

FINE-HVAC New Release 9 NG: The New Generation of the Integrated Software Tool for HVAC Design

(by 4M Support department)

1. Introduction

FineHVAC, the standard software tool for HVAC design, combines Design and Calculations within a synergistically integrated environment, performing all the required calculations directly from the drawings, and producing automatically all the study results: Calculation sheets, technical reports, a complete series of final drawings updated with the calculation results (plan views, vertical diagrams, details), bill of materials, cost estimation and all the rest.

FineHVAC differs from any other HVAC software, as it faces the HVAC design process from a holistic point of view, considering at the same time:

- The Building model as a complex but uniform entity, composed by particular entities with specified features and given interactions (e.g., the structural elements constitute walls, the walls constitute spaces, spaces compose levels etc).
- The HVAC System also as a logical entity composed by particular entities (e.g. a heating installation consists of radiators, pipe network, engine-room, etc. each of them having its own characteristics and interactions with the other ones).
- The “smart” Interaction between the Building model and the HVAC System.

From its structure point of view, FINE-HVAC consists of 2 big Components, the CAD and the Calculations Components (fig.1), which work together, interacting synergistically between each other.

- The CAD Component supports the user to design any HVAC Project in a simple way, through a set of high level commands. Then it “recognizes” the HVAC Installation and transfers the required data to the Calculations Component. After the possible user interventions on the calculation environment, the CAD component gets back the results and creates in a completely automatic way all the project drawings in their final form (vertical charts and ground plans fully updated with the calculation results).
- The Calculations Component acquires automatically the information from the drawings (calculation data sheets are automatically filled), while it uses a rich and reliable methodological background in order to produce the whole case study booklet (calculation sheets, diagrams, bill of materials, technical reports etc) taking also advantage of a flexible report generator.

General Structure of FineHVAC

CAD COMPONENT

- CAD Interface
- Recognition and modeling of the installation
- Automatic update of the final Drawings
- Automatic creation of the vertical diagrams

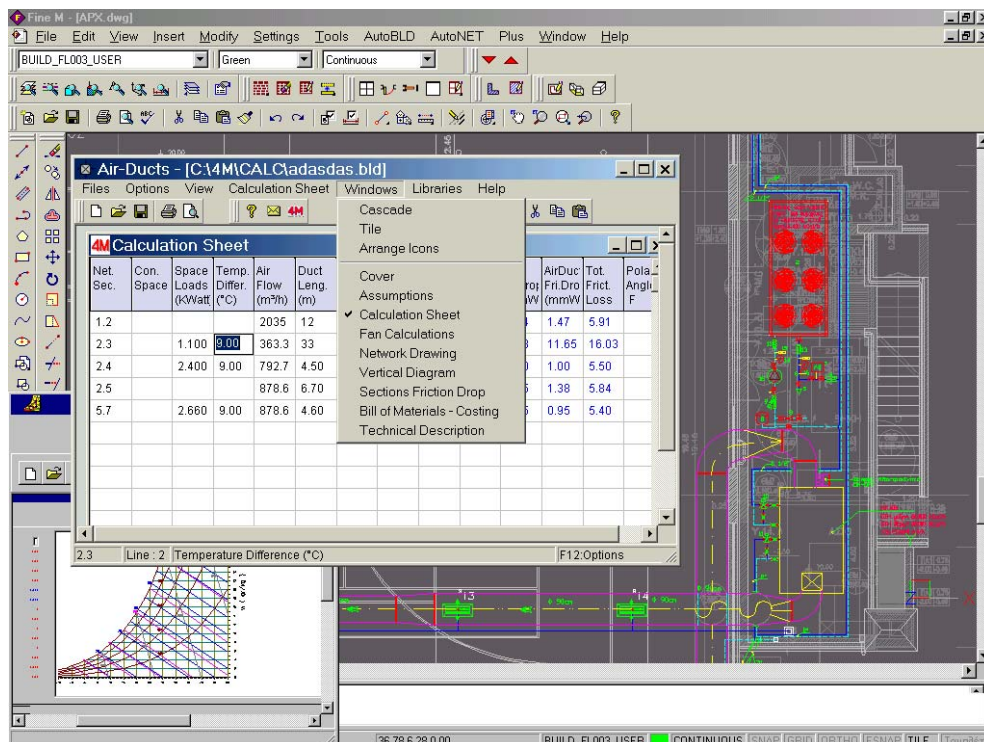
CALCULATIONS COMPONENT

- Calculation Sheet
- Equipment Libraries
- Interim and final results on windows
- Technical reports & specifications
- Bill of materials - costing
- Report Generator



2. Operation principles and functionality

This paragraph helps the reader who has no experience on the program to realize the way the program works practically. FINE-HVAC has its own autonomous CAD engine, based on IntelliCAD, the famous alternative CAD solution provided by ITC (www.intellicad.org). The CAD component performs all the tasks needed for the design of an installation through a series of expert functions.



In particular, the main tasks accomplished by FineHVAC CAD are the following:

- Recognition of Any Architectural Ground Plan: The program «recognizes», that is gives entity to walls and openings, even if they come from a different architectural or even bitmap drawings (from a scanner).
- Automatic Receptor Installation: The package installs on its own the heating radiators in the ground plan, as well as the FCU Units and the Duct Grills, based on logic rules.
- Automatic Connections: Using the commands “Automatic Designing of Single Pipe Circuit”, “Automatic Connection of Radiators with columns” etc, entire blocks are designed with just one move.
- Commands of automated piping drawing (auto-routing): Using the routing commands “Double Pipe ” (i.e. inlet-return), “Pipe Parallel to Wall ” or “Parallel to Points” etc., the pipes and their connections are designed almost automatically.
- Automatic Installation Recognition: The program recognizes and numbers the nodes (junctions) and transfers the data exactly as the calculating subsystem demands.
- Automatic location of symbols: The ground plan drawings are automatically enriched with the results values and also with the necessary drawing symbols according to the standards.
- Automatic Creation of Drawings: All the view plan project drawings are automatically produced, as well as the vertical diagrams (automatically through the ground plans), plus other detailed drawings such as an example the 2D or 3D Air-duct network. The two-dimensional Airduct network is also automatically produced by the conversion of the single line drawing.

From its side, the FINE-HVAC Calculations Component is characterized by the following features and functionalities:

- High performance and functionality Calculating Core (spreadsheet like): The user can interfere freely in the independent parameters and observe in real time the results of his selections (the system is self-updated).
- Rich Methodological background: the user has the ability to select among a wide spectrum of alternative methods and techniques (e.g. DIN4701/77, DIN4701/83 in the heat losses, Carrier-Ashrae for the cooling loads -in fact 3 Ashrae methods are included, CLTD, TFM and RTS- equal velocity-equal friction-static regain methods for the airducts, classical or based on simulation piping models etc).
- Results in various forms: Text, tables, diagrams, auxiliary drawings and others, that result automatically from the calculation sheet.
- Advanced Bill of materials–Cost estimation–Bid System: Many possibilities, such as freedom of editing, possibility to select from auxiliary material and task libraries, open to the user
- Integrated Technical Report Manager: Ready Technical Descriptions, Specification & Acceptance templates, open to the user.
- Enriched Material Libraries: Material Libraries open to the user and possibility to co-operate with specific Material Guides in CDs
- Integrated Reporting system: Selection of ready print templates in many levels (general presentation, fonts, headings-frames-layout, etc) that can be also defined by the user.

Besides, the calculation environment consists of 8 modules, divided in two groups:

I. Heating

- Heat Losses: Heat losses calculation and energy analysis with the degree-days method.

- Twin Pipe System: Calculation of Twin Pipe Heating Installation for any network case (classic or reverse-return), with either the classic method or even with full hydraulic simulation.
- Single Pipe: Complete calculations of the Single Pipe Heating System with 3 alternative methodologies: Equal friction, equal temperature drop, hydraulic simulation.
- Infloor: Complete calculations of the Infloor Heating Installation

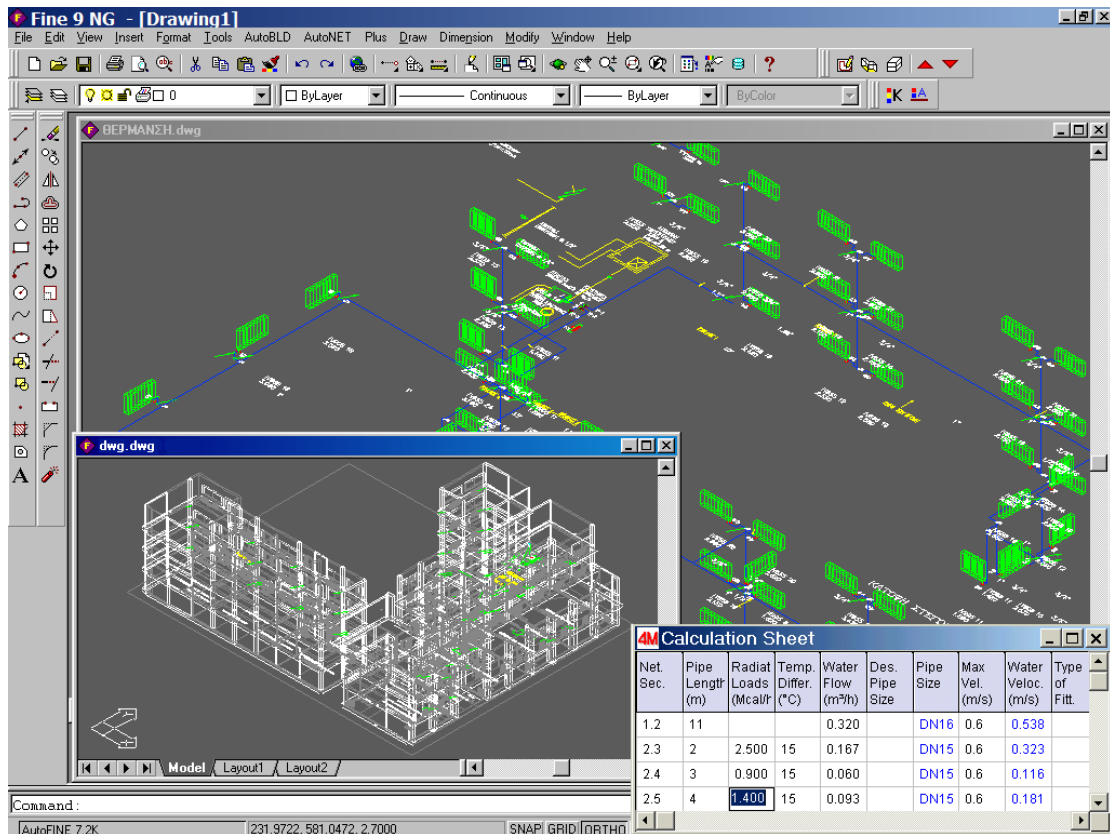
II. Air-Conditioning:

- Cooling Loads: Calculation of the cooling loads with one of the Carrier, Ashrae CLTD or Ashrae TFM methods.
- Piping-Fan Coils: Calculation of Fan Coils pipe network for any case (classic or reverse-return), with either the classic method or even with full hydraulic simulation.
- Air Ducts: Calculation of air ducts networks with three alternative methods: Equal velocity, equal friction, static regain method.
- Psychrometry: Selection of Air-Conditioning Units and distribution of the air in the air-conditioned spaces, based on the detailed equations of psychrometry (for Cooling & Heating), with any method (e.g., cooling dehydration, re-heating, pre-conditioned, return air bypass, 100% wet etc).

3. The New Generation of FineHVAC 9 NG introduces new Innovations

Rather than a major release, the latest version of FineHVAC 9 NG is in fact a completely new generation of the program, based on a completely new Object Oriented structure of the building model and its HVAC Installations. More specifically:

- The new Building model, is based on the IDEA 9 NG Architectural new standards, which introduces innovative object oriented techniques for unlimited power in the dynamic shaping of the 3D building model and consequently of its HVAC model.
- The new structure of the network model embeds an expert technology of recognizing the pipe/duct networks, through native checks and controls, as well as detailed error reports displayed automatically on screen, thus providing friendly guidance to the user. As a result, the designing and recognition processes are being significantly accelerated.



Regarding the new Building model, drawing speed and performances in general are higher, which is due among others to the smaller and “smarter” DWG file, as the result of the smart OOP design approach adopted. This model supports the direct application of the standard CAD commands (copy, move, trim, extend κλπ) to any FineHVAC building object (i.e. walls, openings, columns etc), and provides the user with all standard CAD tools, such as the use of grips while editing the objects (walls, openings, columns etc), the operation “right button -> properties” for direct editing of any object through the dialog boxes and others. Moreover, the FineHVAC new Network model, introduces:

- New functions supporting the fast drawing and recognition of any piping network through sophisticated algorithms which detect possible mistakes (i.e. automatic detection of unconnected network branches or unconnected receptors, control of existence of a starting point etc) and provide the appropriate error messages.
- Auto-correction functions, such as break of pipes, auto-deletion of the double covered pipes and others.

All messages and guiding tips are shown through well structured, user friendly window dialogs.

Additionally, many other improvements have been done covering all the aspects of the program, such as:

- The incorporation of the new IntelliCAD engine, which provides higher speed and performances, is open to any DWG file (up to ACAD 2006) and includes many new drawing tools and utilities such as audit and recovering etc.
- The insertion of new editing options on the CAD environment, concerning the names of the spaces (rooms), the order of the spaces, names of the levels supposed to be transferred to the calculation environment and so on.

- The reading of the space names directly from the XREF (in case they are mentioned).
- Library enhancements with useful drawings ready to be used, as well as with standard texts that can be easily selected and located within the final drawings.
- New toolbars including all FineHVAC commands and function (i.e. Autonet and layers management toolbars, toolbars for calling the application modules, toolbar for the definition of spaces -that condenses the 3 movements to just one click etc.
- Live update option, based on a smart and practical live-update technology, full time accessible to all our subscribers.

4. Conclusions

New version 9 NG, introduces smart innovations in the already successful FineHVAC software environment, providing the HVAC Designer with more tools and automations. As a result, the designing and recognition processes need now maybe the half of the time that was necessary with the previous version FineHVAC8-2002. If FineHVAC succeeded in the past to make real the professional's dream to receive automatically all the results from the drawings of his project, FineHVAC 9 NG manages to make the process even more friendly, significantly faster and exceptionally reliable. In addition, the regaining of that precious time-saving gives the opportunity to the user to study more possible alternatives until he/she reaches the optimal solution. The fact that with FineHVAC 9 NG both the speed of designing and the quality of the projects are being increased simultaneously, shows that the program introduces new competition standards in the HVAC Design Industry.