



# SAPFIR-3D

Software for  
architectural engineering,  
shape creation and calculations

## Purpose

- Design for all kinds of construction projects: multi-storey residential and public buildings, large span structures, landscape architecture products.
- Analytical models of construction projects are prepared for further strength analysis and structural analysis in LIRA-SAPR program.
- Project documentation is generated in accordance with SPDS requirements during the stages from design proposal to construction design documents.

## Advantages

- Powerful tools enable the user to generate and edit parametric 3D models graphically. These tools provide all conditions to develop creative capabilities of designer.
- Working drawings are generated automatically with account of SPDS requirements.
- User-friendly interface allows the user to learn the program in the shortest time.
- Open architecture of the program, support for COM interfaces, custom scripts and plug-ins. So, SAPFIR-3D program may be used as a platform for implementation of BIM-technology

## Main tools

**Grid lines** of rectangular and radial type are generated on the plan and in 3D view on any projections, including perspective ones.

**Walls** and **partitions** of various shapes, including multilayer materials. Wall height may be changed dynamically according to change in storey height. In design model, the walls may be presented either as plates (bearing walls) or as load (partitions, insulation layers, etc.).

**Slabs** may be generated from previously created or imported line or line fragment, or the contour fragment of another object. It is possible to define the zone of different thickness in the slab or to simulate capitals above the columns. When generating design model, such zones are shifted from the slab body to the specified length of offset.

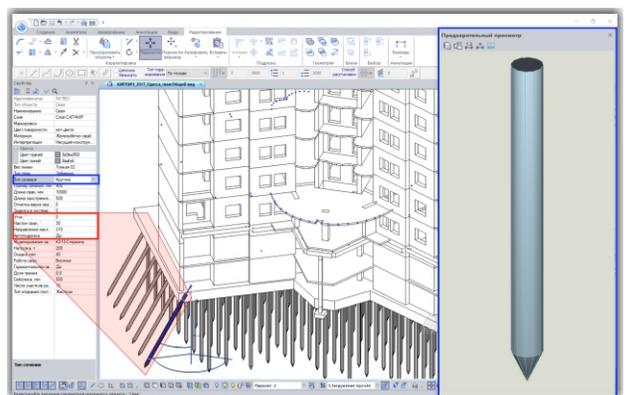
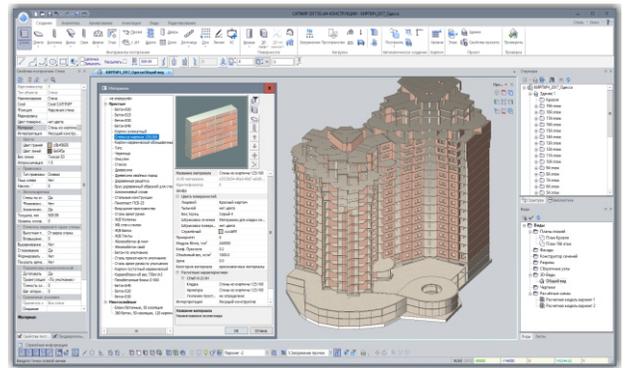
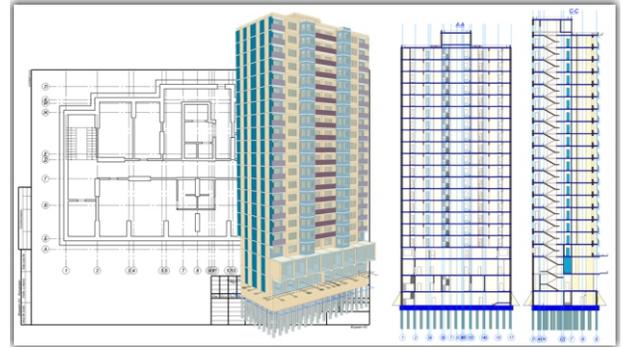
**Columns** and **beams** beams completely correspond to cross-sections of RC and steel profiles in LIRA-SAPR program. For columns, punching shear contours are generated automatically with account of slab edge and presence of closely spaced openings. Perfectly rigid bodies are automatically generated in beams and columns; it enables the user to simulate the real behaviour of structure.

**Piles** are vertical rods of a specified cross-section; piles are defined either as pile group or as single piles. Pile stiffness is presented as bearing capacity and settlement. In design module, triangulation of the base plate is carried out with account of pile location.

**Joints** of panel buildings are simulated parametrically and may be either vertical with account of embedded items, or platform or contact ones. Stiffness of the platform and contact joints are computed depending on the thickness of joint, masonry mortar and thickness of objects included into joint.

**Boundary conditions** are simulated at the joints of structural elements: rigid, hinged with account of eccentricity or free edge. For VISOR-SAPR, elements with boundary conditions are exported with the appropriate adjustments: nodes are 'thrown apart', perfectly rigid bodies are generated, groups of coupled DOF are generated, etc.

Set of tools to define **loads**: to simulate concentrated loads; loads distributed along the line or across the areas; moving loads on superstructures; wind loads and earthquake loads. In the program the user could assign the following data to all above-mentioned loads: type of load case, duration factor, load factors, sign variability, groups of unification, mutual exclusion and accompanying. Combinations of loads (DCF and DCL tables) are generated automatically according to the input data.





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**Stairs** are generated automatically: both physical and analytical model. Reinforced concrete stairs are simulated with plates, while stairs from bridgeboard are simulated with rods of a certain cross-section. The dead and live loads may be assigned to the load-bearing elements of the stairs; boundary conditions at intersections of these elements with the building framework are also defined.

**Space** defines a certain zone with arbitrary name and generates service load from the space in the analytical model. Areas and volumes are displayed in explication; notations are presented on the storey plan.

**Roofs** of several types are generated automatically: hip, semi-high, flat, single-pitched, gable, tent or vault with account of the angle of the roof, the size of overhang, the thickness of structure, the level of roof location. Wall models may be cut under the roof slopes.

**3D bodies** and **surfaces** enable the user to generate the framework of a building. The storeys of the specified height and floor slabs are automatically generated at intersection of bodies, and columns are generated at the intersection points of the grid lines. The surface may be included in design model as bar system or as shells.

**Annotation** may be visualized on a plan, front view, sectional vies and 3D view. Annotations may be attached to those views in which they are applied; annotations are displayed on the drawings when documenting.

**Libraries of materials and textures** offer not only physical & mechanical properties of materials but design parameters and requirements for further analysis of reinforcement in VISOR-SAPR module as well.

The **Editor** allows the user to transfer, rotate, copy and delete objects, move elements from one storey to another. It is possible to generate equidistant curves and symmetric copies. You can edit the element properties, adjust parameter values, graphically change the contour shape or axis line, convert rectangular fragments into curvilinear ones, insert new vertices and vice versa.

**Combinations of modelling layers** correlated with certain types allow the user to manage the object visibility (individually) and work effectively with certain groups of objects.

**Lists** of all item, as well as material specifications, are automatically generated as tables and placed on drawing sheets, exported to CSV files. The user could obtain approximate cost of materials, export physical volumes to a DBF file for estimator engineers.

The programs supports different formats for export (IFC, XML, DXF, POV, 3DS) and import (IFC, DWG, DXF) of design models.

With drawings as DXF floor backgrounds, you can automatically 'raise' them to 3D. Sections of piles, columns and beams, thickness of walls and slabs, dimensions of openings that were defined in DXF file are recognized automatically. To add the entourage elements to the project, it is possible to **import** models from STL, 3DS, OBJ, MESH, MSH files. **Comparison** for project versions of the project is available.

