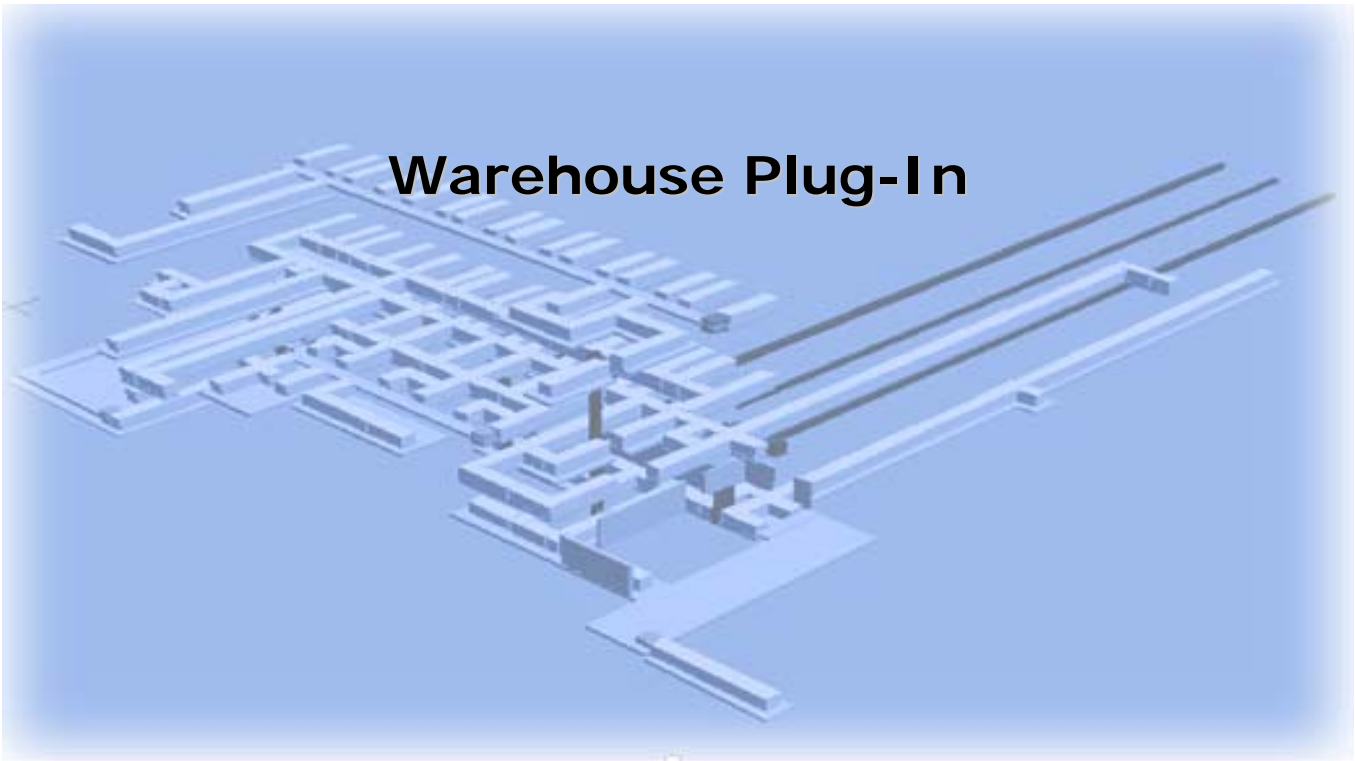


# Warehouse Plug-In



Technical white paper  
Consulting Engineering  
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# 1 Summary

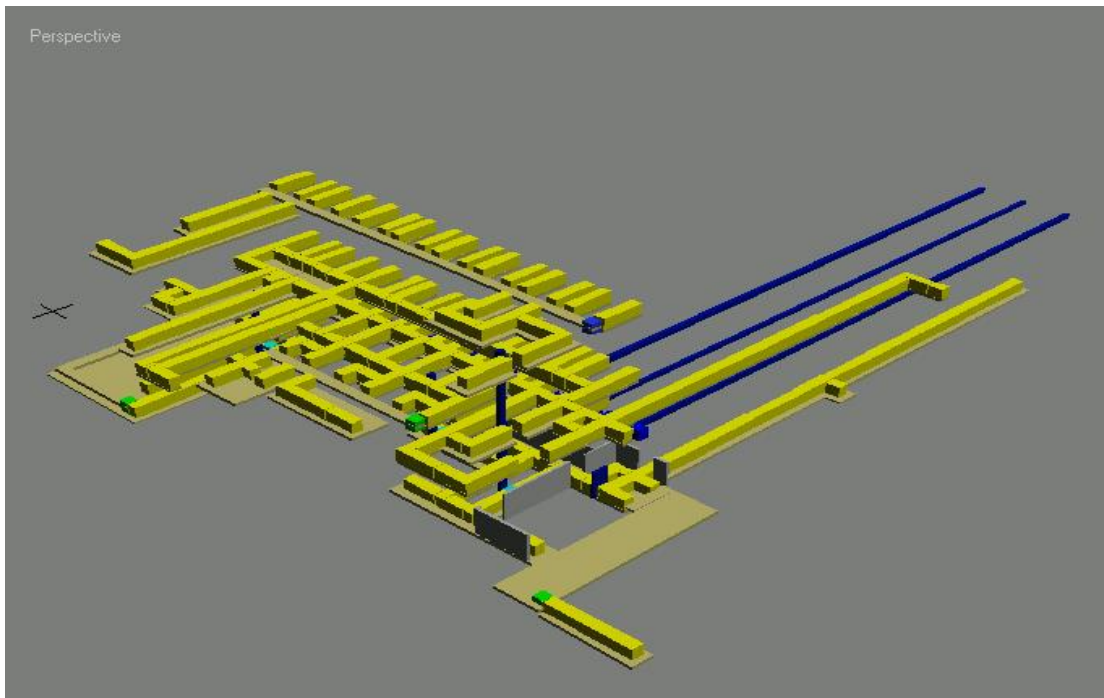
The Warehouse Plug-in enables using the 3D Studio Max as drawing tool for warehouse. All features of 3D Studio Max, like user friendly interface, high quality 3D modeling, and good rendering are available for drawing the warehouse.

# 2 Introduction

The modular architecture of the Plug-In enable high flexibility for different users. The Plug – in is an external program which is integrated to the 3DS max user interface. The 3DS max architecture allows adding new functionality in all segments of the programs.

# 3 What is Warehouse Plug-In

Warehouse Plug – in for 3D warehouse design. You can design warehouse on Auto Cad document which is the 2D representation of the warehouse or to design your warehouse without any document, so with our plug – in you can make the 3D visualization of the warehouse. We have our concept which we use to represent the real objects from the warehouse to the 3D Max scene:



### 3.1 Warehouse Plug – in interface

The Plug – in interface is shown on the picture below:



### 3.2 Details

We have our objects which represent the objects of the real warehouse: Conveyor, Crane, Elevator, Shuttle, AGV, Floor, Wall, Static Object, and Shelf. You can add AGV, Conveyor, Crane, Elevator, Floor, Shelf, Shuttle, Static Object and Wall to the 3Ds Max scene and each of the objects has parameters.

### 3.2.1 AGV

The image shows a software interface for configuring an AGV. At the top, there is a title bar with a minus sign and the text 'AGV'. Below this is a 'Parameters' section containing several input fields: 'Length' with a value of 40,0; 'Width' with a value of 40,0; 'Height' with a value of 40,0; 'ID' with a value of 0; and 'Speed' with a value of 80,0. Below these are two empty text boxes for 'Address' and 'Mesh Name'. At the bottom of the parameters section is a 'MeshNum' field with a value of 0. At the very bottom of the interface are two buttons: a plus sign followed by 'Telegram Point' and a minus sign followed by 'About'.

The length, width and height are standard parameters for each object and represent the real length, width and height for our concept.

Each of the elements has an ID which is unique and you can not have chance to find two elements with same ID.

Speed is the parameter which represents the speed which is used by the element in this case AGV, to move over the warehouse.

Address is the parameter which represents the real address of the element in the warehouse. Because you can “say” for example, this AGV will be placed to the first floor and second sector of the warehouse (if warehouse is partition of the sectors)

All other elements have the same parameters, but some of them have some different.

### 3.2.2 Conveyor

Stay Time which represent how long to be present the palettes on the Conveyor (in warehouse palettes move over the Conveyers), and when the time finish the palettes will “die” on the Conveyor.

Speed in this case is the speed of the palettes which move over the Conveyor.

### 3.2.3 Shuttle

Shuttle has the same parameters like Conveyor and AGV

### 3.2.4 Elevator

Elevator has the same parameters like Conveyor and AGV

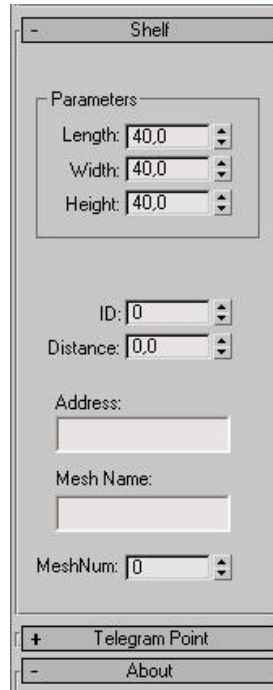
### 3.2.5 Crane

The image shows a software configuration window titled "Crane". It contains several input fields and buttons. At the top, there is a "Parameters" section with three spinners: "Length" (40.0), "Width" (40.0), and "Height" (40.0). Below this are "ID" (0), "SpeedX" (80.0), "SpeedY" (80.0), and "Depth" (0). There are two empty text boxes for "Address" and "Mesh Name". At the bottom of the main area is a "MeshNum" spinner (0). Below the main area are two buttons: "+ Telegram Point" and "- About".

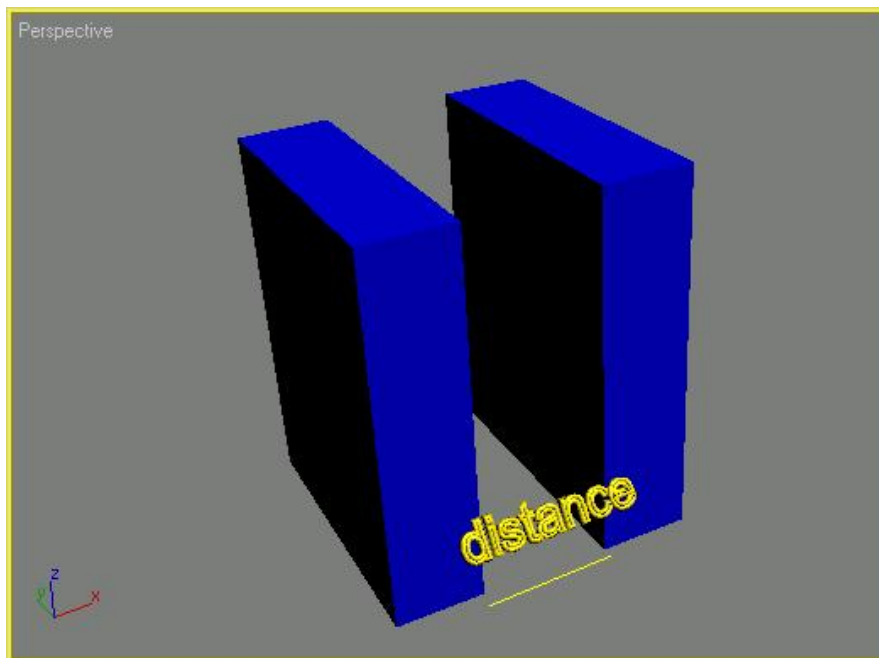
The Crane has two speeds:

Speed X which represents the speed over X coordinate and  
Speed Y which represents the speed over the Y coordinate of the real crane.

### 3.2.6 Shelf



The Shelf has Parameter Distance which represents the distance between the Left and right side of the shelf:





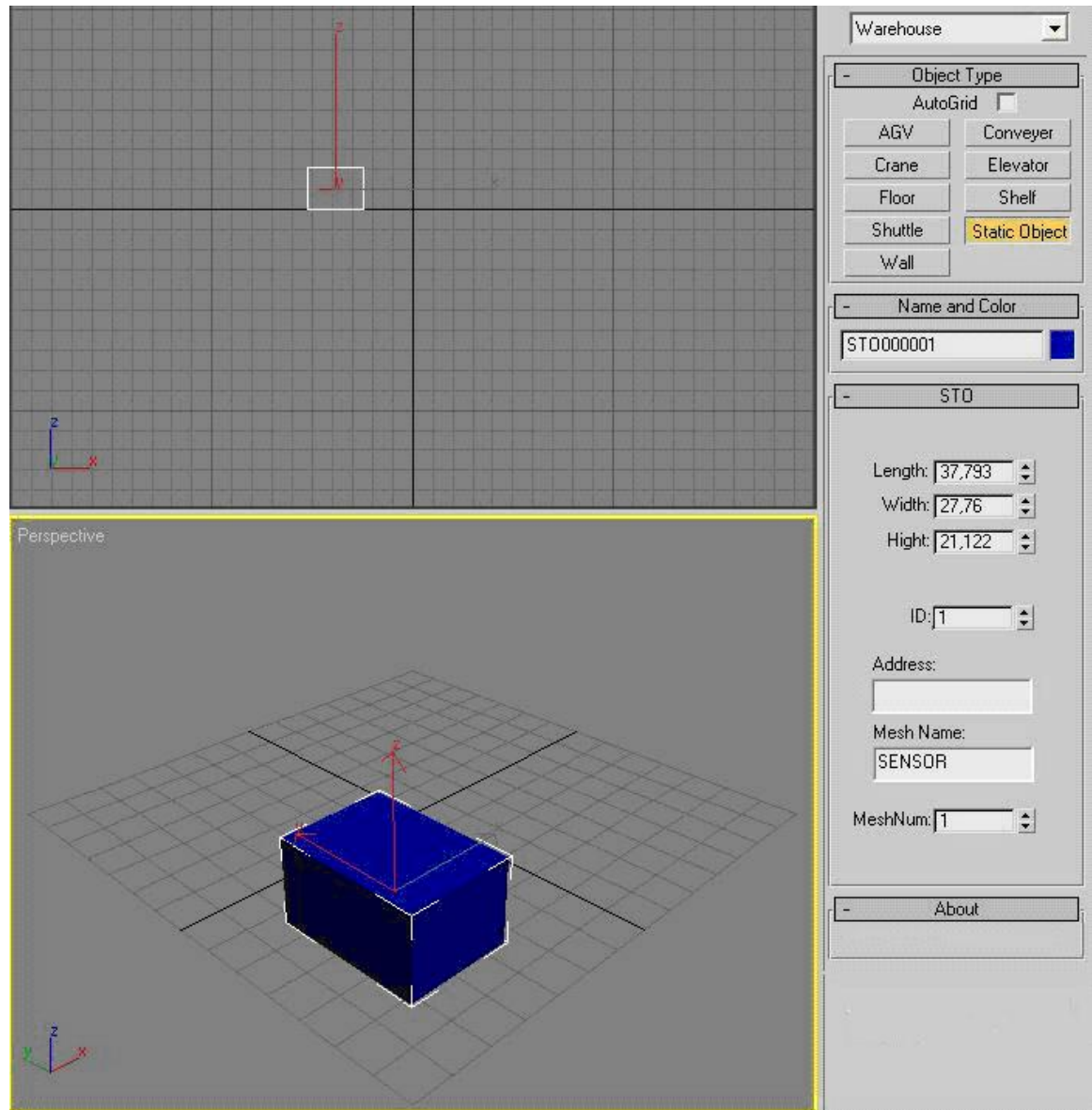
### 3.2.7 Static Object (STO)

Static Object is an object which is very useful when you design warehouse. Static Object has the simple parameters which are present to the other objects too.

The image shows a software dialog box titled "STO". It contains the following fields and controls:

- Length: 0,0 (spin box)
- Width: 0,0 (spin box)
- Hight: 0,0 (spin box)
- ID: 0 (spin box)
- Address: (text input field)
- Mesh Name: (text input field)
- MeshNum: 0 (spin box)
- At the bottom, there is an "About" button.

Mesh Name parameter is very interesting parameter. You should add to this field the name of the mesh which you like to be replaced with the current object on the scene. For example if you add the Static Object to the scene and put the name of the mesh to the Mesh name field to "Sensor"

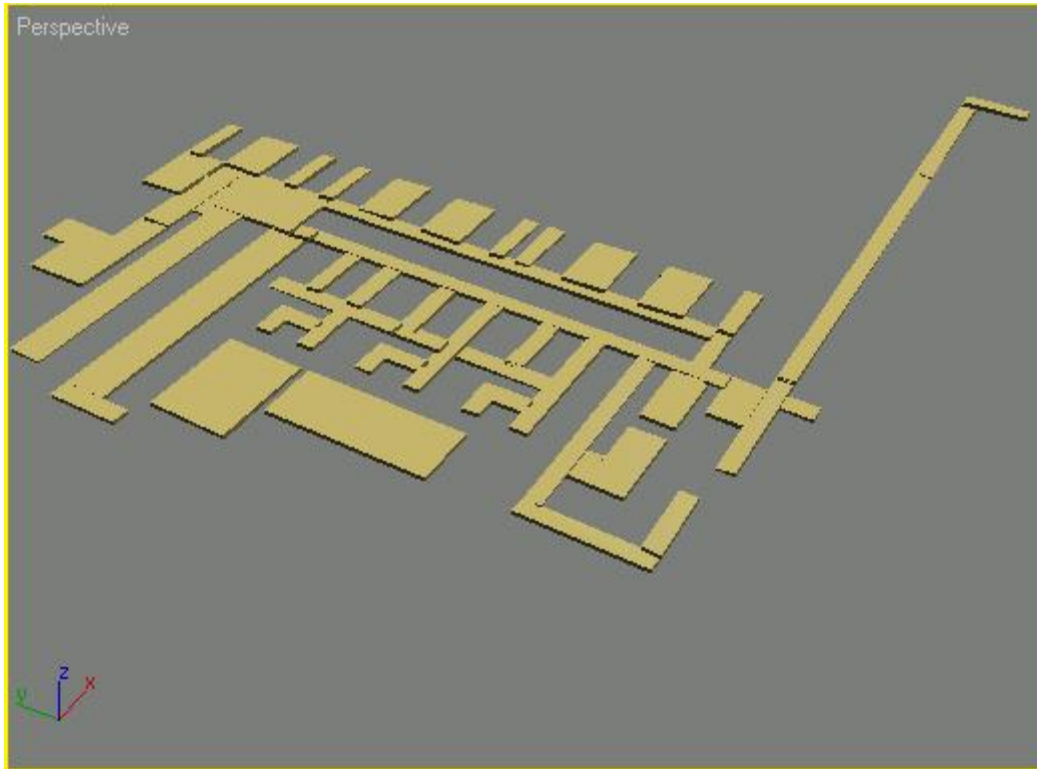


This object will be replaced with some real object which name is "SENSOR".

Floor and Wall like Static Object are static objects from the warehouse too.

### 3.2.8 Floor and Wall

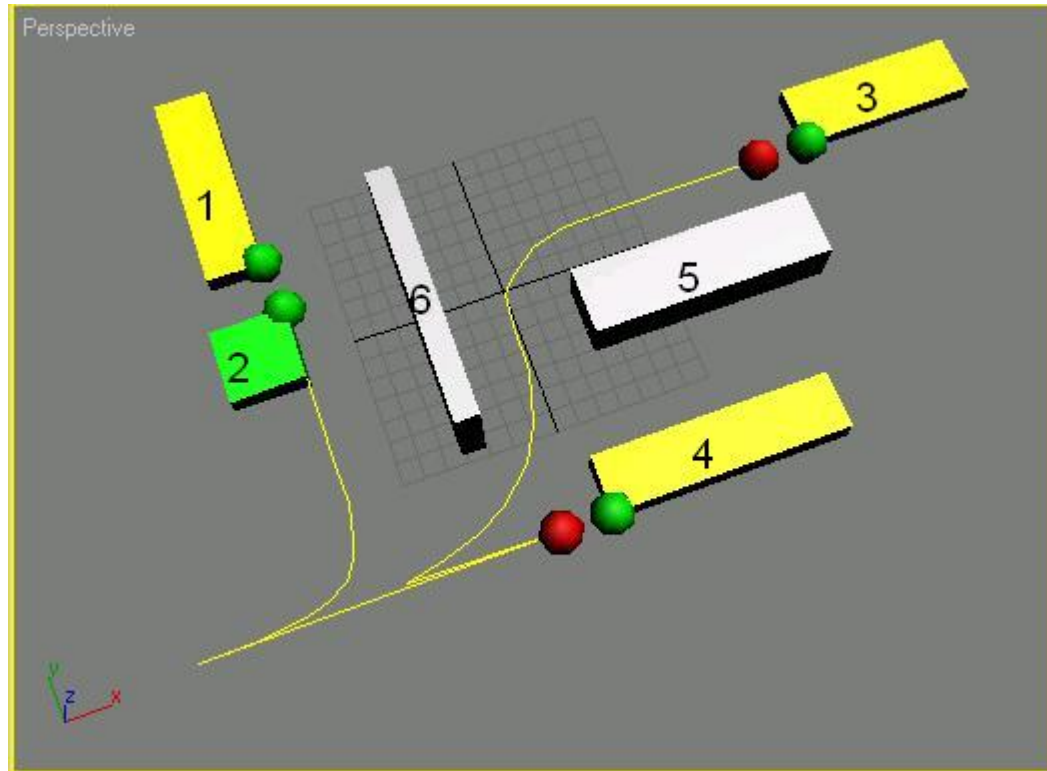
With Floor and Wall you can draw the floors and walls of the warehouse:



## 4 Moving Elements

AGV, Shuttle, Elevator etc. are moving elements of one real warehouse system. With the Plug – in user can define the paths where the moving elements will be moving over the warehouse.

For example in one warehouse one moving element is AGV. The AGV transport the palettes from source to destination places and moving over the whole warehouse in previous define paths. The paths can be design from the designer of the warehouse.

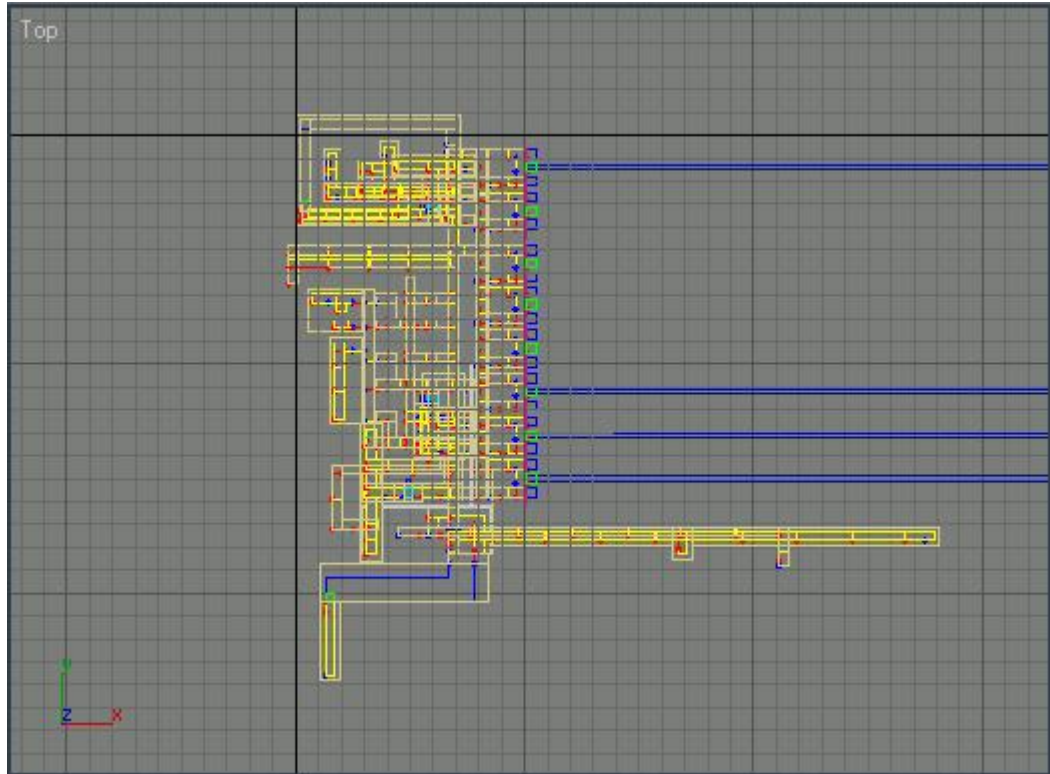


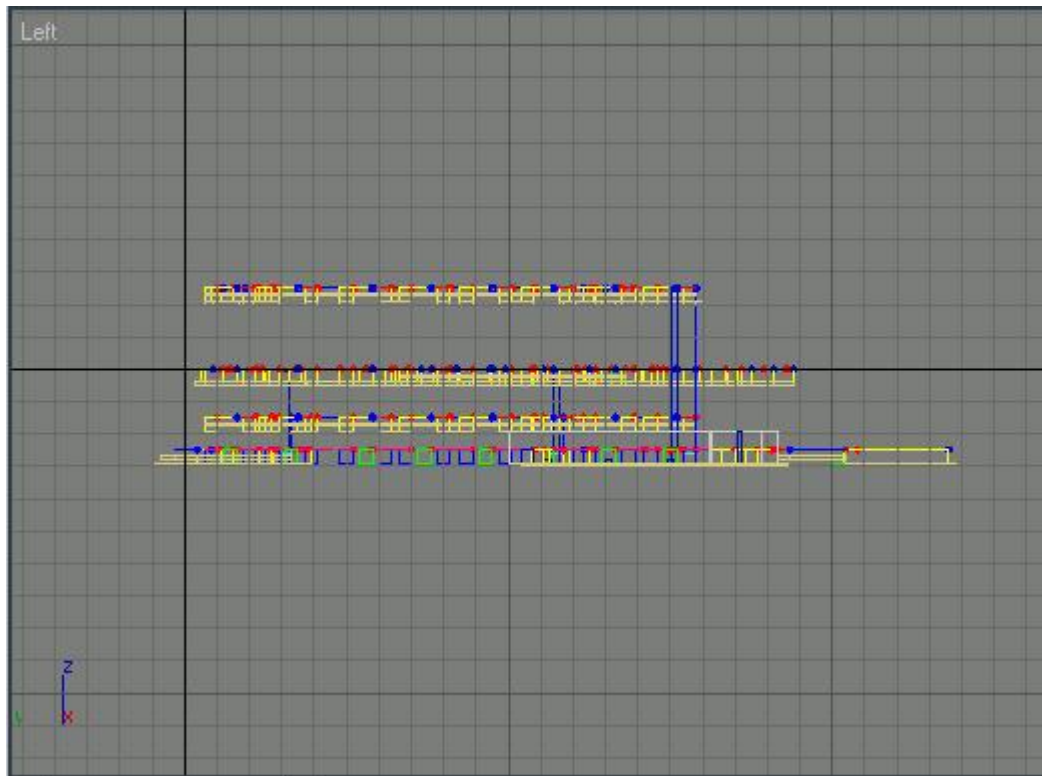
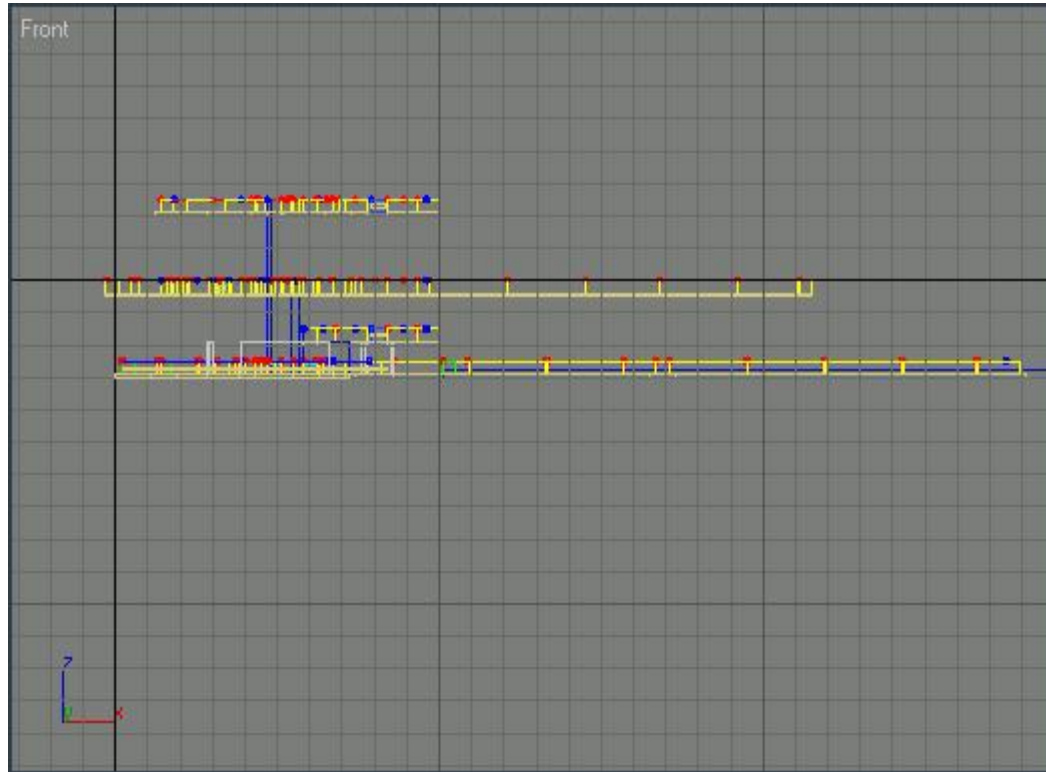
For example lets we have the situation like the picture above with six elements: Conveyor (1), Conveyor (3), Conveyor (4), AGV (2), Wall (5) and Wall (6). The idea is: the AGV (2) get the palette from Conveyor (1) and to put the palette to Conveyor (4), stay a little time while come new palette to the Conveyor (4), get the new palette and put to the Conveyor (3). The paths (with yellow color) are drawn by the designer of the warehouse and the AGV on the visualization will be move over that paths.

You can add the telegram points to the scene. That telegram points represents the real telegrams which are present into the system (warehouse).

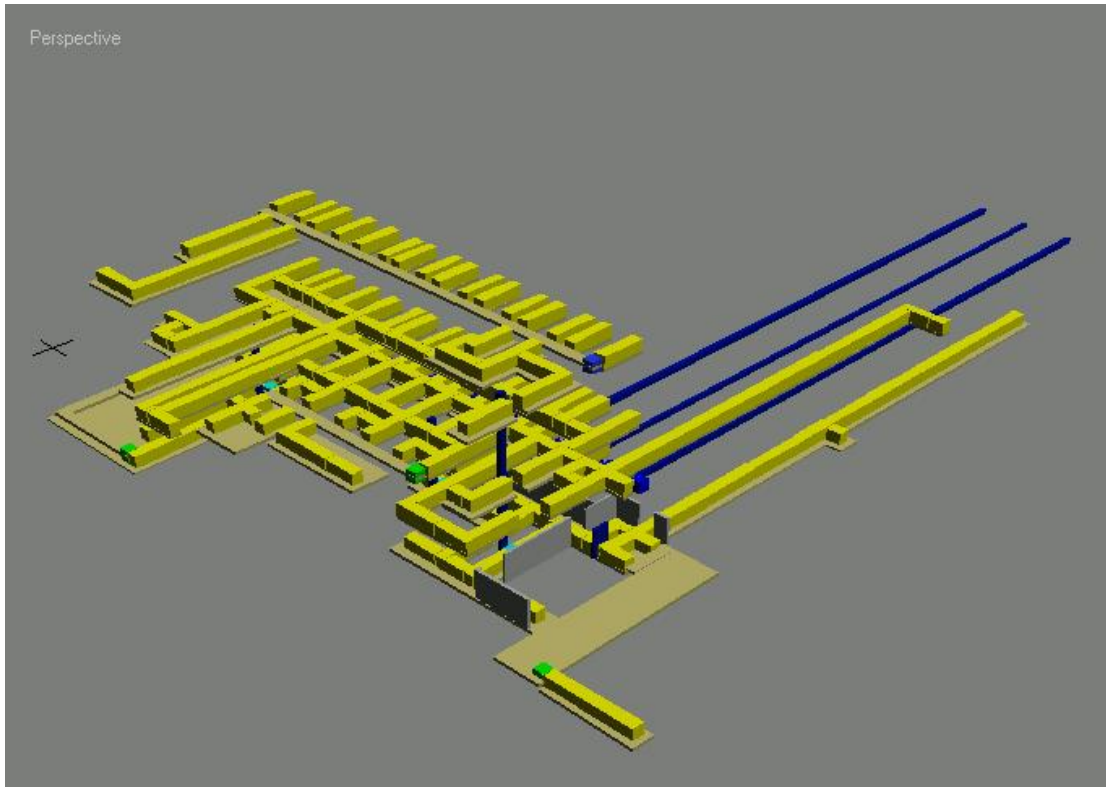
## 5. Plug – in and Auto Cad document

The idea with this Plug-In is very simple: If you have Auto Cad document from some real warehouse you can put the plug – in objects on the places where the elements real are (you can see from Cad document also you drawing on the Cad document), you should put the paths, gets, puts of the elements:



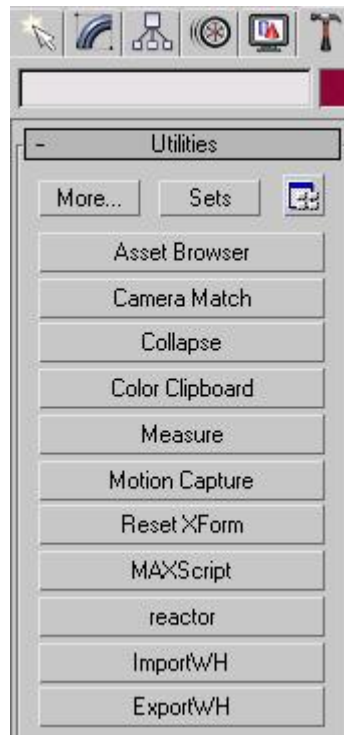


And to get the real 3D representation of the warehouse:



## 6. Import and Export

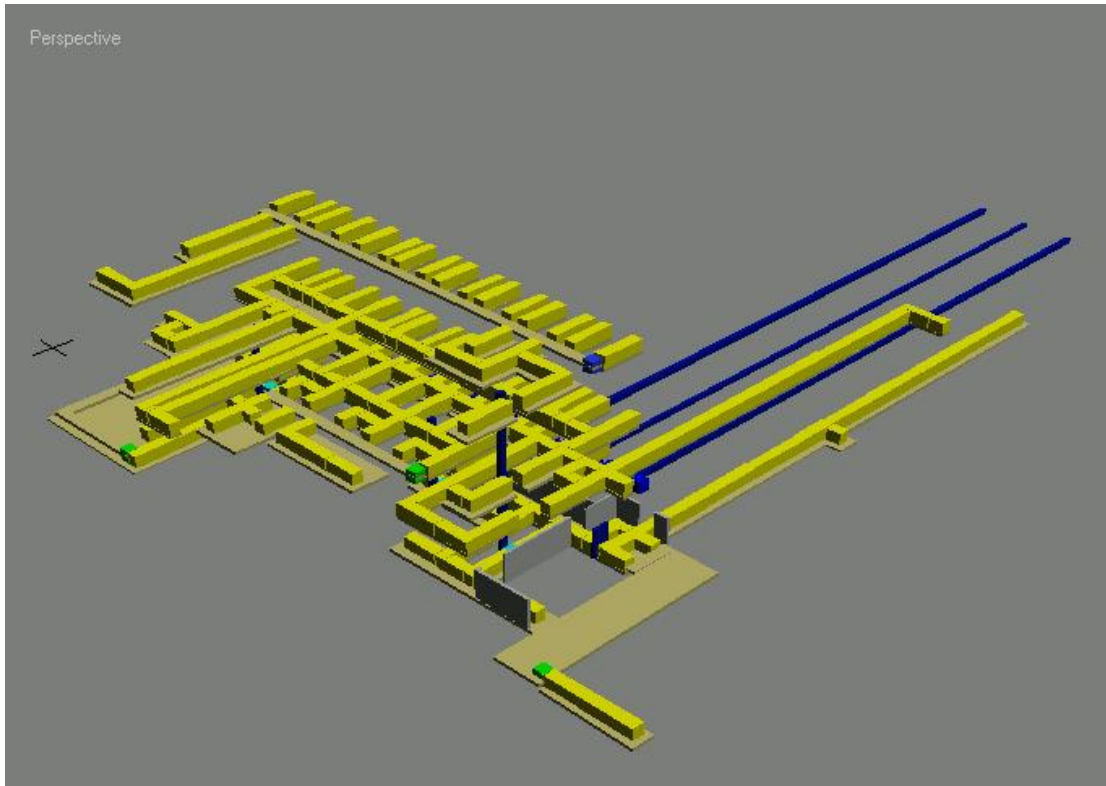
All of these elements have some parameters, positions, rotations, parents, children, etc. You can make Import of the scene to the real database. For that purpose we have utilities which allow to the user to make Import of the scene to the database and export the database to the 3DS Max scene:



If you make import of the scene to the database you will fill a lot of tables with data. All of those tables have important data for the elements of the scene but for the user it is not important that are only the numbers

The user is interesting about the real view of the warehouse. We make export of the data from the database and the results which are interesting about the user will be on the scene:





But we must use the data from the database for the 3D visualization.