In the absence of any units specification, feet is assumed. As well, you may specify the segment height in the fbStyle file as a line in the form “Height=nn.n”, with or without units. Specifying segment height allows the maximum elevation change/segment to vary proportionally to segment height. If no height is specified, a standard height of 8' is assumed. If a “Dim=” statement is included, all distance displays will reflect its setting. Similarly, if a “Height=” statement is included, all elevation displays will reflect its units specification.

There is no practical limit on the number of segments that may be specified in fbStyle files. As well, segments for more than one type of fence/object may be specified in the same file. But, it is recommended you use this latter capability only if you intend to specify the segment to be used for every placement.

If you examine the two included fbStyle files, you will note that both use the same Guids but in different formats. This duplication is not problematic, since both FS9 and FSX cannot run on the same system simultaneously. However, it provides a shortcut for scenery designers where similar scenery is to be used for both FS9 and FSX. FSX accepts .bgl files containing scenery elements compiled for FS9. So long as the corresponding FS9 and FSX models to be placed have the same Guid (in different formats), the same object placement .bgl file, compiled for FS9, may be used for both FS9 and FSX. In the case of FenceBuilder, this means you would "fence" for FS9 but use the resulting FS9 placement .bgl for both FS9 and FSX.

SEGMENT ELEVATION - FenceBuilder sets the elevation of each section it places such that, on flat terrain, the bottom of the segment model will be at ground level. On sloping terrain, the starting elevation is adjusted so that a straight line between the start and end elevations would intersect the bottom of the model at its center. Thus, on downward slopes, the bottom of the segment will be below terrain at the start and above terrain at the end. On upward slopes, the opposite will occur. This avoids large triangles of empty space below fences on sloping ground. The actual point at which the bottom of the segment intersects the ground depends on the actual slope.

Using the Elev. is AGL checkbox, elevations may be specified as either relative to ground level (checked) or as an absolute value (unchecked). For fences that follow the terrain, it shouldn't matter which mode is used.

However, should you want to place the fence along, say, the top of a retaining wall (which is why the author added this feature), you would use the elevation override capability. The Elev. is AGL checkbox selection should then reflect how, in this example, the elevation of the retaining wall is established. If the retaining wall is placed AGL, then your fence should be AGL. If absolute, then your fence - to remain attached to the retaining wall at all mesh settings, should also be placed absolutely in elevation.

You may override either or both the Start Elev or the end elevation, i.e., - Elev (end override) field. This in combination with the Alt is AGL checkbox should allow you to fence any area that does not follow the mesh.

What may also matter are the mesh resolution and complexity settings (TERRAIN_MAX_VERTEX_LEVEL in FS9). On undulating terrain at low mesh resolutions (i.e., longer distances between mesh "points"), FenceBuilder will place longer segments than at higher resolutions. When that fence is used with higher resolution mesh, it's "ground-hugging" characteristics may be degraded. But, while "fencing" on higher-resolution meshes may give better all-round "ground-hugging", it will use substantially more fence segments and, hence, generate more polys and have a greater FPS-hit. Like most other things, a trade-off is involved. Experiment to see what works best for you.

SEGMENT PLACEMENT PARAMETERS - Other than position, the two most important user controls for segment placement are:

- Segment Length - except for AUTO, the length of the segment to be used to fill the entire distance; many segments of that length as can be contained in, without exceeding, the Section Length parameter will be placed in a straight line and
- Max. Elev. Change/Segment (%) - the maximum permitted change in elevation between two adjacent segment as a percentage of the segment height.

With Segment Length “AUTO”, on flat terrain, FenceBuilder will start with the longest length available that fits within the specified Section Length and then fill the remaining distance with more instances of that model and with progressively shorter models until the distance remaining is less than the shortest model. If the terrain is sloping, FenceBuilder will determine the longest available length that may be used without exceeding Max. Elev. Change/Segment (%).

The Scenery Complexity combo-box allows you to select the scenery density setting at or above which the segments will be display by FlightSim. The full range of settings permitted by FlightSim (VERY_SPARSE to EXTREMELY_DENSE) is available. Normally, you will only need to adjust this setting on start-up.

You may specify whether the calculations are to be made based on Great-Circle (round earth) arithmetic or on the simpler flat-earth model. Unless very short or very long distances are involved, the results should be virtually identical.

BGLComp requires that *<SceneryObject>* XML code contain pitch and bank settings. By default, these values are set to 0.0, but may be changed should it be necessary.

The final control in this area is Cozy To. It is unlikely that the Section Length will be completely filled with fence sections. Even when using the AUTO mode, the end of the last fence segment will likely come up a little short of the desired end point. To compensate, you may specify which end of the fence is to be placed exactly using the Cozy to Start/End radio buttons.

XML FILE- FenceBuilder generates *<SceneryObject>* XML code for each segment placed. This code is saved to a file of your choice.

When you select a XML file, if it already contains scenery object placement data, you are given the option of starting the next segment at the point at which the last segment in the file ended, thus allowing you to continue from a previous session with the first segment to be placed in the current session starting exactly at the end of the last segment placed in the previous session.

You may move the Start Position to any segment in the XML file by clicking on the Start at Closest button. FenceBuilder will scan the XML file from the beginning looking for the segment whose start is closest to the User Aircraft position. (Remember, segment position in the XML files reflects the start point.) If the next segment in the XML file extends from the end of the closest segment, then the start position is updated to the beginning of the closest segment. If the selected segment is at the end of a series, you will be given the option of positioning at either the beginning or end of that segment.

XML code for the current set of segments, i.e., the segments resulting from the most recent placement operation is saved to the XML file when you click the Output XML button. That

XML code includes as a comment the corresponding user-furnished comment string from the fbStyle file or, if no such comment has been specified, the segment length. You may also place a comment at the current position in the XML file from FenceBuilder's control panel.

The whole of the XML file may be viewed at any time by clicking on the View XML File button.

There is no XML "undo" function. To replace or delete one or more segments from a XML file, using the Start at Closest function, load the segment(s) of interest while in the "profile" mode and modify as desired.

PROFILE MODE - In the "profile" mode, FenceBuilder plots the profile of the terrain along a user-specified baseline and provides a set of graphical tools that allow you may place, modify and delete segments. The profile mode is only available when FenceBuilder is connected to FlightSim.

To enter the "profile" mode:

- slew or otherwise position the user aircraft at the desired start point and click the Use as Start button,
- slew the user aircraft to where you want the baseline to end and click the Use as Baseline end button, and
- click the profile button.

FenceBuilder will slew the user aircraft back to the Start Position and, in a straight line towards the baseline end, will successively slew the user aircraft in increments equal to the nominal segment length, recording the ground elevation at each point and, finally, slew the user aircraft to the mid-point of the baseline. Upon completion, the terrain profile will be displayed in a new window.

The new window contains a vertical red bar that reflects the current user aircraft position along the baseline - initially in the center. The window may be zoomed on either side of the red line. At zoom levels > 1, a horizontal scroll bar is in view. As the display is scrolled, the user aircraft is slewed so as always to remain in the viewed portion of the baseline. The user aircraft may be slewed along the baseline using the track-bar control below the window.

When FlightSim reports ground elevation, what it actually reports is elevation at the top of scenery. Thus, if the user aircraft is directly above a scenery object, the elevation reported is the top of the model.

Since, normally, you will want to place segments on the ground, these "blips" in the terrain profile may be problematic. Should that be the case, click on the Adjust Profile button, place the mouse cursor over the point to be adjusted and depress the left mouse button, drag the point up or down (you can't move it sideways) and then release the mouse button. Repeat for other points as necessary. When finished, click on the Adopt Changes button. These changes will persist so long as you don't change the start or end position of the baseline.

Create/modify/delete segments using the following buttons (results are based on the Segment Length and Max. Elev. Change/Segment (%) settings):

- Plot Section - creates one or more segments extending from the start of the profile or the last accepted (see next section) segment, as applicable, to the red line, i.e., User Aircraft position. If the segments are not to your liking, reposition the red line and/or change the length and elevation change settings and try again.
- Start Next - Causes the next series of segments to begin at the then-position of red line. You would use this button either to accept the last plotted segments or to create an empty space along the baseline
- Auto-Fill - Places ground-hugging segments along the entire length of the baseline (disabled).
- Delete - Deletes currently-selected segments. Segments are selected by clicking anywhere within them. The Shift and Ctrl keys perform their normal "select" functions
- Split - The selected segment is split into two as close as possible to its center
- Consolidate - a series of selected segments are consolidated
- View XML - The XML pertaining to the segments then displayed is shown

When you are satisfied with segment placement along the baseline, click on the Output XML button on the main control panel. If you make further changes, simply save again.

Segments that have been entered into, or are sourced from, the XML file are displayed in light blue. Unsaved segments are colored "light salmon". The set of segments currently being placed are colored "salmon". selected items are red.

Unlike the manual and sim-associated modes, in the profile mode the Start Position is not changed when the XML is saved. Since the user aircraft is positioned at the end of the segment closest to the end of the baseline (unless you move it), when you are finished with this baseline, click on the Use as Start button on the main panel to move on.

COMPILE AND SCENERY UPDATE - The XML file may be compiled at any time by selecting the folder in which the compiled file (.bgl) is to be placed and then clicking on the Compile XML button.

The FS9 compiler is included as part of FenceBuilder as permitted by the MicrosoftFS9 SDK end user license. To compile for FSX, you must have the FSX SDK installed. (FenceBuilder will locate the compiler automatically.)

If you are connected to FlightSim at the time, checking the Refresh FlightSim checkbox prior to compiling will cause FlightSim to be directed to refresh the then-displayed scenery, and your newly-compiled fence (or other segmented objects) should be included in the FlightSim display.

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SUPPORT

FenceBuilder is freeware and, consequently, support may be limited. Nonetheless, I would like to be made aware of any problems. I will make a reasonable effort to address any issues that prevent FenceBuilder from being used as intended.

END-USER LICENSE AGREEMENT (EULA)

You are granted a free, non-exclusive right solely to install and use FenceBuilder on your computer system(s) for your own personal enjoyment and to place segments for Microsoft Flight Simulator scenery add-ons you make available to others without charge.

You may not:

- upload FenceBuilder, whether or not modified, in whole or in part, to any file distribution system,
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- incorporate FenceBuilder in whole or in part, whether or not modified, or any derivative works into any commercial product or facility, "shareware" or "freeware", or any other product or facility for which there is a charge of any kind. without the express written permission of the author.

Your use of FenceBuilder is entirely at your own risk. The author accepts no liability whatsoever for any damage arising from its use no matter how caused.

By downloading and installing this software, you are deemed to have agreed to the foregoing.

In the event you use FenceBuilder to place segments for Microsoft Flight Simulator scenery add-ons, an acknowledgement in the associated documentation to the effect that FenceBuilder was used would be appreciated.

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