ANEXO 1: TRADUCCIÓN AL INGLÉS DEL APARTADO "COMPOSICIÓN 3D DEL EDIFICIO"

BUILDING PLANS

The next step consists in using the plans shown previously at the "Graphic Material" section for the Consell Insular of Menorca building in three-dimensional way.

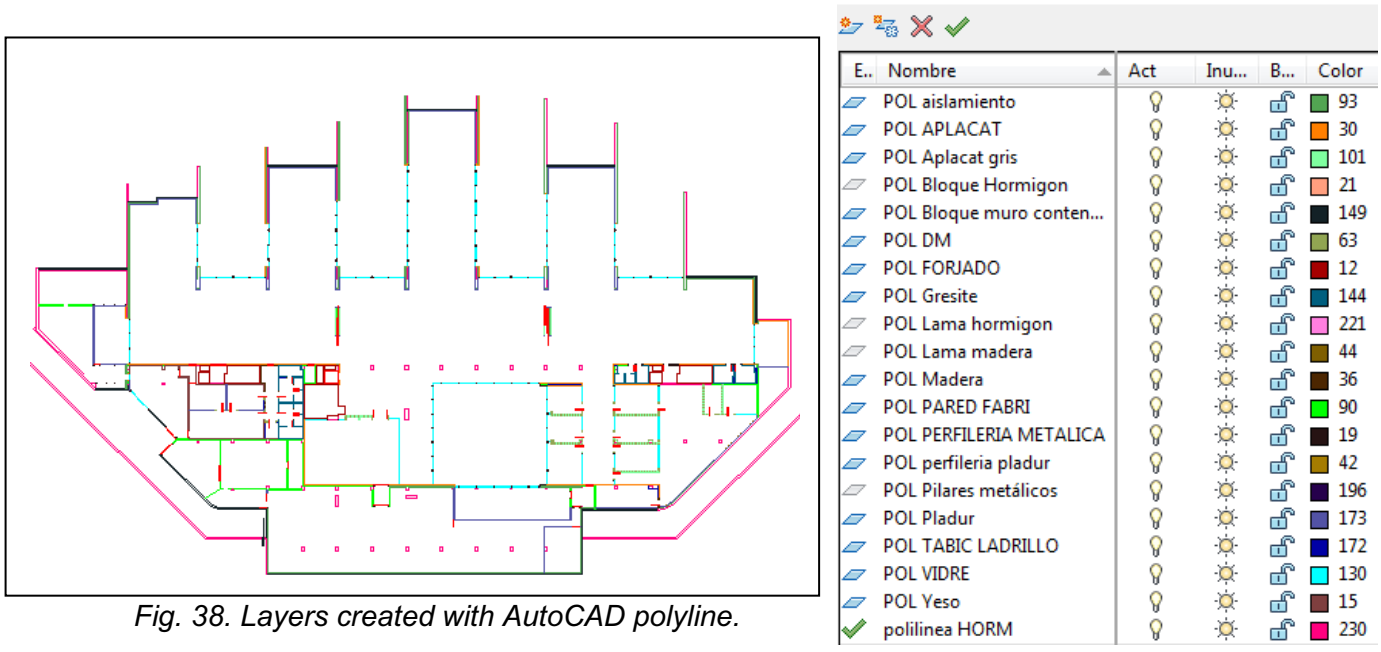
Before 3D view, it is necessary to treat or handle these drawings to facilitate further processing. To do this, we must unify the lines to polylines.

In this case, as the drawings reflect various architectural elements together (walls, flooring, carpentry, etc...) we must make an effort then it will be rewarded more quickly by providing the volume to generate each of the parts. So what it is needed to do is to unify the lines for each item. For example, to unify all closed contours which is part of plasterboard partition wall. Then, we must locate each of the architectural elements on separate layers.

Thus we get a layer in which we are all closed contours that form the outside concrete walls, another layer that is the stone lining, another with aluminum frames, one for each floor, and so on to get all the necessary elements.

This section is rather long and complicated due to the number of layers which contain the drawings and mixed and inaccurate they are.

But in the end the result is as follows:



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	POL Lama madera				44
	POL Madera				36
	POL PARED FABRI				90
	POL PERFILERIA METALICA				19
	POL perfileria pladur				42
	POL Pilares metálicos				196
	POL Pladur				173
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Fig. 38. Layers created with AutoCAD polyline.

Finally, the whole content of the AutoCAD file of floor building drawings will be useful only for the three-dimensional view all the layers you have created as polylines which contain all the elements to give volume. Everything is ready to be imported and worked on it.

BUILDING STRUCTURE'S VOLUME

At the "Building drawings" section we have already prepared drawings to get fastness now. At this step, we are going to work with the vertical and horizontal parameters. The floors due to its complexity will be worked later.

To begin the process, the file which contains the building floor drawings should be imported and to select only the layers containing the contours drawn in polyline elements except the floors that we will work separately. Once, they are already visible displayed on the ground level, the priority will be to give the actual height to each element. First, positioning it to the building base, the level where the base in the Consell Insular de Menorca is located. Then, we put each item to its appropriate height: The Ground Floor's vertical surface to match the base, the first floor's to 3.47 m above, the First basement floor to -4.3 m at the base of Ground floor, and Second basement floor to -7.85 m.

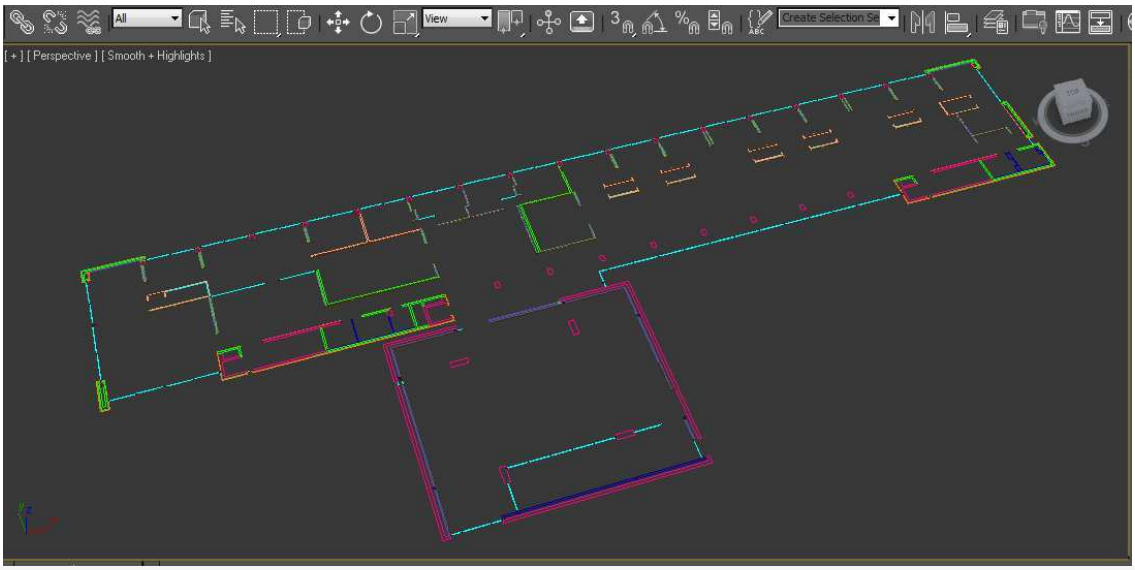

Fig. 39. Vertical faces components of the First floor imported from AutoCAD.

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Now we have to provide the volume to the elements. It's necessary to select layer by layer and indicate the extrusion value. Let's see an example: the high of the external concrete enclosure to 3.47 m.

In the case of First floor is not worth us only with extruding the elements to a unique height, as the central hub of the building becomes higher than the rest of the floor, so we will have to extrude by "edit poly" for each element of the hub of building central to the corresponding height.

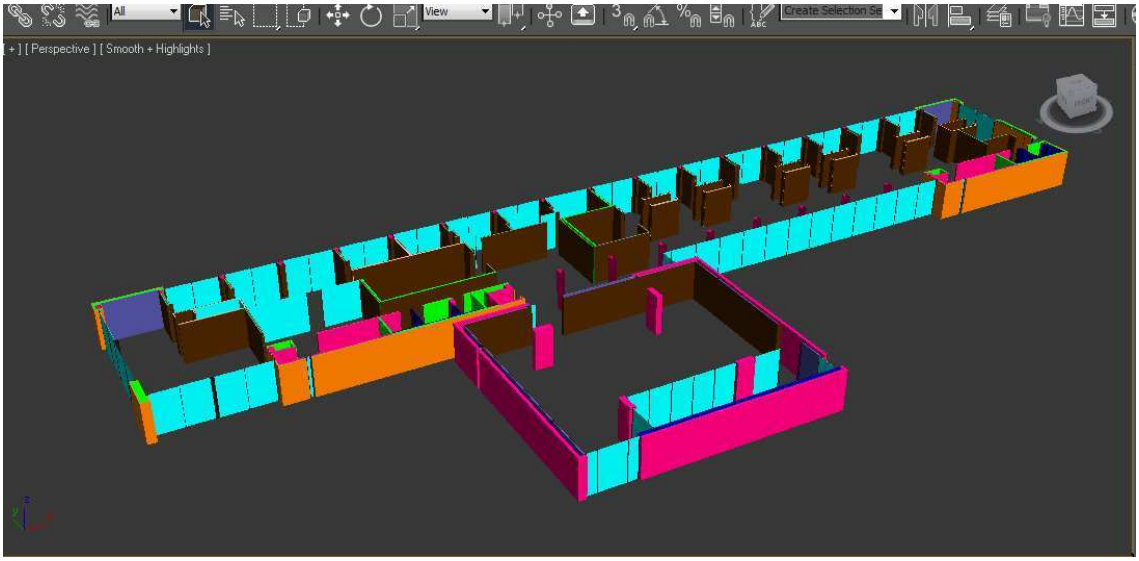

Fig. 40. Extrusion of the First floor's vertical faces to the lowest height of the floor.

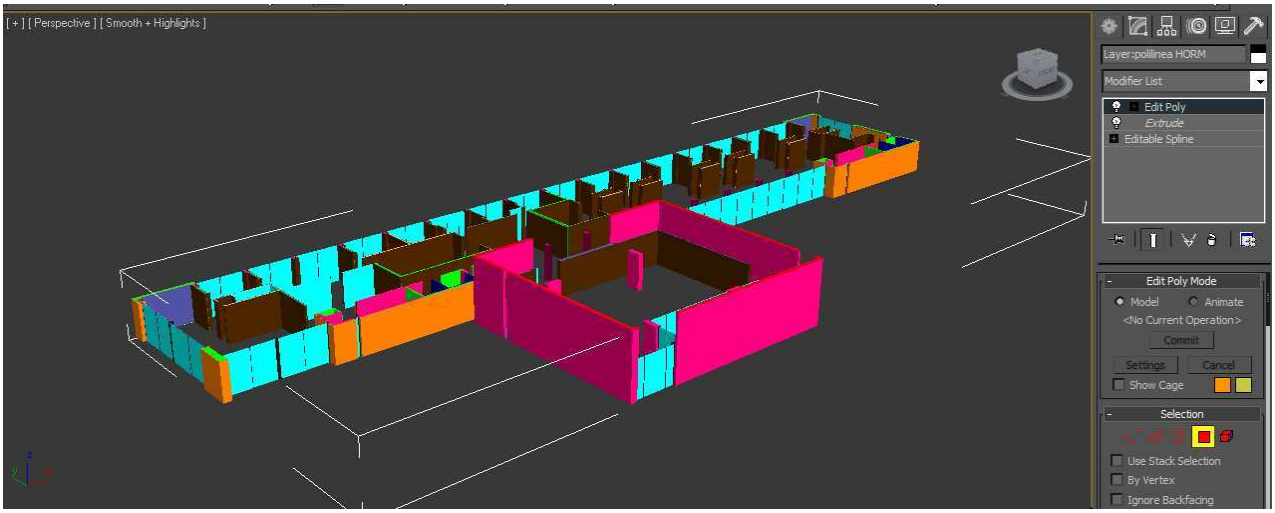

Fig. 41. Extrusion of the vertical faces elements cube by "edit poly"

As shown in vertical surfaces, the walls are not continuous, the vertical holes breaks all openings to be subsequently carpentry.

But not all windows are floor to ceiling, so you have to plug the hole that corresponds to the wall. You have to create prisms of the dimensions of each hole and height to the bottom of the window, or from the roof to the door frame. In this way the holes will be marked for subsequent placement of the woodwork. These prisms can be created through boxes and then attached to the item (option not recommended) or by editing in Maya's own vertical wall, by "edit poly", which is the best option and ensure you don't create additional faces more than just loaded the file and slow your computer.

An important point when importing items from Autocad and extrusion them is to check that you have not created black faces, and subsequently placing textures can give us more of a headache. This phenomenon is known as "normal" and to fix, select "edit poly" and with the face selected we click to "flip", so when we apply a texture to this

item will be on the outside and won't stay inside. In case we are not sure about if one side is right or not, what we can do is, through "edit poly", to apply a positive value extrusion and if extruded outward is that you have the "normals" correctly.

Once we have ready the vertical faces of the different floors, we step to the second part: The floors modeling.

Firstly, we have created on Autocad the limits of the floor forged their elevator shafts, light courts, central fountain, and so on.
Except for the concrete slab of the Second basement floor, the others have already acquired several levels within the same floor, including several thicknesses and in the case, from Ground floor to -1.2 ° tilt in the trans verse direction in a one of its parts. So we have to cut up our floors by the limits which produce the change on level or slope or width. Then import the floors cutting to 3ds Max where we will finish them later, extruding parts of these as we did above with vertical surfaces, giving the heights and slopes for each part and finally joining the cuts of each floor by selecting "attach" in "edit poly" option.

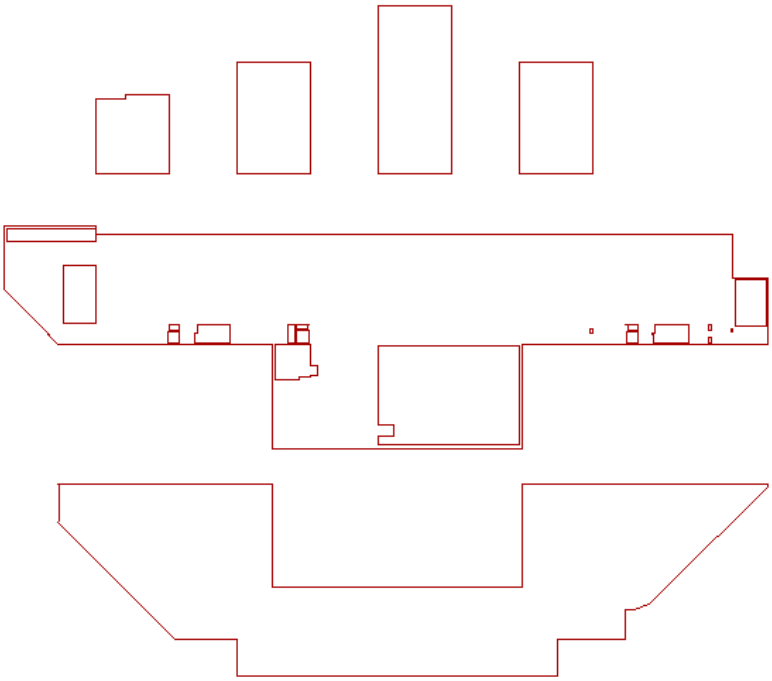

Fig. 42. Ground floor's cutting in Autocad.

Once created our floors we place it with vertical surfaces to their respective heights.

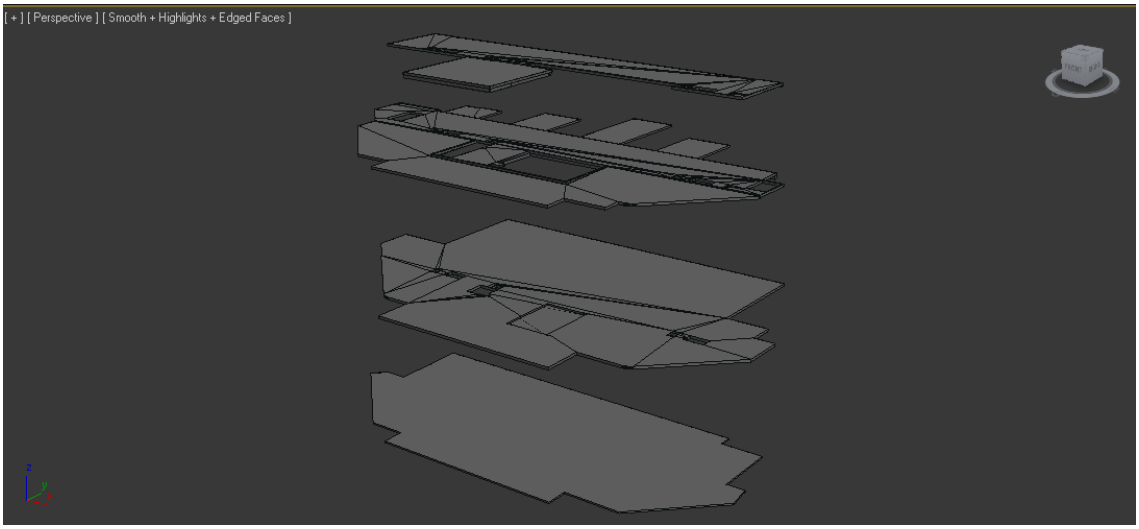

Fig. 43. Floors ready to put together with vertical surfaces.

For the molded “Consell Insular” cover, apart from following the same strategy as the floors, made from cutting in terms of its height and thickness, the part of the skylight will be created from profile that we developed in Autocad thanks for the cross section of the building we have. Such as the other parts of the cover we import them to 3ds max. Extruded profile skylight giving the total length of this and finally we will join the rest of pieces that make up the cover.

With vertical surfaces, floors and roof completed following will be finished the modeling grid, as we have already vertical profiles extruded from the polyline layer created in Autocad.

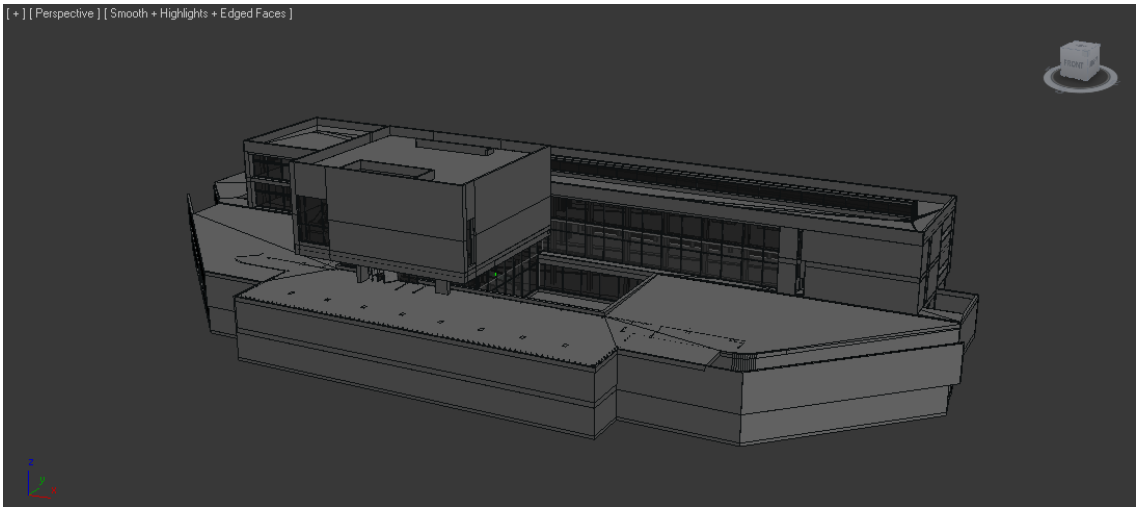

Fig. 44. Results after floors, roof and horizontal profiles placement.

Land

The first point to consider is to define the limits of our ground, in our case we decided to model part of the Biosphere Square corresponds to the Consell insular building front, from this will become the meeting point in case of evacuation. For the back side and lateral sides we will model the terrain to the pedestrian zones.

To perform 3D modeling of the terrain, the best option would be to work from the contour given by the topographic map of the area, but since we didn't have it, we had to draw on the planes section, elevation and longitudinal and transverse images taken from our photo shoot and available to us through "google earth" for the development of our land.

For this, we followed a strategy similar of forged floors, cut up our land in terms of changes in altitude and inclination.

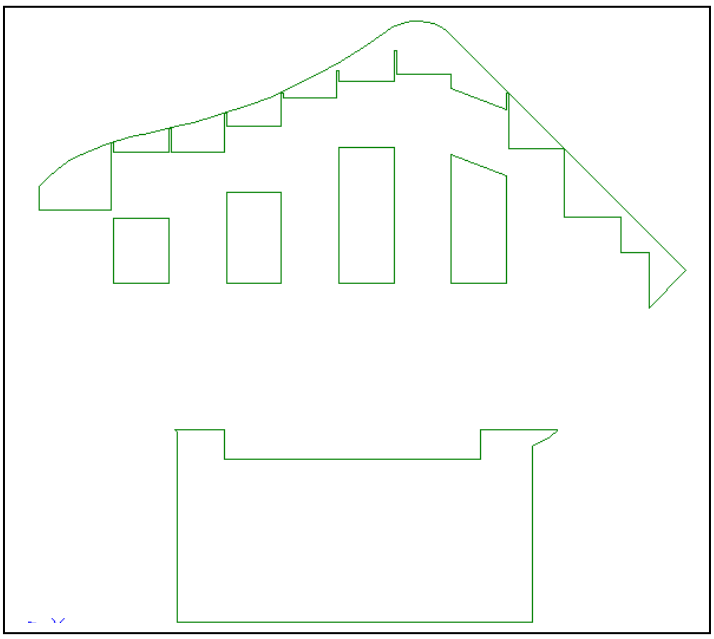

Fig. 45. Land's cutting by AutoCAD.

Next, we imported our 3ds Max file and we have applied the proper inclinations in different axes to each of the parts.

To solve part of the "hills" that occur in the ground back-side from a height of Ground Floor is introduced into the courtyard of First basement floor, we had to make changes to it using 3ds Max and guide us directly and photographs taken by the panoramic view offered by the "google earth". A cutting from the back of our property using the modifier "edit poly" option we have created several drawings with inclination up to the height of the courts of the First basement floor.

To finish, with the use of the "turbo-smooth" modifier we have provided the desired smoothness of our hills curvature .Join the parts of our site and place it in the correct coordinates with respect to our building.

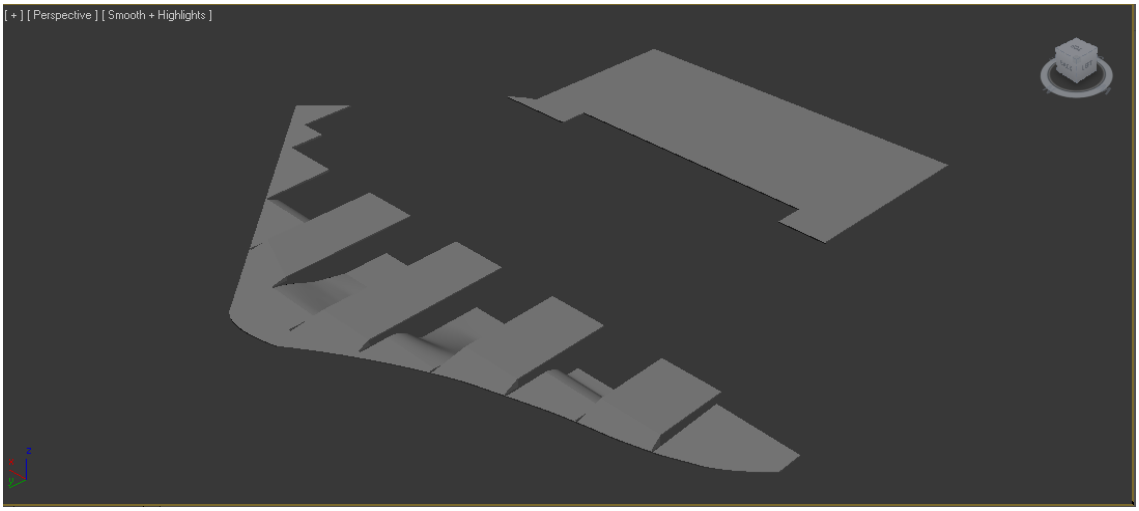

Fig. 46. Land in 3ds Max ready to move it next to the building.

ADDITIONAL ITEMS

Additional elements are elements such as stairs, fake ceilings, handrails, ramps, parking, revolving doors, escalators, ventilation shafts and concrete and wood blades.

➢ Stairs

For the stairs modeling, the first thing we did was draw in Autocad sections of each stairs flight, the stairs both emergency and centrals as it was not provided to us the drawings of longitudinal section of the Consell Insular. To do this, we copy the footprint of the stairs which appears at the plan and to determine the riser divide the headroom between floors by the number of steps taking into account intermediate landings. From there we draw the sections or profiles of each of the stairs.

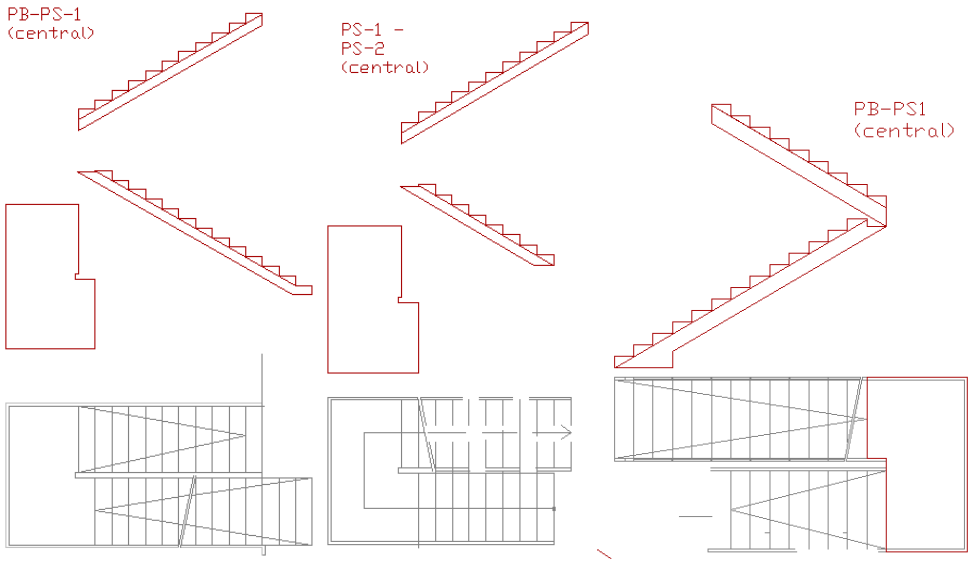

Fig. 47. Central stairs sections ready to import Autocad.

Once the sections have lists imports to 3ds max, where by using the "extrude" modifier option we will be able to give it the scope or width of the stairs and on the other hand the intermediate landing width. Then, we join the flights of stairs and landings using "attach" option. Finally, we put these in their respective starts of stairs in the building with the "snap" to set accurately marked.

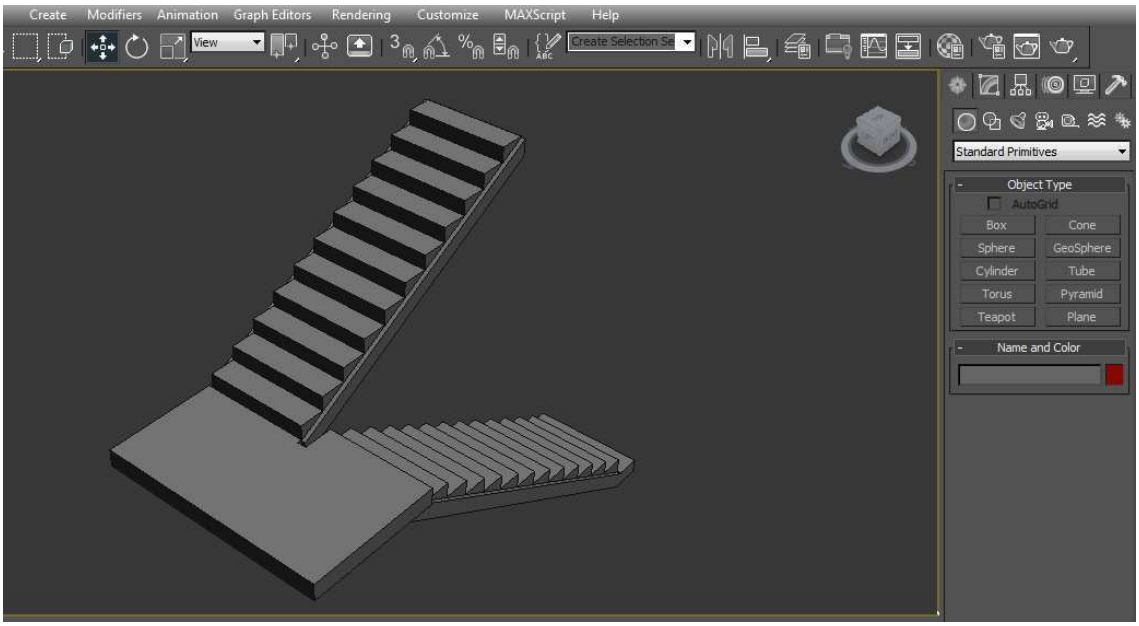

Fig. 48. Central stair "Ground floor to first basement floor", after extrusion at 1.15 m wide with 3ds Max.

- **Fake Ceilings**

The fake ceilings are one of the elements of the building as long as required, as each Consell Insular's floor has installed plasterboard ceilings or wooden strips except for the Second basement floor. There are also different heights and fake ceilings geometries within the same plant, which further complicates their preparation.

For its preparation we rely on the planes of the cross section of the building available to us in order to define heights and geometry. As the information that we can bring these planes is insufficient we will have to dip into the photo shoot at our disposal in order to check the heights in the different rooms and limits of each of these.

The technique to be applied is that we've been using on the stairs and other elements, to create a profile or section of each of fake ceilings taking into account changes in width and height.

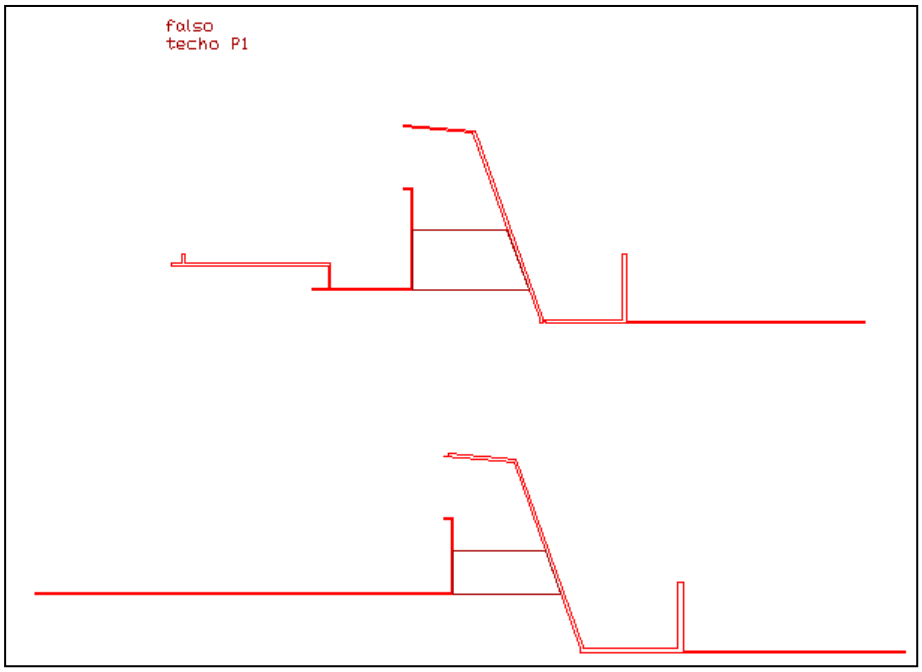

Fig. 49. Profiles of the First floor's fake ceilings.

Once you create the fake ceilings profiles import these to 3ds Max and with extrude option we are going to apply the desired length. On many occasions we will need to edit them with "edit poly" option in order to adapt better to all rooms' corners. Once created all the ceilings, unite them with "attach" as a single element in the scene.

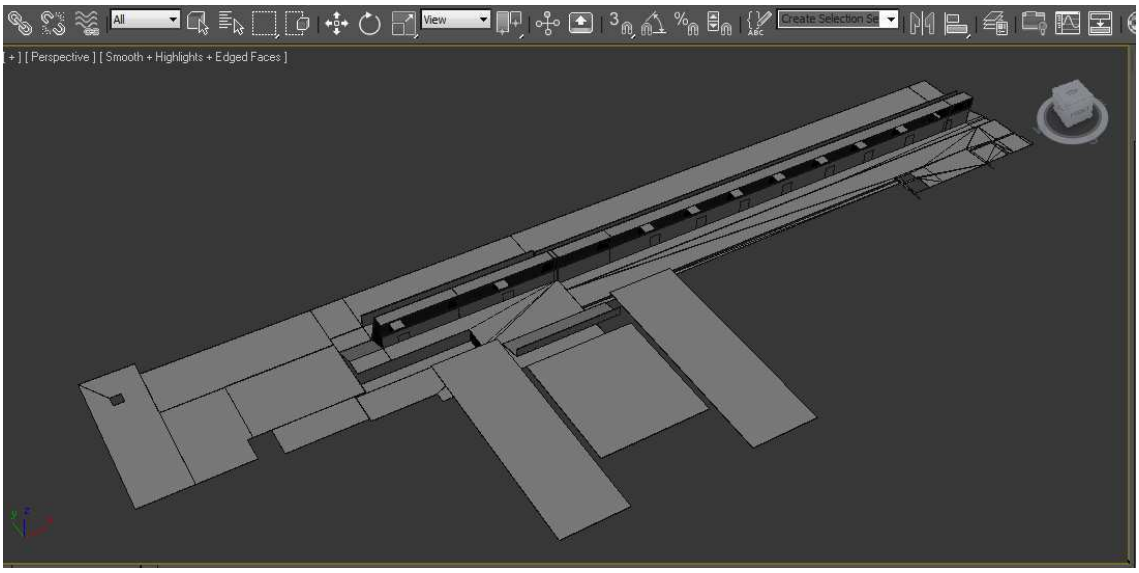

Fig. 50. First floor's fake ceilings in 3ds Max.

- **Railings**

3ds Max has an own system to create rails, which allows you to set multiple parameters like the height of the palm rest, the profile and dimensions of this, the round or square profile of the posts, the number of these and their arrangement along railings, etc..

Using this system that 3ds Max provides we can do all the railings of the stairs and outside Consell Insular building as well, except for the railing that defines the source Ground floor which we let's talk later.

The Consell Insular railings, generally speaking, have the following geometrical structure:

Fig. 51. Stair railing Consell: 1. Top rail square profile 5x5cm 2. Posts 5x1cm square profile 3. Intermediate posts round profile of 1 cm in diameter.

Because our rails interspersed square posts with round posts and the 3ds Max program only gives the option to do everything in round or square profile have to do each rail into two parts. In one the railing with square posts, and in another only round posts.

First of all we have to generate our rail path through the creation of a line. Then into "geometry" we will go to "AEC Extended" where select "railing", click on "pick railing path" and then choose our line path. Now we can start building our rail, we define this height, top railing size, posts numbers and their size, etc... The most important thing is that when we believe other to generate new rail with round posts again clicked on the same line path before.

Once generated the two parts, one with top rail and square posts and other with round posts, we can only unify these two parties with "attach" option to have our railing complete.

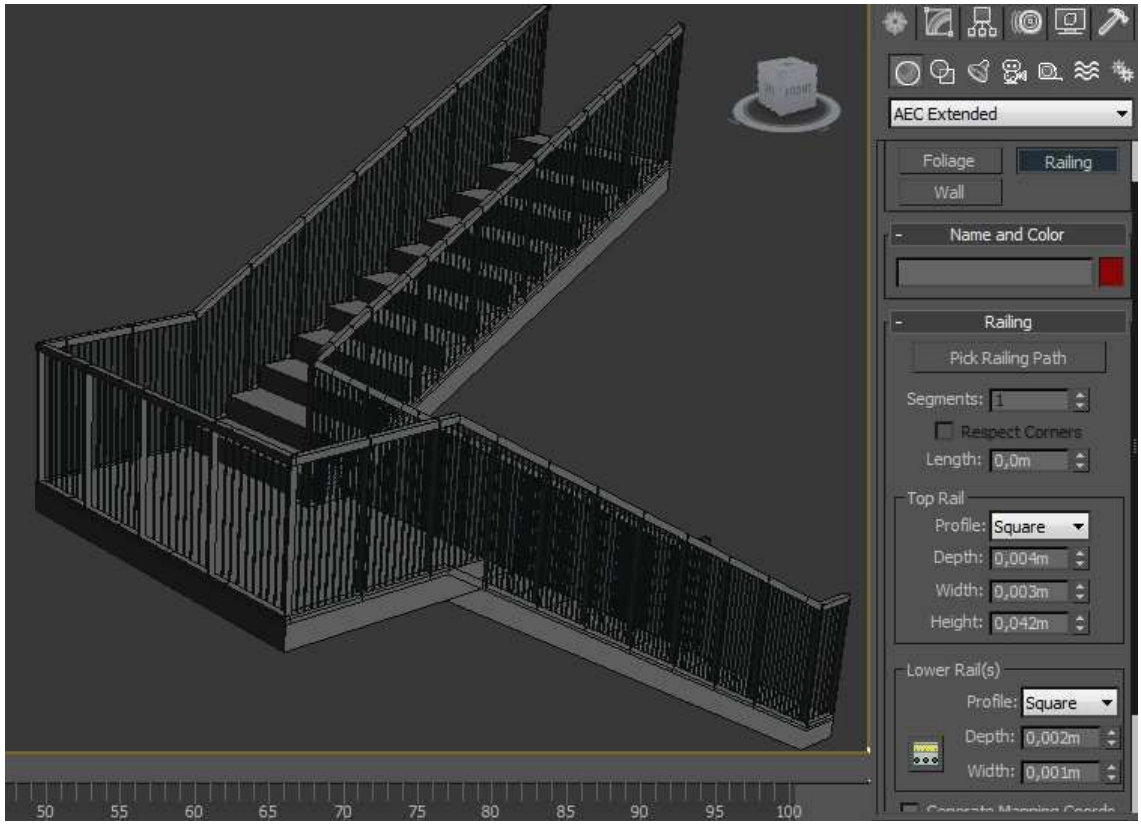

Fig. 52. The central stair railing "ground floor – first basement floor", recently completed on 3ds Max.

- **Parking Ramps**

The Consell Insular building has two parking ramps, one of them is the access ramp with inclining changes because of the store entry at the First basement floor, and the other one is the exit ramp that is completely continuous from parking floor to the street level.

For modeling these, we followed the standard pattern, creating these ramps plants on Autocad. It's important to remember that whenever we draw something by Autocad and then we want to import into 3ds Max must be made in polyline way.

Once imported our ramps to 3ds Max, we extruded them to give a certain amount and we can edit better with "edit poly" to adjust the grade.

Firstly, once we ramp extruded is place it and adjusts to the lower part, to Parking floor. Next, with "edit poly" select the top vertices and with coordinate reference system on local position, climb up at the street level. In the access ramp case will have to adapt first to the First basement floor's store entrance height, and then end at the street level height.

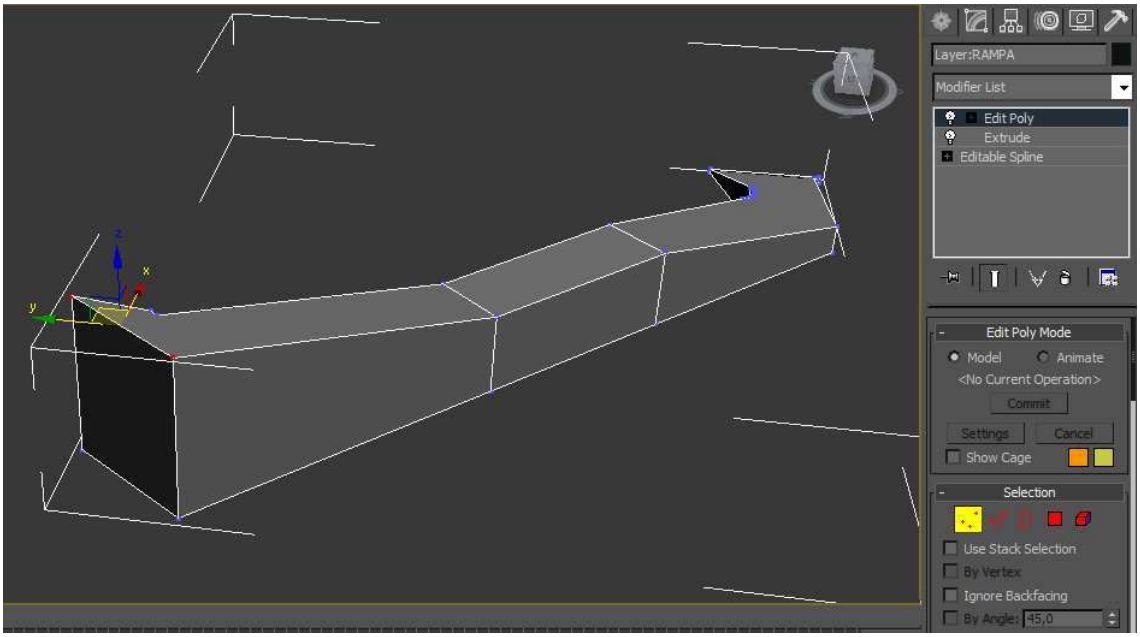

Fig. 53. Editing the access ramp vertices to position at the street level height.

- **Rotating door**

For rotating door modeling we have the vertical woodwork extruded it previously, as part of the imported layer carpentry Autocad. Therefore, the missing part to complete are the crystals curved, horizontal carpentry, doors and revolving circular top cover. To perform the horizontal curve and carpentry, as would become geometrically speaking two cylinder sectors, 3ds Max allows multiple standard geometric shapes, as in this case the tube, which allows us to modify many aspects such as height, radio inner, outer radius, and so on.

So we must create is the tubes with the appropriate revolving door radio and turn the option "sectorize" to define the dimensions of our cylinder sector piece.
To the top cover sufficient to perform a cylinder, which is another 3ds Max standard geometries and after define it with small thickness.

The rotating inner doors are to be arranged between three panels to 120 º, we performed it with the geometric option "box", and then with the angle option put each of the planes to 120º in the Z axis.

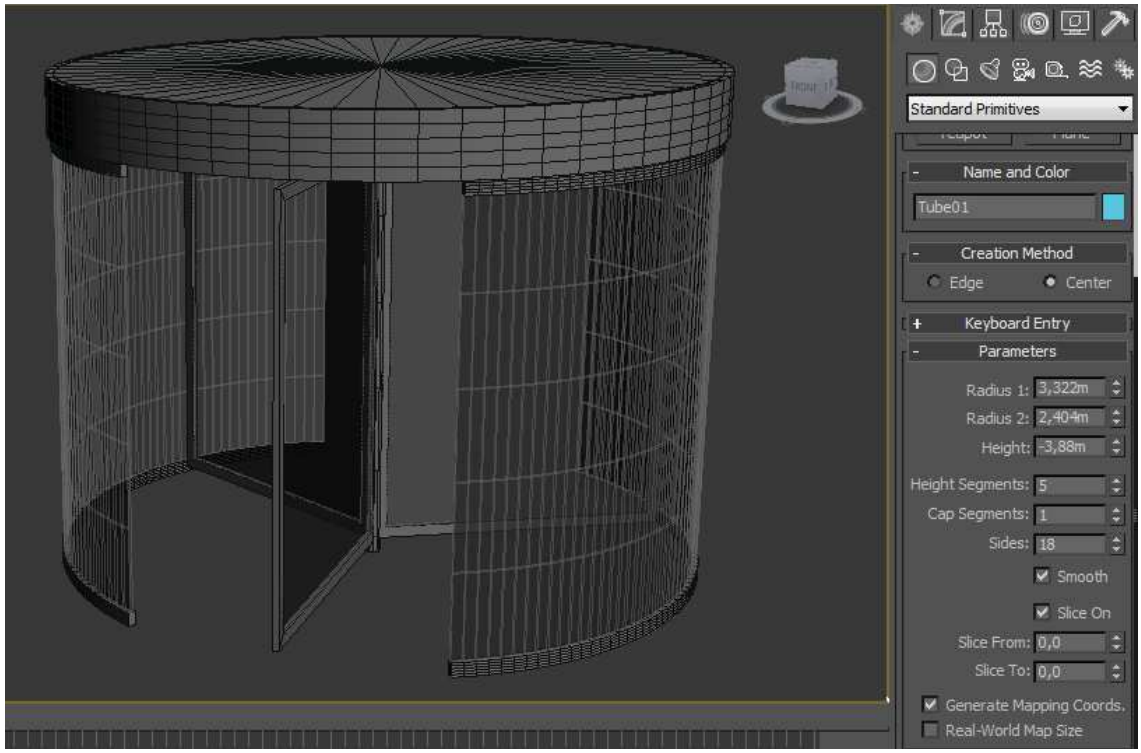

Fig. 54. Rotating door floor ground entrance.

- **Escalator**

As making the escalator from cero takes a lot of time, we decided to find one that fits well to our project on web site for downloading objects in 3ds Max. Once we reach the escalator similar of Consell Insular's we have adapted it and modified to the dimensions of our project, all from "edit poly". To include files from 3ds max to our scene must import the escalator or the object as "import merge".

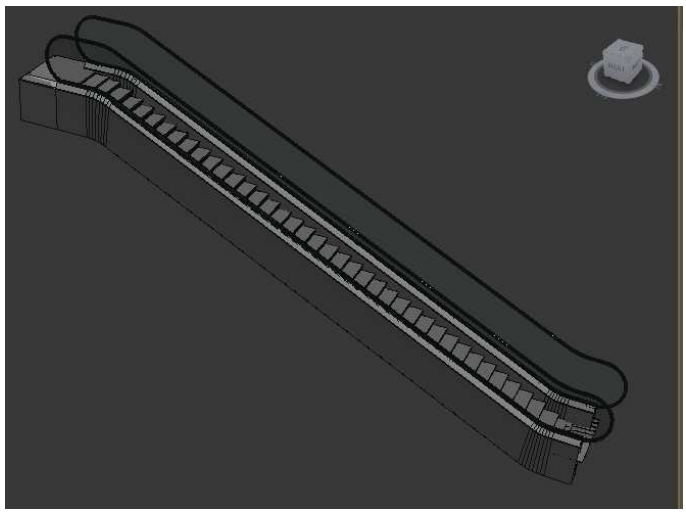

Fig. 55. Escalator on 3ds Max.

- **Vents**

For 3D processing, we did a cutting of their faces on AutoCAD then import to 3ds Max where we have just put the pieces together.

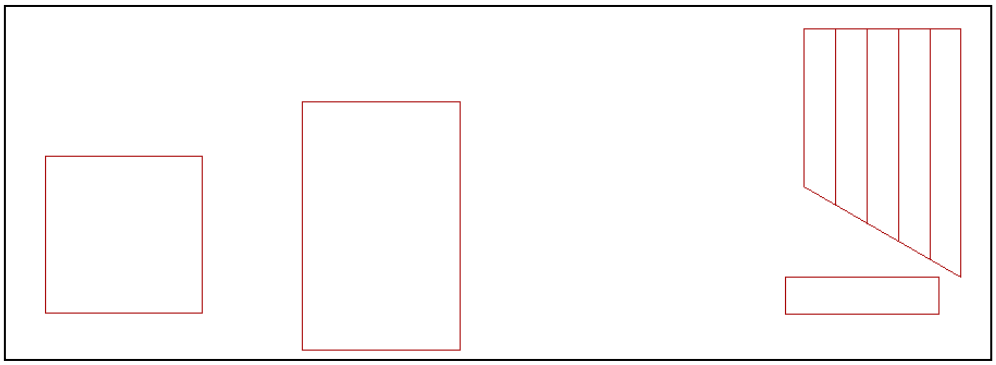

Fig. 56. Vent cutting in Autocad.

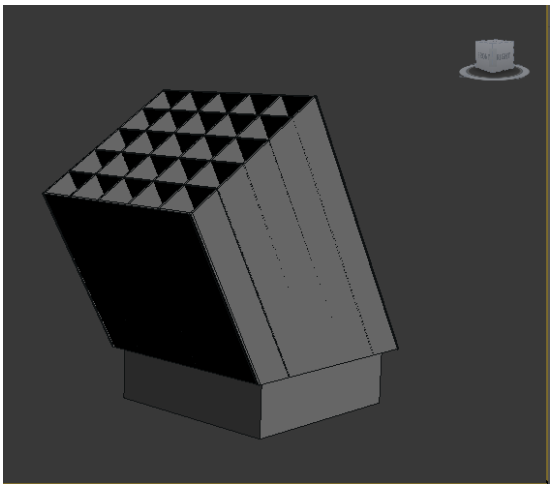

Fig. 57. Vent on 3ds Max.

- **Concrete Brise-Soleil**

Concrete Brise-Soleil is a protection element against solar radiation, and is located both in front and back-side of the facade.

The composition of this is quite laborious, since it consists of eight horizontal slats ranging from street level until first floor end, separated from each other by multiple vertical slats following a different arrangement between the even rows and odd.

For 3ds Max modeling, we start from the vertical slats previously imported from AutoCAD as a layer. Still, it's necessary to draw on AutoCAD Odd row's vertical slats because we don't have it on the drawings. In another place we import the horizontal slats' profiles from the section plane.

Once we have on file in 3ds Max, the vertical profiles of the even and odd rows and horizontal profiles of the uprights, the only thing we need is to extrude each of the elements and go row by row mounting of our lama in the front and rear of the building of Consell Insular.

Once we have our slats assembled group them to deal better.

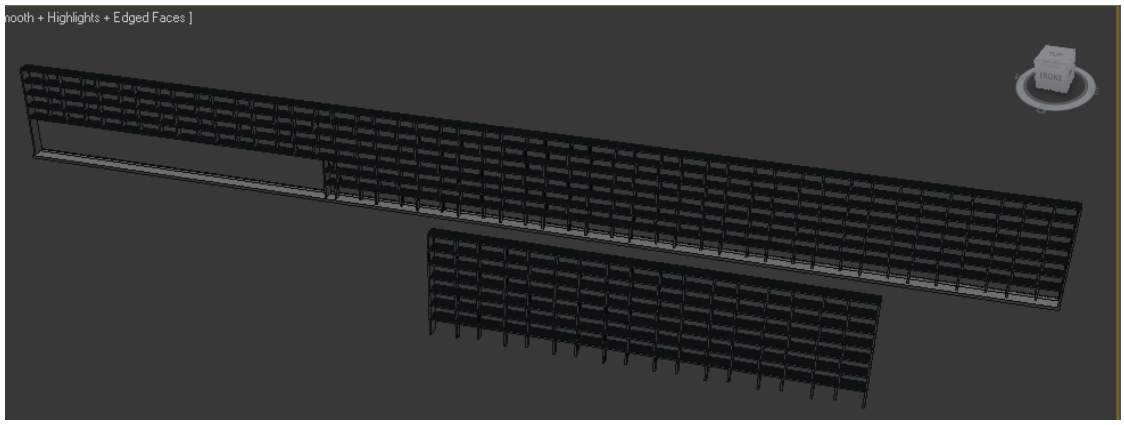

Fig. 58. Concrete Brise-soleil on 3ds Max.

- **Wood Brise-Soleil**

The wood brise-soleil is less complex than concrete, and which consist of square strips separated by a distance. So, once we extruded the vertical strips imported from AutoCAD, the rest of the horizontal strips can be done directly from 3ds Max with "box" option, and giving the appropriate dimensions. The strategy here is to measure at the back-side and front of the building on plan the separations between horizontal slats, then we create a strip on 3ds Max and we repeat it as many times it's necessary and the appropriate distance.

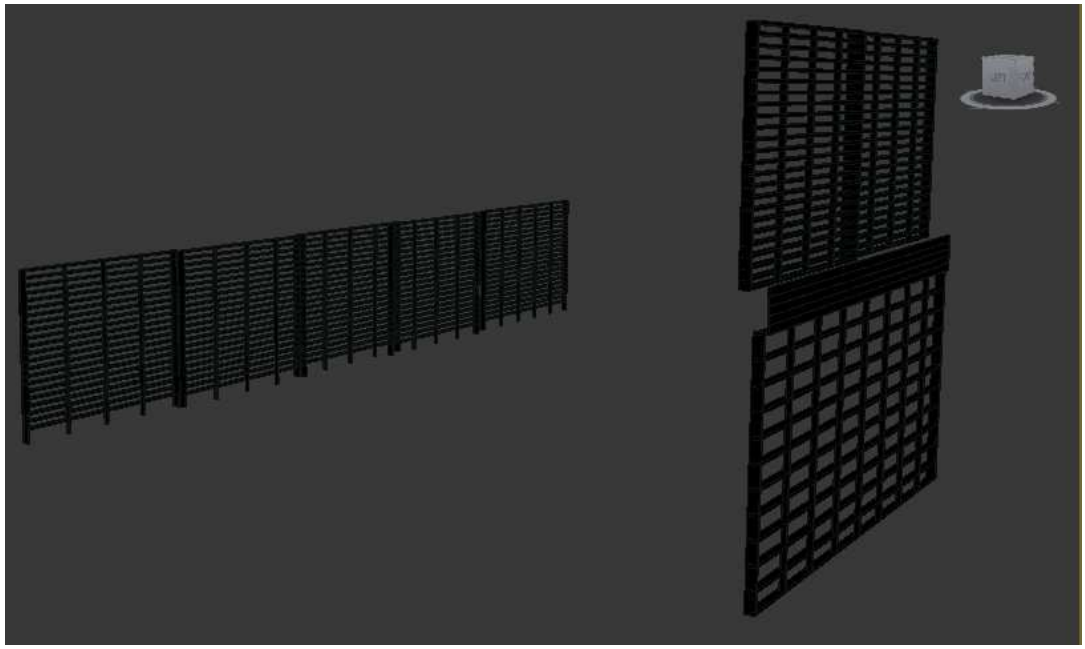

Fig. 59. Wood brise-soleil on 3ds Max.

APPLYING TEXTURES

Before creating our textures, we must bear in mind that Vray adv 1.50.SP4a is the rendering engine that we going to use, so the best option is that our textures are also Vray. To use Vray materials, we must first click on settings tab and assign the Vray adv 1.50 as render production.

From here we can start creating our textures entering the material editor.
We started creating anisotropic materials that we use on multiple elements such as translucent glass, opaque glass, chrome and galvanized steel.
These are materials that don't require additional images; we only need to configure the properties of each material from a Vray material.

For example, chrome is to enter the diffuse channel entirely in black, reflection in dark gray "150", and 2.97 IOR value.
The glass is obtained with the diffuse channel completely black, and the refraction and reflection channel completely white, then put a 1.52 IOR value and select boxes Affect Fresnel reflections and shadows.

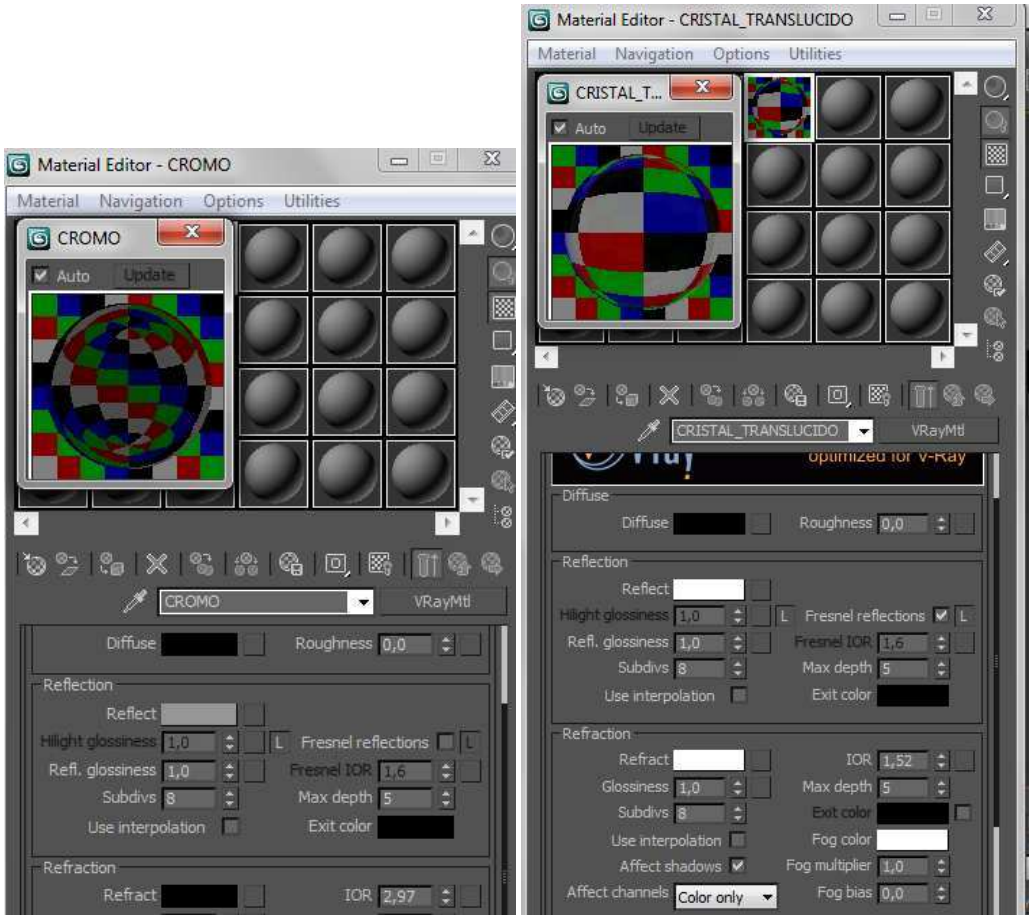

Fig. 60. Chrome and glass material configuration.

The rest of the materials or textures made from a color or bitmap, a tone or an image that simulates a texture. You can then further refine the material giving it more or less brightness, opacity, bump, etc... This is to fit as much as possible to reality. Created the material, is applied it to the geometry and ready.

It may be that to apply the texture to geometry, a message appears warning that we need a coordinates map on the texture geometry to be correctly applied. To fix this, we apply a UVW Map modifier, which establishes the mapping coordinates rather complex geometries.

If a geometry unit doesn't have the same texture on all sides, we must use another type of material. A base exist, called multi-sub-object, which allows you to create different textures to apply in the same object faces or specific parts. Works by identifiers (ID), each part of the geometry has a number and each number belongs to a texture. First we create the IDs on the geometry. To do this, we must transform to an editable geometry (Edit Poly) and from the faces selection, go identifier indicating which gives each of the volume. Then we return to the material editor, with the base multi-sub-object, we have added as many IDs as created in the figure. As each ID has assigned a material, create this material in the same manner as above. If several parts are the same material, you can create one and copy it, or clone for modifying one copy the rest is also changed.

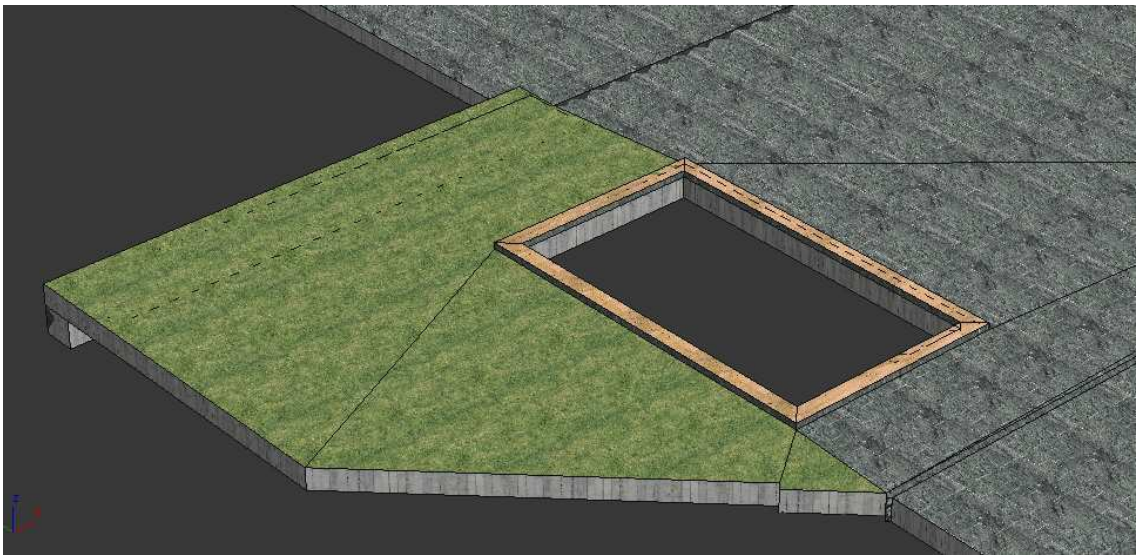

Fig. 61. Ground floor where the pavement joins a stretch of lawn and a border stone coated made from multi-sub-objects with Vray materials with different IDs.

The bitmap or images for textures are taken from my Consell Insular's photographs taken and many other specialized pages like a www.cgtextures.com, that it allows you to download 15mb a day during registration on its website. Best textures are what are called "tiled" which are those that allow you to repeat them without then appreciate the

joint between them. But these tend to be paid for, so we had to find another method to get a similar result.

By correcting the image in Photoshop, thanks to a plug-in called "seamless workshop", we get great results by investing a little time in the program.

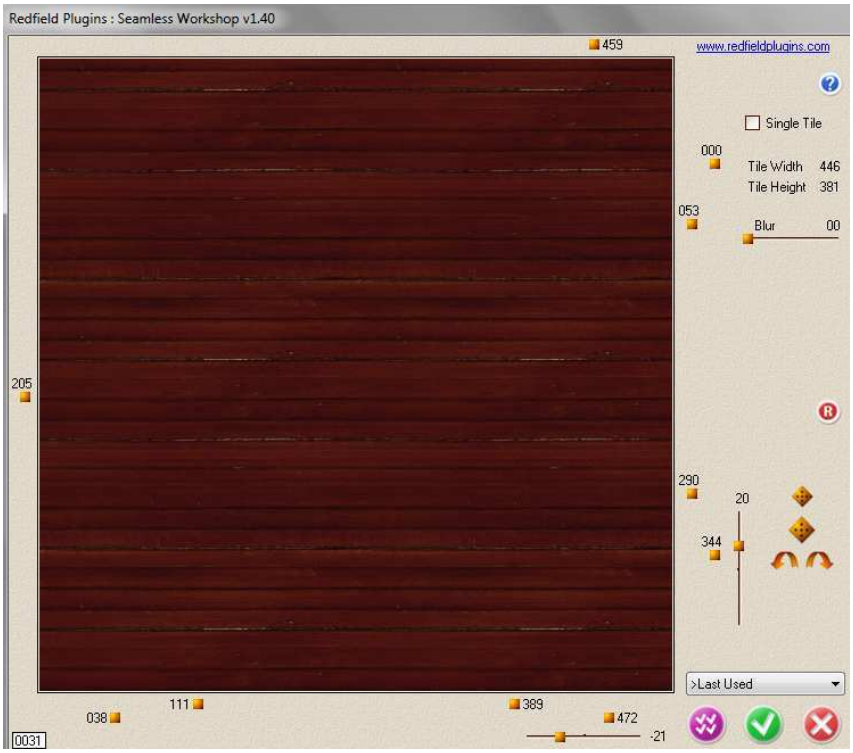

Fig. 62. Photoshop Filter to arrange our tiled textures.

FURNITURE AND VEGETATION

The furniture is one of the points that require more time and patience as we shall see onwards.

First, we have been guided by the distribution and furniture displayed at our plans. Due to the large number of different furniture that appear on each floor of Consell Insular, and that most of these are typical office furniture and office chairs in standard shapes and sizes, we decided to web search a furniture pack office and made by 3ds Max.

At the end we were able to obtain entire companies furniture catalog also offer you these in Cad format or Max.

Now is the time to identify the characteristics of each piece of furniture of our building, and find its counterpart in the catalogs we have.

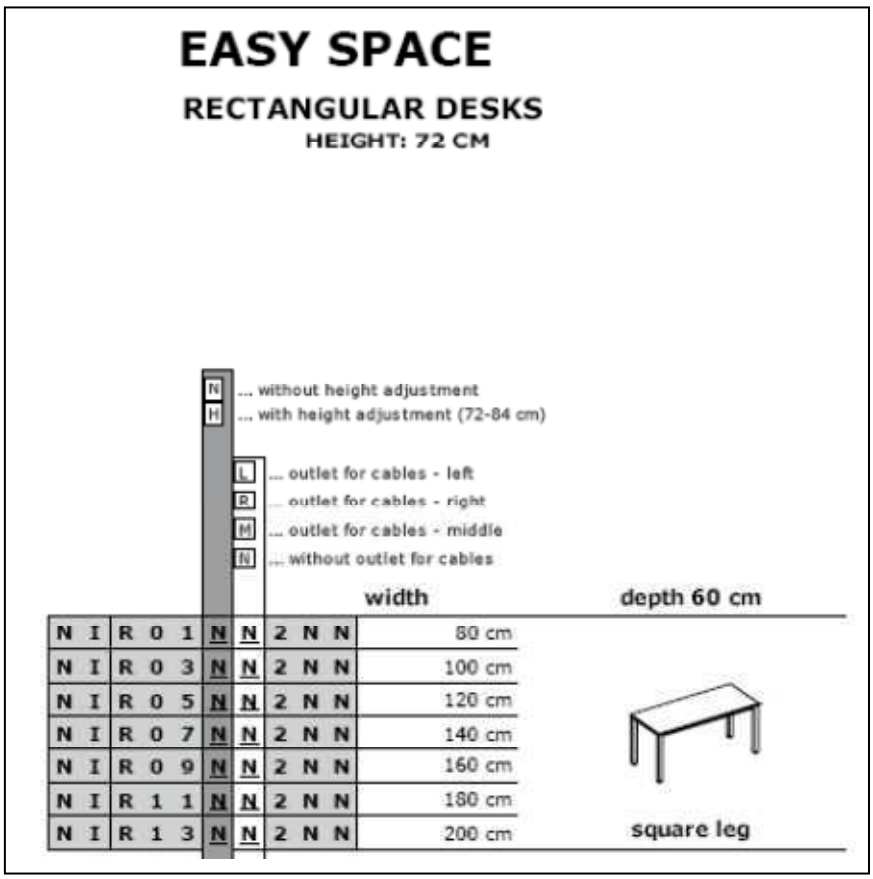

Fig. 63. Image taken from our office furniture catalog.

Generally, most office furniture comes to be a composition, for example, a rectangular table with legs 2x1m round coupling plus a rectangular table with legs of 0.8 x1m round and a fixed pedestal rate 40x50cm.

The rest of furniture other than office or place that are special, we make ourselves with patience, as is the case of furniture from the Consell's hall, those in the assembly hall and the huge binders of First basement floor.

The large amount of furniture and multiple objects that they contain raises a serious problem when working with them and arrange them in our building scene.

At first I tried to create and mount directly into the building file, but slowed so much the program, which couldn't be working well. So I had to find an alternative that would allow me to have the furniture in my building scene and working well.

Seeking different forums and specialist sites in the 3D world, I got a solution, create furniture in a separate file and then convert files in proxy, which would be something similar to the external reference files in AutoCAD. Another question which we asked ourselves was the subject of the file to import building furniture to stay properly positioned in its desired position. To this end, the only thing needed was in the file import furniture cad Consell floor and place it in the exact coordinates to the file we have in our building.

Therefore, the steps to get our building with the furniture are:

13. Create a new file on 3ds Max for each of the 4 floors of Consell Insular.

14. Import the floor with layers in AutoCAD polyline created and placed in the exact coordinates where the file is in our building.

15. Following the furniture distribution and type from CAD drawings, import (import merge) the furniture model of our office furniture catalog.

16. Mount furniture model imported and create and apply their textures.

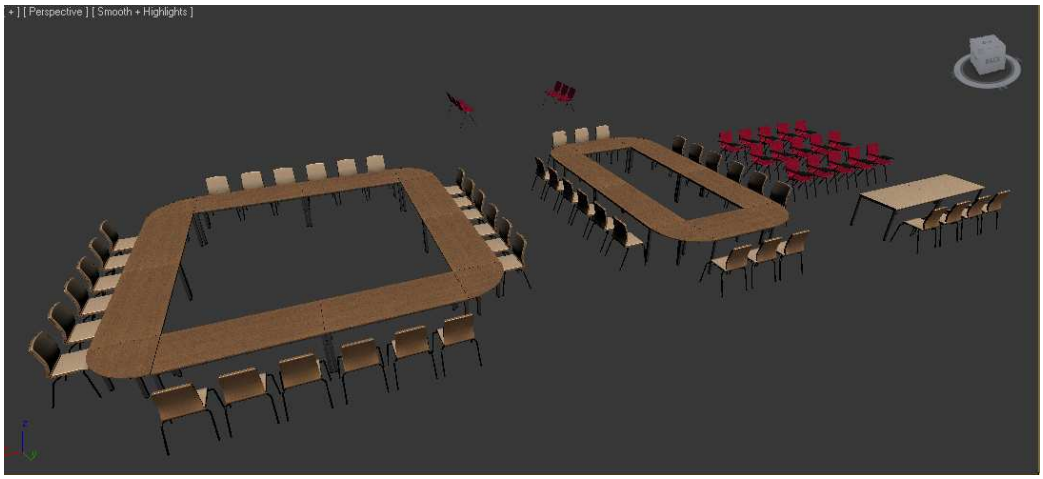

Fig. 64. Furniture model from First Floor mounted and with textures.

17. Cloning furniture as many as you type in the floor and place all along the distribution of the plane.

18. To expedite the work and don't slow down your computer, select the furniture created and with right-click the computer select "object properties" where we mark the box "Display as box," with which on our 3ds Max workspace doesn't show us the furniture or as a texture.

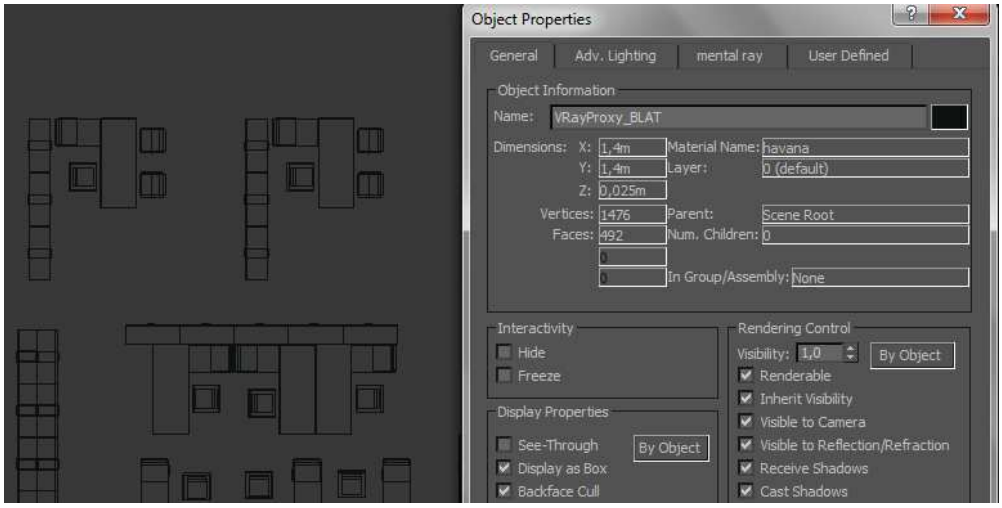

Fig. 65. Furniture with "display as box" marked.

19. Create special furniture that doesn't have them in our office furniture library, using the drawings at our disposal and the creation of sections and profiles in Cad for then extrude and assemble the elements.

20. Create and apply textures to special furniture and place them in their correct positions.

Fig. 66. Special Furniture mounted and with textures.

21. Create a new folder on your computer or multiple files to store proxy's files.

22. Once we have all the furniture created with their respective textures and placed in their correct position, we only need convert to proxy files. To do this, given the large number of furniture so we will make in different files, first sector of furniture right, then the central part and then the left. To convert files proxy must select and pressing the right button of your mouse, select the option to convert to Vray mesh export, and select the folder where we want to create them to, and then mark the box "automatically create proxies."

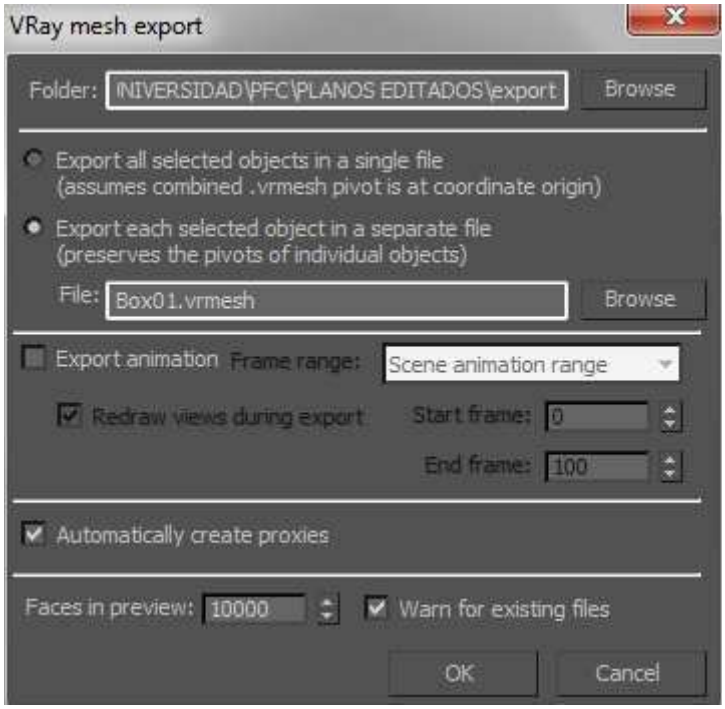

Fig. 67. Window to convert furniture in proxy files.

23. Once the computer has finished the proxy furniture convert, delete the floor from Cad, and keep our 3ds Max file in the same folder where you saved the proxy of our furniture's floor.

24. We opened our building file of the Consell Insular and go to "references" xref scene, where we load the file max of our furniture proxies and give it to "merge".

Note: From step 2 to 12 have to do with the furniture of each Consell Insular floors.

The vegetation of our scene consists of palm trees, shrubs and aquatic plants from the source.

Everything about shrubs or vegetation are usually very heavy (megabites) and therefore quite slow our scene so we opted to follow the technique used and explained with the furniture, create trees and vegetation to a separate file and then import them as proxy files.

3ds Max allows us to create certain types of trees and plants, but since we were looking for certain specific plants and palm trees prefer to look for something on web and download the higher quality models.

The textured palm trees are something particular. It should be textured from multi-sub-objects, giving the leaves, branches and trunk of a different ID.

To implement a realistic texture to the leaves, create more maps, in the diffuse channel have to apply a leaf image and in the opacity channel put the same leaf but in

white and black background. In this way the texture follows the edge of the leaf without any background added.

Fig. 68. Image of palm leaf for the diffuse channel.

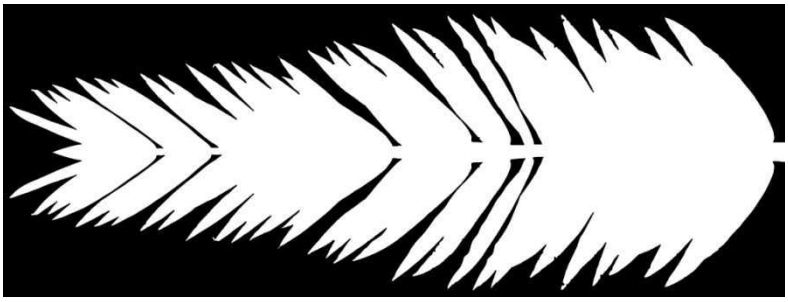

Fig. 69. Image of palm leaf for opacity channel.

After applying the modifier "uvw map" to adjust the texture of the leaf to the geometry of the palm leaves, select mapping as face.

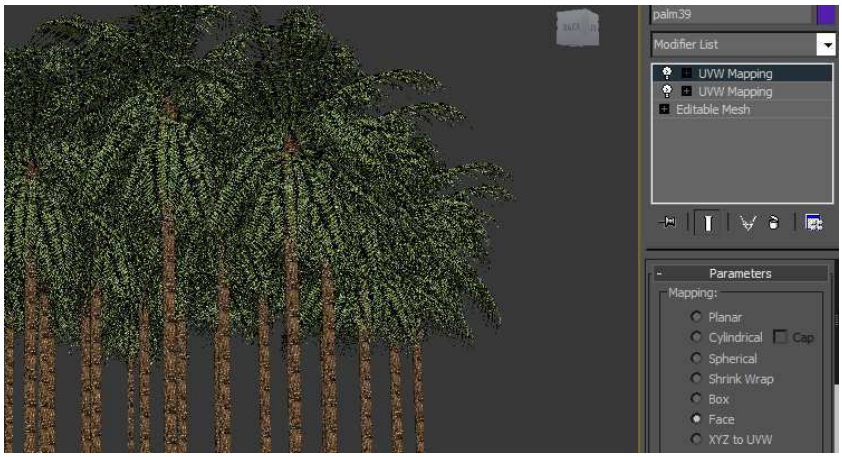

Fig. 70. Palm trees with textures applied and mapped.

For the aquatic plants creation, we had to make ourselves and for this we used a modifier named "Vray Fur," which is used to create hair or like.

This allows us to choose the amount of hair, length, width and intensity with which it affected by gravity. But to apply must first create a plane with the dimensions you want, which created and selected once we choose the modifier "Vray Fur" will act on it.

After several tests and adjustments of the parameters we obtain a more or less something decent.

Fig. 71 Source aquatic vegetables.

SELF PROTECTION ELEMENTS

The self protection elements that appear on our scene will be fire extinguishers, fire hydrants and alarm buttons.

As there are a lot of these elements on each floor we will use the proxy file system as we did with the furniture and vegetation.

To try to save time in the fire extinguisher modeling which is a more laborious than equipped fire hydrants and alarm buttons, we have chosen download from Internet.

Therefore, we only have to create the fire hydrant equipped and the alarm button and apply their corresponding textures.

To properly size the elements we searched the web to the enterprise of which are fire hydrants and other self-protection elements features.

Fig. 72. Self protection elements on 3ds Max.