SVOBODA SOFTWARE   2023

STAVEBNÍ TEPELNÁ TECHNIKA

ENERGIE 2023
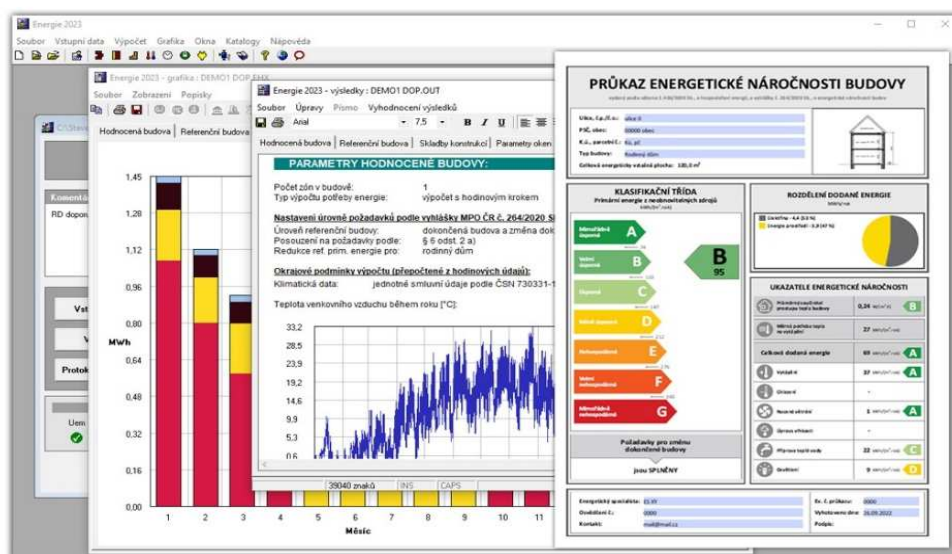
Dynamická simulace energetického chování budov
s hodinovým výpočetním krokem podle EN ISO 52016-1

Průměrný součinitel prostupu tepla budovy

Potřeby energie na vytápění, chlazení, úpravu vlhkosti a
přípravu teplé vody

Produkce energie solárními systémy a kogenerací a
její využití v budově

Dodaná a primární energie podle vyhlášky
MPO ČR č. 264/2020 Sb.

Průkaz energetické náročnosti budovy podle pravidel
platných od 1. 1. 2023

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Chapter
1.

INTRODUCTION

Energy 2023 programme

The ENERGIE 2023 program enables the calculation of the energy performance of buildings with hourly steps according to EN ISO 52016-1 and the Decree of the Ministry of Industry and Trade of the Czech Republic No. 264/2020 Coll. The program also evaluates the average heat transfer coefficient of the building, the specific energy demand for heating and cooling, the partial energy delivered and other data necessary for the creation of the **building energy performance certificate**.

Thank you for purchasing **Energy 2023** and we wish you every success with the program.

Program description

Energy 2023 is the original programme created by Assoc. Dr. Ing. The requirements for the installation and operation of the program are as follows:

Computer	IBM PC compatible computer with Intel Pentium processor and higher (optimally Intel Core i5 to i9), **Microsoft Windows 10 and higher** in Czech version
Disk space	50 MB
RAM memory	Minimum 150 MB.
Monitor	Minimum resolution 1024 x 768 pixels.
Indicating device	Microsoft two-button mouse or compatible.
Printer	Any printer must be installed.

Relationship to previous versions

The program in version **2023** works with a different input data construction than the program in version 2021 and earlier. However, tasks from **Energy 2020/21** can be imported into **2023** (except for custom usage profiles, which need to be re-entered).

Manual and its parts

The manual is divided into six basic parts. The first part (**Installation**) describes how to install the program on your computer, the second part (**Workspace**) describes the program window and its controls, and the third part (**Working with the task**) contains information about input data, calculation and graphical output. The relations used in the calculation can be found in the fourth part (**Background of the program**), in the fifth part (**Practical tips**) some practical instructions for the preparation of input data are given and finally in the sixth part (**Appendices**) information about the catalogue of materials, registry entries etc. can be found.

Required knowledge

To work with the program and the manual it is necessary to know the basic principles of working with Microsoft Windows. At least a basic knowledge of building physics and - if the aim is to create an energy certificate - a very good knowledge of the relevant legislation is recommended.

Notice

On the WWW.KCAD.CZ website, updated versions of building material catalogues and building construction catalogues and in some cases complete new versions of individual building physics programs are regularly available for free download for registered users. If you would like to be informed about the latest news, please follow this page and also our blog page http://blog.kdata.cz.

Chapter

2.

INSTALLATION OF PROGRAM

A. Installation on a standalone computer

Installation procedure

If you are using an older version of the program, you can keep it on your computer if you install the new program in a new, different directory.

If you want to install a new version of the program in a directory that contained an older version, you must first uninstall the older version.

Program installation:

1. Insert the CD-ROM into the drive.
2. Wait for a moment for the startup program to appear.

   If the startup program does not appear, you can start it by clicking **Start** and using the **Run** command. You can then type **X:CDSETUP** at the command prompt (X is the designation of the CD-ROM drive, e.g. E) and press **OK**.

3. Select the **Energy 2023** app from the list of installable programs and press the **Install** button:
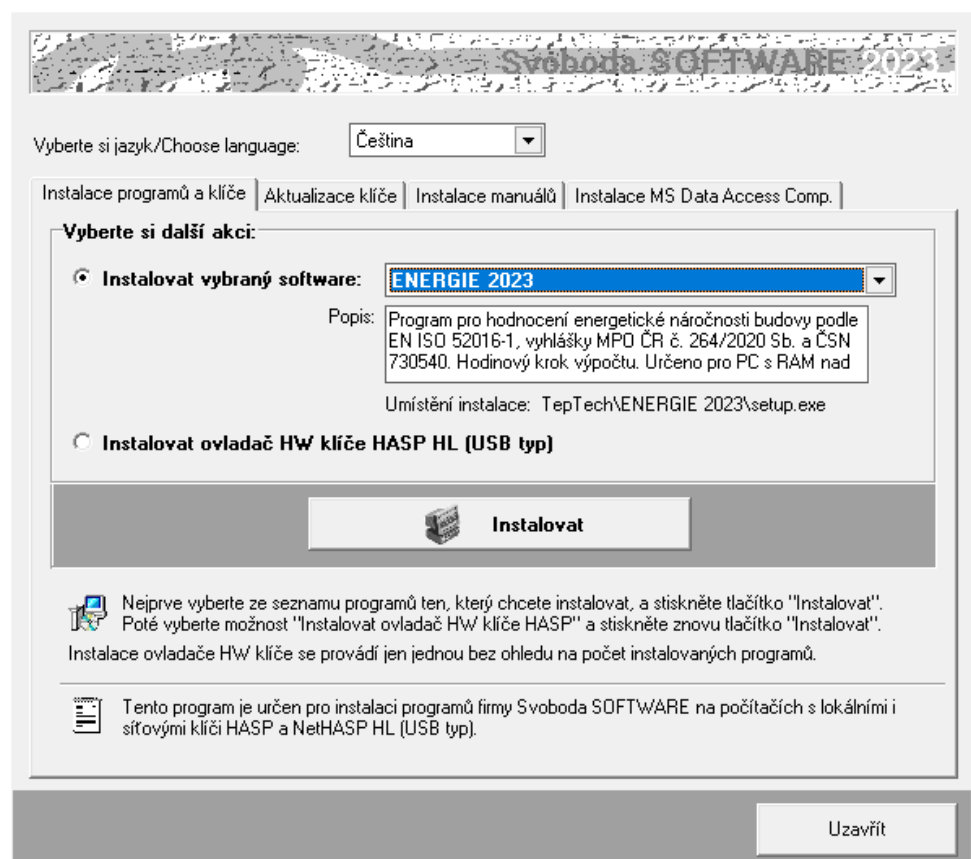
4. Once the installation has started, specify the directory where you want to place the program.

Installing a new hardware key:

Installing a new key

5. On the bootloader window, select **Install HASP HW Key Driver** and press **Install**:
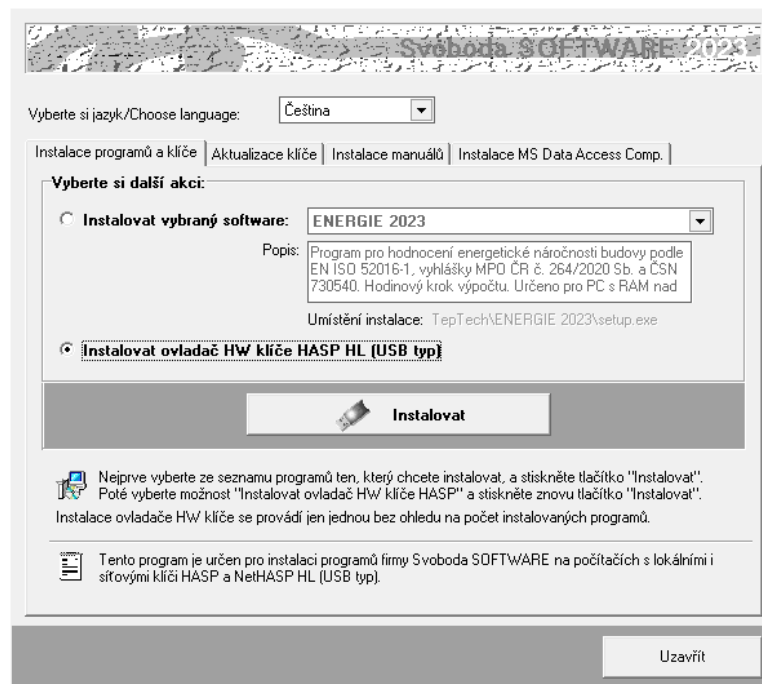
6. After installing the key driver, connect the HASP dongle to the USB port and exit the boot program with the **Close** button.

Update the <u>old</u> hardware key:

Updating an old key

7. If you still have a historical parallel key, you need to replace it with a new USB type. Please contact the program vendor regarding the terms of delivery of the new key.

8. If you are upgrading the program from an older version (lower than 2023) or if you have newly purchased the **Energie 2023** program and you already own the USB HASP key from Svoboda Software, you must also recode the HASP key using the following procedure:

Firmware updates

a. If you have an older type of USB key (about 5 years old or more), you must first **update its company software**. The easiest way to do this is with the option:
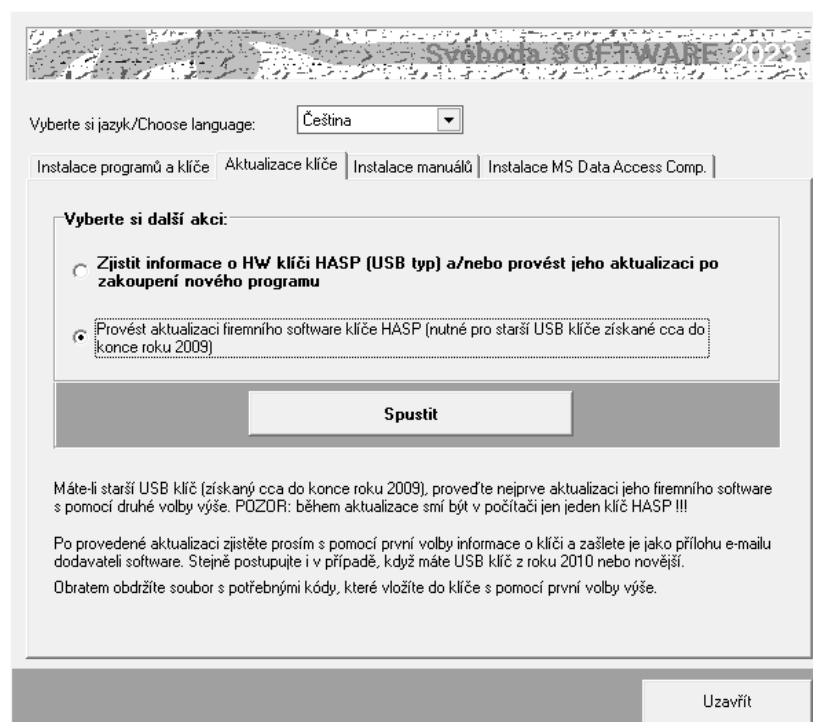
The update program window will then appear with basic information and an **Apply Update** button.

Please make sure you have only one HASP key inserted in your computer and then press the button mentioned above. The key will then be updated automatically.

As an alternative to the procedure described above, you can run the update program manually. This is the **FirmwareUpdate.exe** file in the **HASP\fwUpdate** folder on the installation CD-ROM.
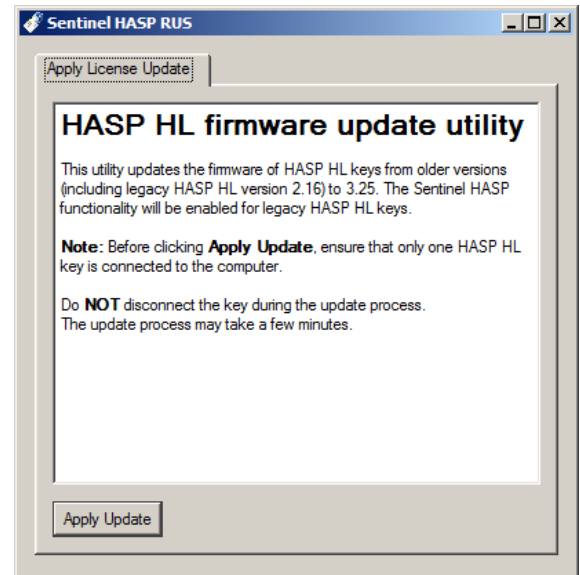
Information about the key

b. If you have a USB key from 2010 or newer (or you have already updated the company software of an older key), find out **information about your key using the** command:
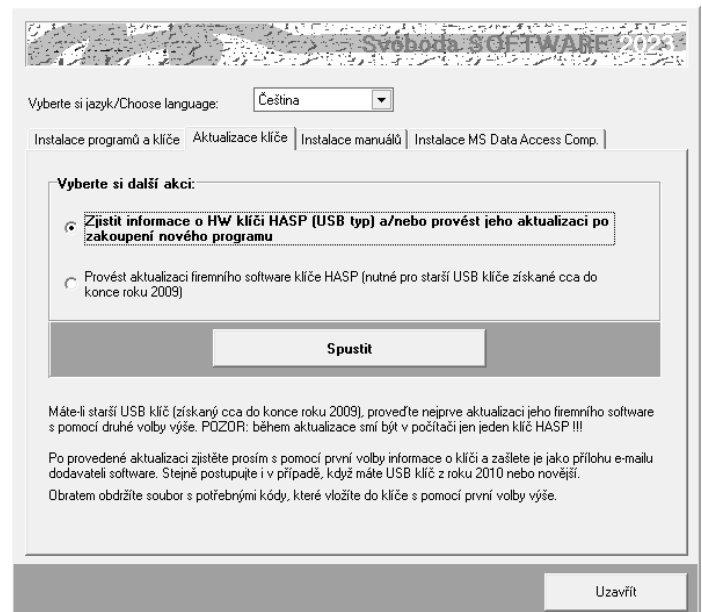
When you press the **Run** button, the update program window appears with a basic description of the update procedure.

Press the **Collect Information** button on the **Collect Key Status Information** tab and select the location and name of the **c2v** file. We recommend using a name of the form **ABCD.c2v**, where **ABCD** is your company name. Please send the created file as an attachment to an informational email to the program vendor.

As an alternative to the procedure described above, you can run the update program manually. This is
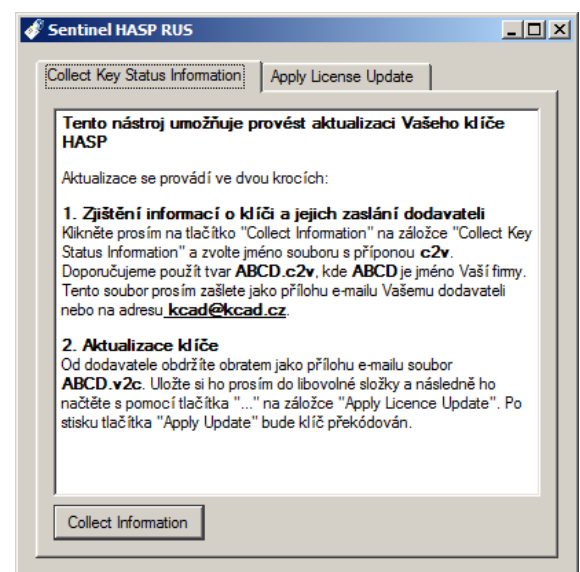
the file **UpdateHASP.exe**, which can be found in the **HASP\lcUpdate** folder on the installation CD-ROM**.**

Updating licenses

c. You will receive the **ABCD.v2c** file (normally as an email attachment), where **ABCD** is again the name of your company. This file contains all the necessary data to **transcode your USB key**. Please save it to any folder on your computer. Then insert the installation CD-ROM into the drive again and select the command:

After pressing the **Run** button, the update program window will appear, into which you can load the received **ABCD.v2c** file using the "**...**" button on the **Apply License Update** tab.
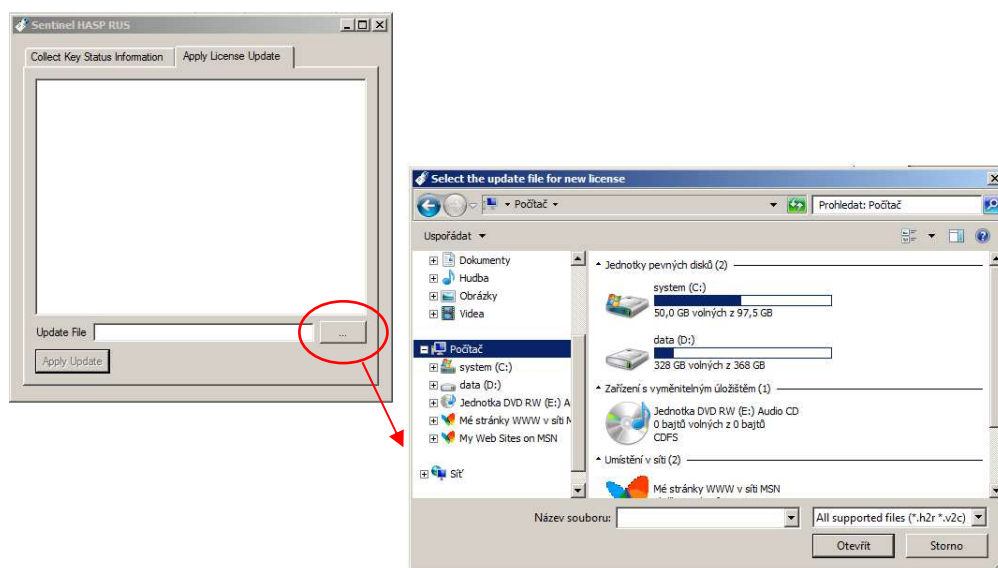
To finish updating the USB key, press the **Apply Update** button.

As an alternative to the procedure described above, you can run the update program manually. This is the file **UpdateHASP.exe**, which can be found in the **HASP\lcUpdate** folder on the installation CD-ROM**.**
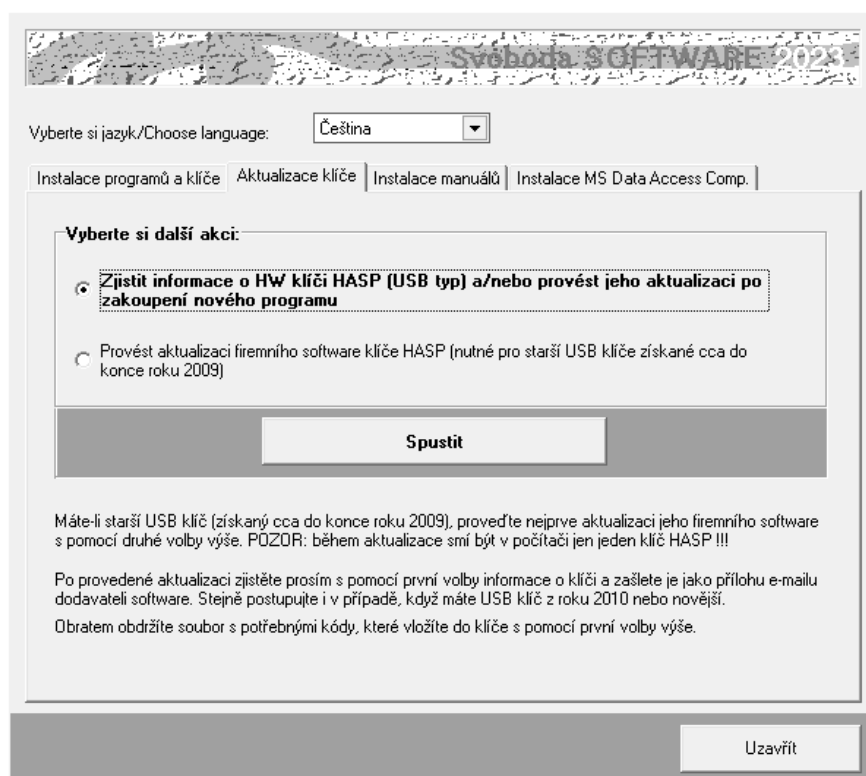
d. After updating your HASP key, you can now launch **Energy 2023** and try out its new features.

Notes:

- The user of the program must always have the right to write to the directory where the catalogues of materials, constructions and boundary conditions are stored (usually identical to the program directory). Similarly, he must have the right to write to the directory with the data describing the evaluated tasks (data directory).

- If you install more than one of our programs on your computer, please note that each program must have its own directory.

- If the HW key does not work correctly after the driver installation described above, it may be because the driver on the installation CD-ROM is older than your MS-Windows system. In this case, please download the key from the manufacturer's website http://www3.safenet-inc.com/support/hasp/enduser.aspx current installer. However, before downloading the latest version of the key driver, we recommend that you first try the **HASPUserSetup.exe** installation wizard**, which** you can find on the installation CD-ROM in the **HASP\huSetup** folder. If you have any questions about the installation of the key, please contact your program dealers.

B. Network installation

The program does not have a direct network version - however, it can be used within a network and allow individual users to share a network HW key and data directories and catalogues. The program must be installed separately on each station as a full installation. For a completely trouble-free installation and operation, it is recommended that individual users have administrator rights on their computers. If you are running a network with a large number of users who rotate computers and therefore cannot have full rights on individual stations, the installation of the program is somewhat more difficult - some tips and recommended procedures are given below.

Installation procedure

1. Install (as administrator) the program on each station in the network according to the procedure described in chapter 2.A. Install not only the program itself, but also the HASP key driver.

2. Connect the NetHASP network key to the server or to any station on the network. If you have an old key (shipped with any version older than 2011), please contact the program vendor - the key must be replaced.

3. Insert the installation CD-ROM into the drive of the computer with the NetHASP key and run the **HASPUserSetup.exe** installer, which you can find in the **HASP\huSetup** directory. The installer will guide you through the process of installing the drivers required for the key to work on the network.

4. Try starting and running the installed program.

5. If you need to make sure that a regular user does not have administrator privileges, you usually need to do the following after installing the program:

   a. Set write permissions to the program directory for a regular user of the User type.

   b. Log in as a regular User and, if necessary, create a shortcut for the program (on the desktop and/or in the Start menu)

   c. Try to run the program in User mode... and if the program does not start with DLLs or OCX not available, run the program installation again in login mode as a regular User and select **Continue** if the error message about the inability to register components occurs.

Notes:

In rare cases, if you only need to install a program on the server, you usually need to do the following:

a. Install the program in the selected directory on the server according to the procedure in chapter 2.A.

b. Set permissions for normal users to write to the directory with the installed program.

c. DLLs and OCXs that are installed on the server in the *SYSTEM* subdirectory of the Windows directory must be available to ordinary users. Therefore, it is necessary to either install these libraries also in the *SYSTEM* subdirectory on each local station (this can be done, for example, by installing the program on the stations and deleting the program directory from the stations), or allow the stations to access the *SYSTEM* subdirectory on the server.

d. Modify the program initialization settings in the Windows registry as needed, especially the default data directory settings. Call **regedit.exe** and edit the settings in the **Energy 2023** section:

- [**Data Directory**]: *directory=dir*

where *dir* is the path to the data directory that will implicitly contain the data and results of the calculations and that ordinary users will be able to write to

If there is only one initialization setting common to all users, the path must be set so that all users can use it. Thus, the default data directory will have to be the same for all users. However, this does not mean that when creating a new job or opening an existing job, a normal user cannot use any directory that they can write to. See Chapters 4.B. and 4.C. for details on directory selection when creating and opening a job.

Chapter

3.

PROGRAM WORKSPACE

This section provides basic information about the **Energy 2023** window, the taskbar, how to work with taskbars, and how to invoke help.

A. Starting the program

After the installation is complete, a new line will appear in the **Start** menu under **Programs** - **Heat Technology**.

Launch **Energy 2023** is possible by clicking on its name.
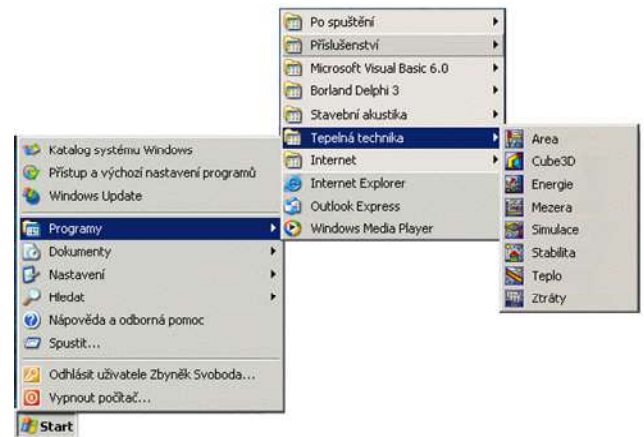
B. Program and task screen

When you launch **Energy 2023**, a blank program window appears with a horizontal menu and toolbar buttons.

Program screen

menu commands

toolbar

initial dialog box

panel with information about the
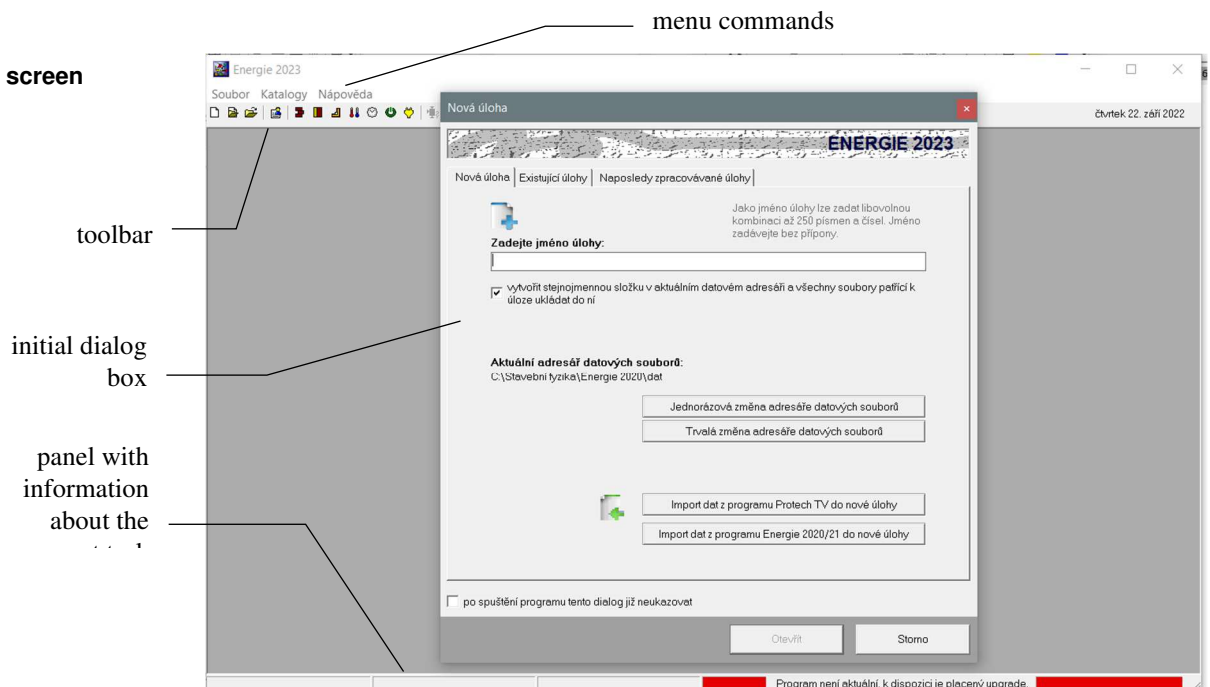
As soon as you create a new task or open an existing task, a new smaller window appears in the currently empty **Energy 2023** panel - the task panel, which contains the task name and several buttons for quick command recall.

All data related to the task being processed (input data, calculation results, graphical outputs, etc.) can be stored in up to 19 file types, which include:

Task

FileName.**enx**	job name
FileName.**jpg**	photo of the building in JPG format
FileName.**dt1**	parameters of boundary conditions and data about the building as a whole
FileName.**dt2**	parameters of individual zones with their technical systems and usage profiles
FileName.**dt3**	parameters of constructions at the interface of individual zones
FileName.**dt4**	energy consumption parameters in unheated spaces (lighting, ventilation)
FileName.**dt5**	parameters of technical equipment in the building
FileName.**dt6**	compositions of opaque constructions
FileName.**dt7**	types of hole fillers
FileName.**dt8**	Types of lightweight envelopes
FileName.**dt9**	parameters of custom usage profiles
FileName.**s**???	parameters of opaque constructions in the zone envelope at the interface between the zone and the outside air
FileName.**o**???	parameters of the hole fillers in the zone envelope
FileName.**p**???	parameters of constructions at the interface between the zone and the soil
FileName.**z**???	parameters of unheated spaces and conservatories adjacent to the zone
FileName.**c**???	lightweight envelope parameters in the zone envelope
FileName.**j**???	thermal jointing parameters in the zone envelope
FileName.**f**???	parameters of photovoltaic systems
FileName.**k**???	parameters of solar collectors
There can be up to 99 files listed above (the serial number is always given instead of ??).	

Some of the above files may not be created if no zone contains the appropriate type of constructions.

FileName.**out**	calculation results **for the assessed building** in RTF format
FileName_REFERENCE.**out**	calculation results **for the reference building** in accordance with MIT Decree No. 261/2020 Coll. in RTF format
FileName_PaidEnergy.**out**	table of the resulting delivered energy from the power grid (i.e. excluding energy from the surroundings) in RTF format
FileName_Constructions.**out**	overview of the specified compositions of opaque constructions with calculated sum. heat transfer in RTF format
FileName_Windows.**out**	overview of the entered types of hole fillers with the calculated heat transfer coefficient in RTF format
FileName_LOP.**out**	list of entered LOP types with calculated heat transfer coefficient in RTF format
FileName_TZB.**out**	overview of entered technical devices in RTF format
FileName_ProfilesUsed.**out**	overview of parameters of custom usage profiles in RTF format

FileName_PENB_vyhl264**.pdf**	energy performance certificate of the building according to the Decree of the Ministry of Industry and Trade of the Czech Republic No. 264/2020 Coll. in PDF format
FileName_EŠOB_ČSN730540.pdf	energy label of the building envelope according to CSN 730540-2 in PDF format
FileName_DataProENEX**.xml**	data in XML format containing data for the ENEX system
FileName**.exm**	internal data file containing entered and calculated values, necessary for generating the energy certificate and label and other outputs.

From the user's point of view, the job acts as a single *FileName*.**enx** file. All files are saved to the selected data directory without exception.

Task panel

Energy 2023 allows you to open several tasks at the same time and switch between them by clicking the mouse or using the **Windows** command in the horizontal menu of the program:
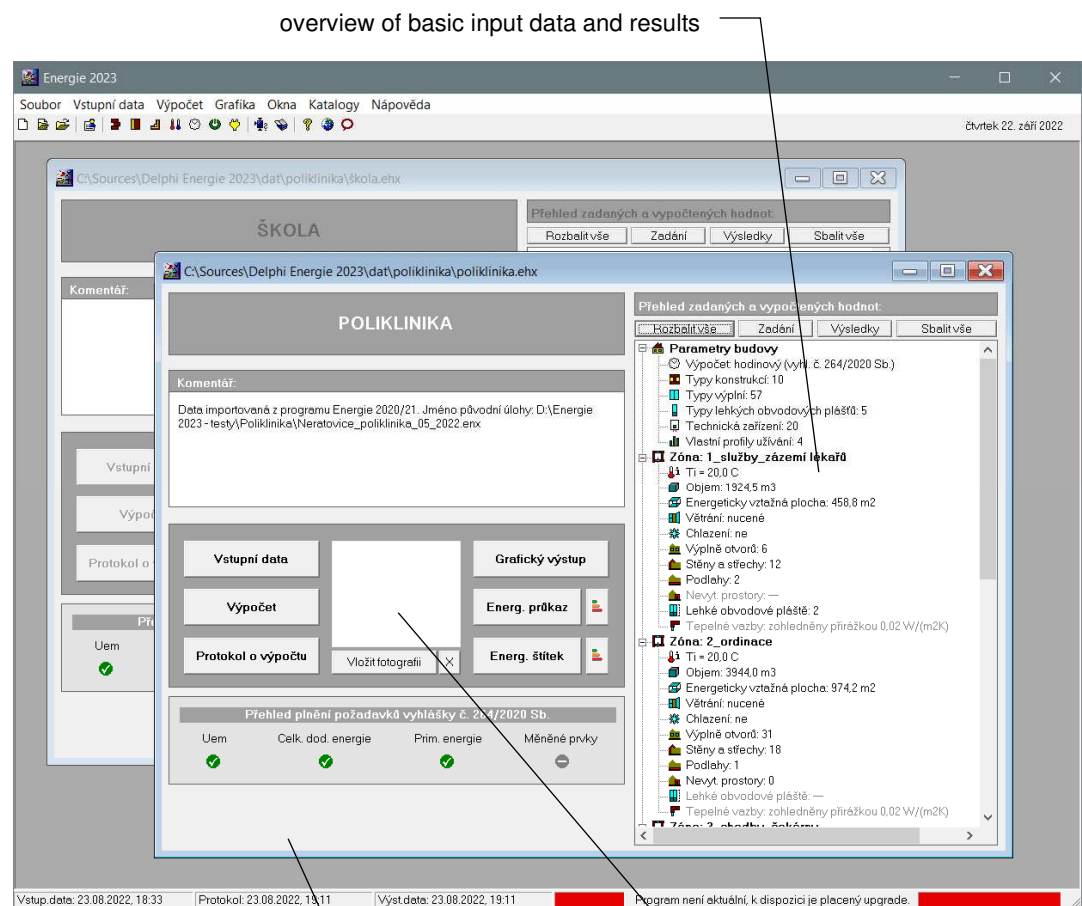
overview of basic input data and results

active role

photos of the

Active role

If the task is **active**, all commands in the **Energy 2023** horizontal menu apply to it. If it is not **active** or **is** reduced to an **icon**, it cannot be operated.

Windows

You can arrange the panels of individual tasks by using the **Cascade** (arranges the panels in a row), **Tile** (arranges the panels side by side), and **Arrange Icons** (arranges the icons of scaled-down tasks) commands on the **Windows** menu.

C. Help in the program

Energy 2023 includes context-sensitive help. This is a powerful tool that allows you to instantly find information on the activity you are performing.
Help uses the standard MS Windows help window and supports all the usual functions, such as calling up definitions of terms and performing link bounces.

However, the most common way to invoke help is to press **F1** while working with the program. The **Energy 2023** program responds to this command by immediately calling up the help for the action being performed.

Information about the program (serial number, authorized user) can be found under **About** in the **Help** menu.

Requirements Standards

Information on the requirements of selected regulations (ČSN 730540, Decree of the Ministry of Industry and Trade of the Czech Republic No. 264/2020 Coll.) for the building under assessment in terms of average heat transfer coefficient or energy performance indicators can be found under the command **Requirements of standards** in the **Help** menu:

Chapter

4.

WORKING WITH THE TASK

In this section you can find the workflow of the task from input data input, through calculation and processing of the calculation report to graphical evaluation of the results.

A. Directory for storing jobs

Jobs are preferably saved to a job storage directory, which you can set by using the Job **Storage Directory** command on the **File** menu. This command is available only when all jobs are closed. Of course, when opening existing jobs, it is also possible to pull these jobs from other directories.
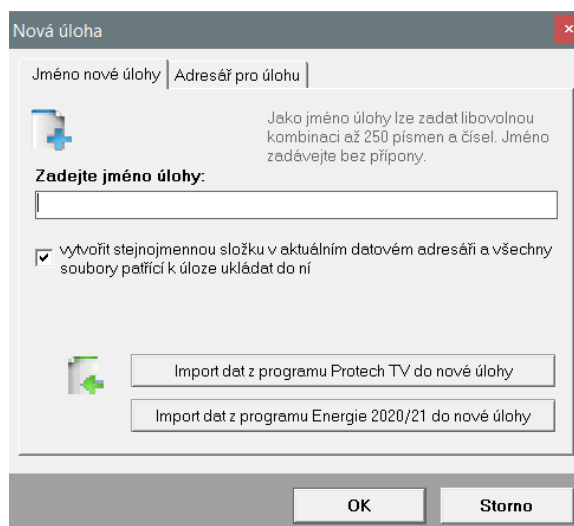
B. Create a new job

You can create a new job in two ways. Either press the appropriate button on the **Energy** toolbar or select **New Task** from the **File** menu**.**

In both cases, a window appears in which you can enter a name for the new task (maximum 250 characters without suffix).

When you click **OK**, the new task panel appears with the task name.

Change the directory

Each new job is saved to the configured job directory by default. If you want to save the new job to a different directory, click the Job **Directory** tab and use the **Change Directory** button to set the directory for the new job.

C. To open an existing job

If you want to work with an existing job, you can again proceed in two ways. Either press the appropriate button on the **Energy** toolbar or select **Open Job** from the **File** menu. The standard MS Windows dialog box for loading a file appears, which you can use to change directories and select the name of the desired task. After selecting a task, its panel appears on the screen.

Alternatively, you can use the Advanced Job Opening dialog, which allows you to either select from recently solved or existing jobs, or create a completely new job. You can call up the extended task opening by pressing the appropriate icon in the **Energy** toolbar.

D. To save a job under a different name

If you want to save the job under a different name or in a different directory, choose **Save As** from the **File** menu. When you select it, the standard MS Windows dialog box for saving a file will appear and you will be able to specify the directory and name of the task.

E. Finish working with the task

You can quit a job either by using the **Close Job** command on the **File** menu, by double-clicking the left button in the upper-left corner of the job bar, or by clicking the **x** in the upper-right corner.

F. Input data entry

You can access the input data entry mode either by using the **Input Data** button on the job panel or by using the **Enter and Edit Job** command on the **Input Data** menu.

F..1 Type of rating, boundary conditions and building description

The 1st form appears for entering the first part of the input data:

1. form

Specification of compositions of opaque

specification of types of hole fillers and their

specification of lightweight envelope types and their

specification of technical equipment in the buildin

entering custom usage profiles

calling the form for entering the zone connection

calling up the form for entering individual zones

Working with the input item

Input data is entered into individual input items (boxes), which can be used either for text input or for number input. In the latter case, only digits, a sign and a decimal separator can be entered.

Aids

For the **current item, the F1** key can be pressed to bring up a help with more detailed information about the quantity, including references to the standard and possible standard values. Help can also be called up via the **Help** menu in the horizontal menu of the form.

All menu commands are only accessible if it makes sense. So you don't have to worry about using them incorrectly. One more tip: for faster work, many commands have **keyboard shortcuts** that allow you to quickly execute the command without searching for it in the menu. The keyboard shortcuts are listed next to the menu items.

Moving around the form

You can move between items using:

mice	Point the mouse at the item (the mouse cursor changes from an arrow to a vertical line) and press the left button.
Enter key	Moves to the next item in the logical input sequence.
Tab keys	Moves to the next item in the logical input sequence. It is also possible to access the form controls (buttons, form list panel) using this key.

Edit by

You can also use the functions in the **Edit** menu to work with the item.

These commands are **Undo** (undoes the typing action you just performed), **Redo** (reverts the correction you made to its original state), **Remove marked text** (removes the text and places it on the clipboard), **Copy marked text** (copies the text to the clipboard), and **Paste text** (pastes the text from the clipboard).

End of work with data

You can exit the input data by using the **Exit Data** command, double-clicking above the upper left corner of the form, or simply clicking the X in the upper right corner of the window.

Automatic data storage

All entered input data are saved automatically before each further data operation, i.e. even before the end of the job.

Calling up other forms

Calculating the energy performance of a building requires the input of a relatively large amount of data. These are filled in successively on a number of forms, some of which must always be filled in and some only exceptionally.

The first group includes forms for specifying the types of opaque constructions, types of openings and technical equipment in the building.

Types of opaque envelope constructions

You must specify all the opaque constructions in the building envelope (walls, roofs, floors) using the **Opaque Construction Types** button. For each construction, either the heat transfer coefficient or the composition can be entered directly. At the same time, the type of construction according to EN 730540-2 is also defined in order to derive the standard requirements for the construction.

When entering compositions, both catalogues of materials and constructions and auxiliary calculations for the thermal conductivity of the material, for the effective thickness of the gradient layer and for the allowance for the effect of thermal bridges are available. Compositions can also be imported from jobs processed in **Heat**, **Simulation** and **Energy** (if a composition list exists).

The program prints the construction compositions and data used in the auxiliary calculations into a detailed report in RTF format. The log is created automatically for each calculation and is saved under the name **abc_Construction.out**, where *abc* is the selected job designation. The method of using the specified compositions when specifying the building envelope is described further in chap. F.2.

Types of hole fillers

Using the button **Opening types**, it is necessary to enter the properties of the individual opening types in the assessed building and then use these types of windows and doors when entering the building envelope.

For each type of window or door, the standard properties of its parts (frame, glazing and their contact) are defined, either by direct input, by selection from the help, or by importing from the tasks processed in the **Energy** program (if there is a list of windows).

Alternatively, the resulting thermal transmittance of the infill can also be entered directly, either for specific dimensions or for any window dimension in general.

The method of using the specified types of openings when specifying the building envelope is described further in chap. F.3.

Types of lightweight cladding

Using the **Lightweight envelope types** button, it is necessary to enter the properties of the individual lightweight envelope types in the building being evaluated and then use these LOP types when entering the building envelope.

It is possible to enter either directly the resulting heat transfer coefficient of the characteristic section or the detailed geometry of the section and the properties of the subparts (columns, transoms, translucent and opaque fillings).

Technical facilities in the building

Using the button **Technical equipment in the building under evaluation**, it is necessary to enter individual technical equipment (heat sources, cooling sources, HVAC units, air humidity treatment equipment, etc.).

For each technical device, its efficiency, energy carrier, primary energy factor, power, ENEX designation and other parameters, if applicable, are entered.

Types of usage profiles

Using the button **Types of usage profiles**, it is necessary to enter all usage profiles that are different from the profiles from ČSN 730331-1 (these are already available in the program).

When defining a custom usage profile, it is possible to choose whether the individual operating parameters (temperatures, ventilation rates, heat gains, etc.) are specified with one annual average value, 12 monthly average values or detailed hourly waveforms.

F..2 Description of individual zones

After pressing the **Zone Description** button, a form appears for entering the use and technical equipment in the zone:

act.form number

start and end of block

Zone entry form

cards for specifying the use of the zone and technical systems

information about the aids for the current item

Detailed information on all entered values can be obtained with the help of the context help, which can be called up most quickly by pressing the F1 function key.

Working with the input item

Working with the input item was described in detail for the first form. Here we will only mention the differences.

Aids
For a number of input items, there is an auxiliary calculation available via the **F2** key **-** the program draws attention to the auxiliary calculation in the window with the title **Act. aids** at the bottom right. Auxiliary calculations can also be called up using the **Auxiliary Calculation** command in the **Aids** menu in the horizontal menu of the form.

Working with forms

If the assessed object is divided into several zones, it will be necessary to fill in several forms, with a description of one of the zones appearing on each form.

List
A list of all forms/zones can be found on the right side of the form. You can quickly move between forms by left-clicking on the name of the form you want to use. Similarly, you can move around using the **Next Form** and **Previous Form** buttons.

Quick shifts
More extensive options are available in the **Quick Scrolls** menu, where you can find the **Previous Form**, **Next Form**, **Jump to 1st Form**, **Jump to Last Form**, and **Jump to Selected Form** commands.

Working with zones

You can additionally edit the created zone file using the commands in the **Form (zone)** menu item. It is possible to add a new (empty) zone before the current zone (command **Insert new empty zone** or shortcut key **F6**), cancel the current zone (command **Delete current zone**) or copy the selected zone. Before copying, the zone to be copied must first be selected with

the **Select Zone** command, and then the actual copying is done with the **Paste Copy of Selected Zone** command (or the **F7** shortcut key). The zone is copied with all the specified envelope constructions and all other data.

Working with subzones

Each zone consists of sub-zones. There can be only one subzone, or there can be more (the total number is not limited).

Subzone parameters

For each sub-zone, the basic geometric characteristics (external and internal volume, total energy reference area, internal floor area) and operational parameters (temperatures, ventilation rates, internal gains, etc.) are entered.

A new subzone can be created by pressing the **Add New Subzone** button:

Subzone entry form

After pressing it, a separate window appears, in which it is possible to enter both the geometric properties of the subzone and the operating parameters - in basic cases by simply selecting from the drop-down menus **Subzone type**, **Profile type** and **Usage profile**:

Contractual usage profile

If the contractual use profile is used (i.e. the profile taken from the publication "*Hourly climatic data and parameters of typical use of buildings and zones with cooling, humidity treatment or power generation for the calculation of delivered energy and auxiliary energy in accordance with Section 4(1) of Decree No.264/2020 Coll., on the energy performance of buildings*" by K. Kabele et al., STP Prague 2022), almost nothing needs to be added regarding the operating conditions. The program points out any missing data with a red exclamation mark, and unclear values (which may or may not be correct) with a blue question mark. In both cases, these signs appear directly on the tab with the problematic value.

Custom profile   A custom use profile can also be used for a subzone if a non-residential zone and a custom profile type are selected:

The program then displays all existing custom profiles in the **Usage Profile** drop-down menu. If no custom profile already exists, you can create one by selecting the **Add/Edit Profile Type** function (see figure above).

After closing the subzone entry window, a window will appear with the choice of whether or not to use the subzone:

Automatic zone composition from subzones   If a subzone is used, the program automatically recalculates the resulting, aggregated parameters of the zone - depending on which subzones it is composed of. Some values are calculated as a weighted average (e.g. operating temperatures), others as a sum (e.g. hot water consumption) and others are selected as a maximum (e.g. prevailing design indoor temperature).

The calculated zone operating parameters can be checked (and in some cases supplemented with additional data) on the tabs below the list of entered subzones:

Entering the zone envelope

Zone wrapper constructions are entered on the **Constructions and Bindings** tab.

You can enter the individual constructions in any order and return to and modify them as needed. To enter them, use the buttons for **Openings**, **Walls and Roof**, **Floor and Basement**, **Unheated Spaces**, **Lightweight Envelope**, **Solar Constructions** and **Thermal Joints** on the left side of the tab:

Overview of constructions

In addition to the function buttons, the tab also contains an overview of the entered constructions with their basic properties and the total sum of the envelope areas. The construction types are distinguished by colour for better clarity.

It is practically always necessary to fill in the forms for entering constructions at the contact zone and outside air (the **Walls and Roof** button), the forms for entering hole fillers (the Hole **Fillers** button) and the forms for entering constructions at the contact with the soil (the **Floor and Basement** button).

The other forms only need to be completed if necessary. If none of the relevant constructions (e.g. attic, garage, lightweight cladding, etc.) are in the zone being assessed, the relevant forms do not need to be opened at all.

Methods of specifying opaque constructions with hole fillers

There are two basic ways to specify zone envelope constructions:

(a) without any interconnection between the opaque constructions and the opening fillings
(b) with dynamic coupling between the opaque constructions and the hole fillers placed in them.

The second method is advantageous especially in cases where changes in window sizes are envisaged. If there is a dynamic relationship between the opaque construction and the windows, the area of the opaque construction is automatically recalculated whenever the window size changes.

A more detailed description of the two methods of specifying zone envelopes is given in Section 4.J.

F..3 Parameters of hole fillers

After pressing the button **Hole fillers**, a form for entering hole fillers appears:

Window and door entry form

Selecting a hole filler from the list

in the drop-down menu next to the **Filler Type** field, a list of all window and door types entered on the **Opening Filler Types** form is provided (see chapter F.1). Simply selecting a filler type from this list not only automatically fills in a number of data (thermal transmittance, dimensions, slope, solar transmittance, etc.), but also creates a dynamic link between the opening filler type and the form where it was used. Then, as soon as an entry is changed on the **Opening Filler Types** form, all related properties are automatically changed for all relevant windows or doors in the entire dataset.

The program visually warns about the dynamic link by a lock icon on the selected fields.Such marked fields are locked and cannot be edited.

Addition of the filling type

If the required type is missing from the list of fill types, it can be easily added by clicking on the **Add/Edit hole fill type** function:

This brings up the **Hole Filler Types** form, where you can edit existing filler types or add completely new ones. When you return to the form environment to enter the hole fillers in the zone envelope, the list of fill types will automatically update in the **Fill Type** field.

Working with the form

If you want to fill out another form after the first form, press the **Next Form** button on the right side of the form or the **F4** key. The program will ask you if you want to create a new form, and if you answer **YES**, another identical but blank form will appear in front of you.

New form

Other functions for working with forms are the same as for the previous form type (see F.3).

End of work with data

When you have finished working with the hole fill description form, you will return to the zone description form environment.

F..4 Parameters of constructions in contact with outside air

After pressing the **Walls and Roof** button, a form will appear for entering opaque constructions in contact with outside air:

act.form number

list of constructions

start and end of block

Wall and roof entry form

toolbar

information about the
aids for the current item

| **Attention** | Only opaque constructions separating the interior of the zone from the outside **air** are actually entered on the form **Opaque constructions in contact with outside air**. Fillings of openings, floor constructions or constructions in contact with unheated spaces must be entered on other forms (see chapters F.5 and F.6 below). |

Selection of constructions from the track list

The drop-down menu next to the **Type/Composition** field lists all the types or compositions of opaque constructions previously entered on the **Types of Opaque Constructions** form (see Chapter F.1).

Simply selecting a construction from this list will automatically fill in the heat transfer coefficient and create a dynamic link between the construction composition and the form where it was used. Then, when an entry is changed on the **Impermeable Construction Types** form, the thermal performance of all the relevant constructions is automatically changed across the entire dataset. The program visually highlights the dynamic link function with a lock icon next to the selected fields. Fields marked in this way are locked at the same time and cannot be edited.

Solar parameters
Since according to EN ISO 52016-1 solar gains are evaluated as standard even over opaque building constructions, it is necessary to specify the solar performance for all external constructions.

These are the absorption of solar radiation for the outer surface of the construction, the orientation and the correction factors for shading by various obstacles.

Working with forms

New form
If you want to fill out another form after the first form, press the **Next Form** button on the right side of the form or the **F4** key. The program will ask you if you want to create a new form, and if you answer **YES**, another identical but blank form will appear in front of you.

List
A list of all forms can be found on the right side of the form. Use your mouse to quickly move between forms by left-clicking on the name of the form you want to use. Similarly, you can move around using the **Next Form** and **Previous Form** buttons.

Quick shifts
More extensive options are available in the **Quick Scrolls** menu, where you can find the **Previous Form**, **Next Form**, **Jump to 1st Form**, **Jump to Last Form**, and **Jump to Selected Form** commands.

Form
The main menu for working with forms is the **Form menu**.

You will find the **Insert empty form** function, which allows you to insert another empty form before the current form, the **Cancel current form** function, which cancels the currently displayed form and finally the functions for working with the block of forms.

Block
You can specify the beginning of a block of forms by using the **Mark Block Begin** command, and the end by using the **Mark Block End** command. The current setting is shown below the forms list pane. You can set the block more quickly by double-clicking the mouse on the box that displays the block start and end and directly typing the block start and end numbers in the box.

You can then insert a form block before or after the current form using the **Insert Selected Block** command, or cancel it using the **Cancel Selected Block** command.

End of work with data

When you have finished working with the form for entering opaque constructions in contact with outdoor air, you will return to the form for entering the zone description.

F..5 Parameters of constructions in contact with soil

After pressing the **Floor and Basement** button, a form for describing the constructions in contact with the soil appears:

Label	
act.form number	
list of forms	
beginning and end of	
Floor and basement order form	
floor or basement type switch	
toolbar	
information about the aids for the current	

Type of computational model

For this form, it is important to select the correct type of floor construction at the start of the form. The EN ISO 13370 standard, according to which the calculation of heat flow through the ground is carried out in the **Energy** program, defines four different types of floor construction - floor on the ground, raised floor, heated basement and partially or fully unheated basement.

Before you start entering the floor construction, select the matching floor type. Next, fill in all the required data for the floor type.

If you only want to perform an approximate calculation of the specific heat flux through a construction in contact with soil or an unheated basement, you can set the **Heat flux through soil calculation type** to **approximate calculation**. Then only a few very basic data are entered for the construction - the area in contact with the soil or basement, the heat transfer coefficient (without soil influence) and the temperature reduction factor. The last quantity expresses the fact that the construction under evaluation is not affected by the outside temperature, but by the temperature in the soil or unheated basement, which is higher. The temperature reduction factor can be taken from the help or determined by an auxiliary calculation.

Selection of constructions from the track list

The drop-down menu next to the **Type/composition of floor construction** field lists all types or compositions of opaque constructions previously entered on the Form **Types of opaque constructions** (see chapter F.1).

Simply selecting a construction from this list will automatically fill in the thermal resistance of the construction and create a dynamic link between the construction composition and the form where it was used. Then, when an entry is changed on the **Impervious Construction Types** form, the thermal properties of all the relevant constructions are automatically changed throughout the dataset. The program visually highlights the dynamic link function with a lock icon next to the selected fields. Fields marked in this way are locked at the same time and cannot be edited.

Working with forms

Although it is common for a zone to have only one single floor construction, you may want to divide the floor under the zone into multiple sections and evaluate them separately.

The EN ISO 13370 standard does not provide for this approach and does not mention it directly anywhere - however, the **Energy** Programme does allow it. The resulting thermal transmittance through the soil is given by the sum of the partial transmittances in the case of a floor divided into several parts.

New form   If you want to fill out another form after the first form, press the **Next Form** button on the right side of the form or the **F4** key. The program will ask you if you want to create a new form, and if you answer **YES**, another identical but blank form will appear in front of you.

Other functions for working with forms are the same as for the previous form types (see F.3).

End of work with data

When you have finished working with the form for entering constructions in contact with soil, you will return to the form for entering the zone description.

F..6 Parameters of unheated spaces and conservatories

After pressing the **Unheated spaces** button, the form for entering unheated spaces will appear:

Form for entering unheated spaces

For this form, it is again possible to choose an approximate or exact calculation method.

The approximate method requires only a few basic data for each construction - the area between the heated interior and the unheated space, the heat transfer coefficient and the temperature reduction factor. The last quantity expresses the fact that the construction under assessment is subjected to a different temperature on the outside than the outside temperature. The temperature reduction factor can be taken from e.g. EN 730540-3 (see help to the item) or determined by an auxiliary calculation.

For an **accurate calculation** according to EN ISO 13789, all three main tabs need to be filled in sequentially - i.e. the **General Data** tab (contains a description of the ventilation of the unheated space), the **Constructions between the unheated space and the interior** tab (contains a description of the constructions at the interface between the unheated space and the interior) and the **Constructions between the unheated space and the exterior or soil** tab (contains a description of the constructions at the interface between the unheated space and the exterior or soil). In addition, there are always three more tabs on the latter

tabs, which are used for specifying the parameters of opaque constructions (**opaque constructions** tab), the parameters of windows and doors (**opening fillings** tab) and the parameters of linear thermal links (**linear thermal links** tab).

Solar parameters

For external constructions between the unheated space and the outside air, it is necessary to specify all the necessary solar parameters in addition to the basic thermal properties, because according to EN ISO 52016-1 the solar gains from all unheated spaces (not only from conservatories as according to the now expired EN ISO 13790) are also evaluated as standard.

Working with forms

If the assessed zone is adjacent to a larger number of unheated spaces, the parameters of the additional unheated spaces must be entered on additional forms.

New form

If you want to fill out another form after the first form, press the **Next Form** button on the right side of the form or the **F4** key. The program will ask you if you want to create a new form, and if you answer **YES**, another identical but blank form will appear in front of you.

Other functions for working with forms are the same as for the previous form types (see F.3).

End of work with data

When you have finished working with the unheated space entry form, you will return to the zone description form environment.

F..7 Parameters of lightweight envelopes

After pressing the **Lightweight envelope** button, a form will appear to describe this type of envelope construction:

Selection of constructions from the track list

The drop-down menu next to the **LOP Type** field lists all the lightweight envelope types previously entered on the **Lightweight Envelope Types** form (see Chapter F.1).

By simply selecting a construction from this list, the dimensions and properties of the subparts of the characteristic section and its resulting heat transfer coefficient are automatically filled in, and a dynamic link is created between the LOP type and the form where it was used. Then, as soon as an entry is changed on the **Lightweight Envelope Types** form, the thermal properties of all the relevant LOPs are automatically changed throughout the dataset. The program visually highlights the dynamic linking function by a lock icon on the selected fields. Fields marked in this way are locked at the same time and cannot be edited.

Working with forms

New form

If you want to fill out another form after the first form, press the **Next Form** button on the right side of the form or the **F4** key. The program will ask you if you want to create a new form, and if you answer **YES**, another identical but blank form will appear in front of you.

Other functions for working with forms are the same as for the previous form types (see F.3).

End of work with data

When you have finished working with the lightweight envelope entry form, you will return to the zone description entry form.

F..8 Thermal jointing parameters

Where a detailed evaluation of the effect of thermal links on the energy performance of a building is required, the lengths and linear heat transfer coefficients for linear links and the point heat transfer coefficients for point thermal bridges are entered on the **Thermal Links Between Constructions** form:

Thermal joints between constructions

The form can be called up using the **Thermal Joints** button on the **Constructions and Joints** tab of the form to enter a zone description.

F..9 Interface parameters between zones

After pressing the **Enter Interzone Interface Parameters** button (note that this button is on the 1st form **Building Rating Type and Boundary Conditions**), the form appears:

Interface between zones

For this form, it is necessary to fill in both main tabs sequentially - i.e. the **Planar Building Constructions** tab (contains a description of the constructions at the interface between two zones, whose numbers are set at the top of the form) and the **Linear Thermal Joints** tab (contains a description of 2D thermal joints at the interface between zones).

Working with forms

If there are more than two zones in the object, or if the interface between two zones is made up of more than 10 constructions, you must continue with the entry on the next form. The method of further input is described for this case on the **Notes** tab.

New form

If you want to fill out another form after the first form, press the **Next Form** button on the right side of the form or the **F4** key. The program will ask you if you want to create a new form, and if you answer **YES**, another identical but blank form will appear in front of you.

Other functions for working with forms are the same as for the previous form types (see F.3).

F..10 Parameters of additional energy consumption in unheated spaces

When you press the **Enter Additional Consumables** button (note that this button is on the 1st **Building Rating Type and Boundary Conditions** form), the form appears:

Additional consumption in unheated spaces

With this form it is possible to define the energy consumption for lighting and for forced ventilation of unheated spaces (typically garages).

If there is any other energy consumption in the space, it can be entered directly (even by the hour) on the **Additional electricity consumption** tab.

Working with forms

If there are multiple unheated spaces in the building with significant additional energy consumption, you must continue with the input on the next form.

New form

If you want to fill out another form after the first form, press the **Next Form** button on the right side of the form or the **F4** key. The program will ask you if you want to create a new form, and if you answer **YES**, another identical but blank form will appear in front of you.

Other functions for working with forms are the same as for the previous form types (see F.3).

G. Calculation of the task

You can invoke job calculation either by using the **Calculation** button on the job panel or by using the **Calculate Job** command in the **Calculation** menu. A window will then appear where you can select the type of calculation and influence how it is performed:

If the **Energy** calculation module finds an error in the input, it will report it and not perform the calculation.

Calculation protocol

The result of the calculation is a calculation report, which contains a detailed recapitulation of the input data and detailed calculation results for both individual zones and the building as a whole. The following information, among others, can be found in the report:

- specific heat fluxes through penetration and ventilation

- energy requirements for heating and cooling

- energy supplied for heating, cooling, forced ventilation, humidity treatment, hot water, lighting

- primary energy from non-renewable sources

- the average heat transfer coefficient of the building.

The protocol can be optionally supplemented with graphical outputs.

The calculation report is a text file in **RTF** (rich text format), which contains Czech diacritics and can be loaded into any text editor for MS Windows. A characteristic feature of the RTF format is the preservation of fonts and formatting.

Browsing module
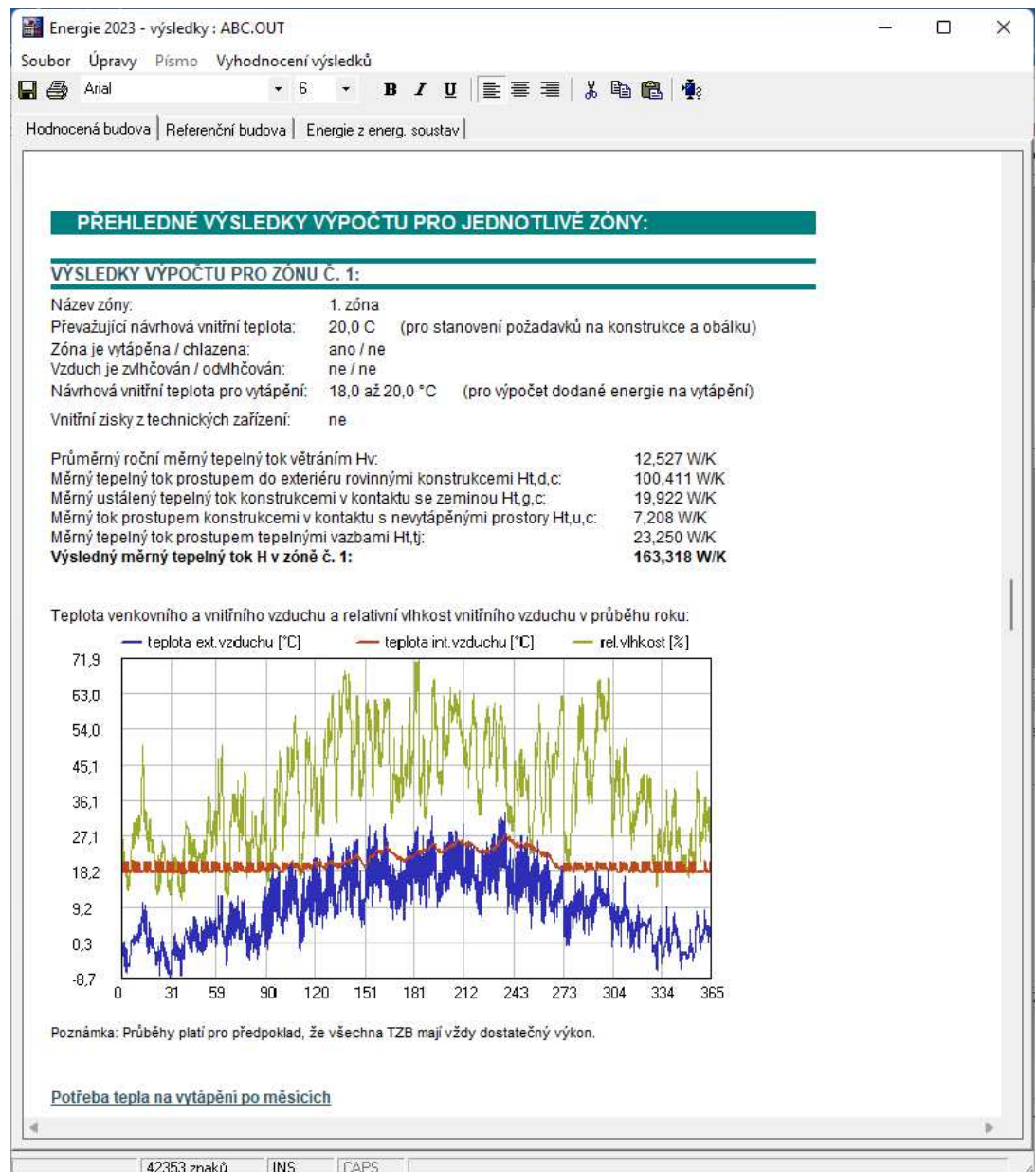
The calculation report can be displayed in a simple editor after the calculation is completed - in the viewing module of the **Energy** program. The viewing module is a separate program Energie2023ED.EXE. Several viewing modules with one or more calculation reports can be run simultaneously.

You can set whether the viewing module will be called using the **Options** item in the **Calculation** menu. The **Options** item allows several other settings. For example, if you want to use any other text editor instead of the internal viewer, you can use this item to set the path to that program.

After the calculation, only the viewing module can be called up using the **Calculation log** command in the **Calculation** menu.

Working with the protocol

The calculation report can be edited in the viewer using the commands in the **Font** (change font type), **Edit** (copy, delete, paste) and **File** (save changes, save under another name, print, printer settings) menus.

You must select part or all of the text with the mouse or keyboard before using the **Font** command. Font editing will then apply only to the selected text.

Printed from   Before printing, the viewer allows you to set the margins for printing using the **Page Setup** command in the **File menu**, and to set printer parameters using the **Printer Setup** command in the **File menu**.

You can print a document by using the **Print** command in the **File** menu or by pressing the corresponding icon in the toolbar.

Printing from the viewer environment is performed using the MS Visual Basic 6.0 library function and is therefore affected by the interaction between the printer driver and the MS Visual Basic libraries. Print quality can only be affected when the printer driver allows it.

If you encounter problems with printing or if you want a higher quality print, please take advantage of the fact that the calculation report can be loaded or transferred via clipboard to any text editor without any problems and print the report from there.

You can exit the viewer by pressing the **Esc** key, using the **End** command in the **File** menu, or by double-clicking the mouse over the upper left corner of the window.

H. Graphical evaluation of results

You can either click the **Graphical Output** button in the job panel or use the commands in the **Graphics** menu to display graphical evaluation of the results.

Types of charts   There are nine different graphical outputs:

1. detailed annual trends of selected variables
This graphical output shows the progression of up to five selected variables (from climate data to calculated delivered and primary energy) at selected times during the year.

2. daily delivered energy
This graph shows the evolution of the sub-components of energy delivered in kWh/day over the year.

3. monthly delivered energy
This output shows the sub-components of energy delivered in kWh/month over the year.

4. daily primary energy
This graph shows the evolution of primary energy from non-renewable sources in kWh/day over the year.

5. annual energy balance of the building
This bar chart shows the distribution of the annual energy balance of the building by the individual sub-energies supplied.

6. distribution of specific energy delivered
This pie chart shows the distribution of the total annual specific energy delivered to the building into the individual energy sub-supplies.

7. distribution by energy carrier
This graph shows the distribution of total energy supplied, primary energy and CO_2 emissions by energy carrier (electricity, gas, coal, wood, etc.) in a pie chart.

8. distribution of specific heat fluxes in the form of a pie chart
This graphical output will show the percentage distribution of specific heat fluxes through the individual envelope constructions of the selected building zone in the form of a pie chart.

9. distribution of specific heat fluxes in the form of a bar graph
This graphical output will show the absolute magnitudes of the specific heat fluxes through the individual envelope constructions of the selected building zone in the form of a bar graph.

Exit screen
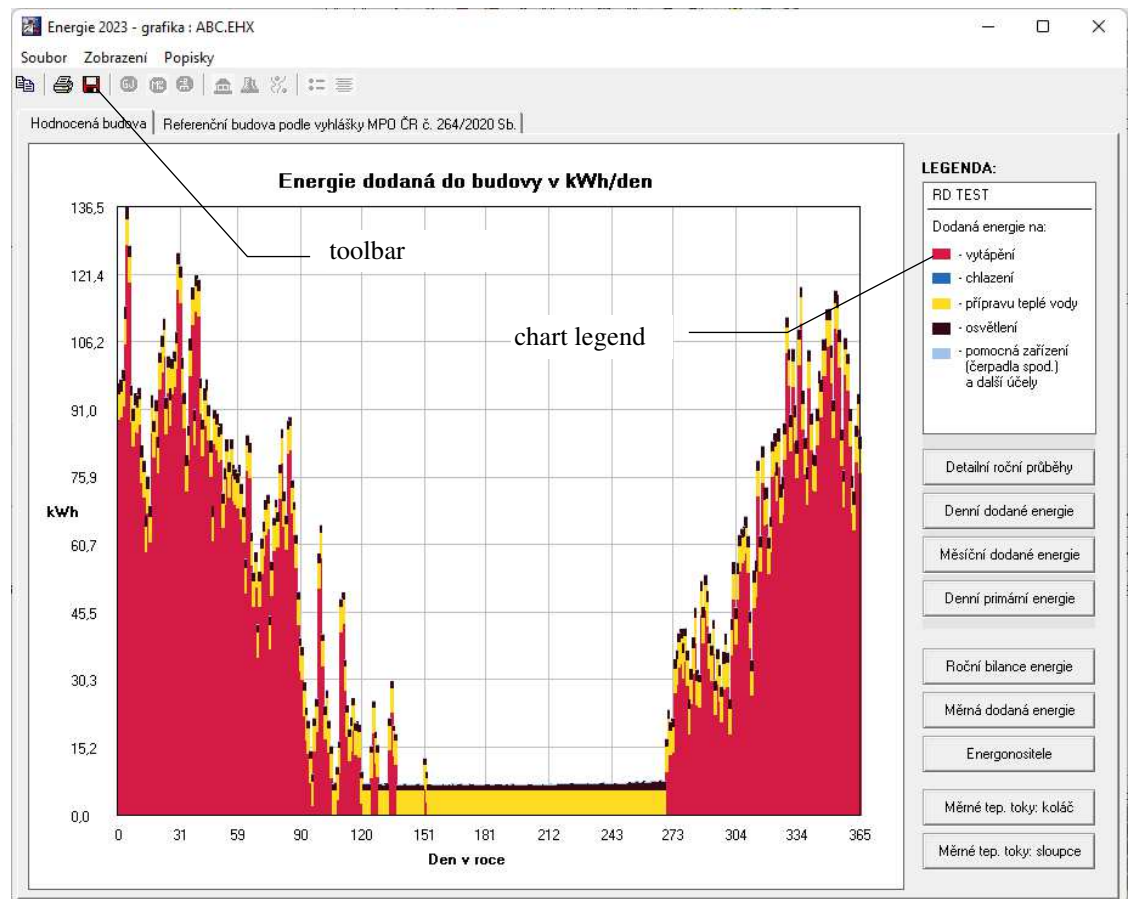
If you press the **Graphical Output** button on the task bar, the energy balance of the object is always displayed. If you use the commands in the **Graphics** menu, you will be able to directly specify what type of graph you want to see.
However, the type of graphic output can be changed directly in the graphic module environment.

The graphic module is a separate program EGRAPH.EXE. Multiple graphic modules can be run simultaneously with one or more calculation results.

Descriptions

The graphic module can be supplemented with labels that can be inserted into the graph using the **Insert Next** command from the **Labels** menu. The label is inserted in the upper left corner of the chart and is ready for writing any text. It can also be moved with the mouse to any location on the chart using the "grab and drop" technique. To cancel a label, use the **Cancel** or **Cancel All** command from the **Labels** menu. If you press the right mouse button over a label, a floating menu will appear at the mouse location with a menu for working with the label.

Printed from

You can print the created graphic output using the printer icon button or the **Print** command in the **File** menu.
Before printing, you can both set the margins for printing using the **Page Setup** command in the **File menu**, and set printer parameters using the **Printer Setup** command in the **File menu**.
Printing from the graphic module environment is performed using the MS Visual Basic 6.0 library function and is therefore affected by the interaction between the printer driver and the MS Visual Basic libraries. Print quality can only be affected when the printer driver allows it. If you encounter problems with printing or if you want a higher quality print, please take advantage of the fact that the graphic output can be easily transferred to and printed from any text or graphics editor via the Windows clipboard.

Transfer to clipboard

You can transfer graphic output to the Windows clipboard and from there to any MS Windows application that works with graphics by using the **Transfer to Clipboard** command from the **File** menu.

Save to file

You can also save the graphic output to a graphic file (BMP bitmap). For this option, select either the button with the diskette icon or the **Save to file** command from the **File** menu.

I. Comparison of calculation variants

You can compare individual calculation variants using the **Compare calculation variants** command in the **Calculation** item of the main menu of the program.

Comparison of variants

When you select this option, the following window will appear:

On the first tab, specify at least one data file that will be compared to the current job (the current job is always located in the first row). You can use the **Find** buttons to select the file. If you want to delete a job from the comparison, you can use the button with the **X** symbol.

Individual comparisons in terms of specific energy consumption, specific heat fluxes, specific heat demand and specific heat demand reduction can be found under the respective tabs.

Graphical outputs and the table can be transferred to the Windows clipboard via the corresponding buttons.

If you want to transfer a table so that it can be further edited as a table, either paste it directly into **MS Excel** or paste the **MS Excel** table first into a text editor (e.g. **MS Word**) and then the table from the clipboard.

You can print graphs via the **Print** button. Printing from the environment of this module is performed using the library function of MS Visual Basic 6.0 and is therefore affected by the interaction between the printer driver and the MS Visual Basic libraries. The print quality and placement of the graph on the page can only be influenced when the printer driver itself allows it.

If you encounter problems with printing or if you want a higher quality print, please take advantage of the fact that the graphic output can be easily transferred to and printed from any text or graphics editor via the Windows clipboard.

J. Methods of specifying envelope constructions in the zone

As of the **2019** version, **Energy** offers two basic options to specify opaque constructions with hole fillers in the zone envelope. Both input methods can be combined freely.

J..1 Specification of walls and roofs without reference to windows

Specification of constructions without interconnection

The traditional way is to specify envelope constructions without any interconnection between the opaque constructions and the hole fillers.

In this case, the individual hole fillers in the zone can be entered in any order on the **Hole Fillers in Contact with Outside Air** form and the individual opaque constructions in contact with outside air on the **Opaque Constructions in Contact with Outside Air** form.

For opaque constructions, a **clear area** (i.e. an area without hole fillers) is always entered, which must also be set on the form:

Because there is no connection between the wall or roof and the windows in it, the area of the opaque construction remains the same - even if the number or size of the windows changes.

J..2 Specification of walls and roofs with dynamic link to windows

Specification of constructions with interconnection

The second way of specifying envelope constructions - with a dynamic link between the opaque constructions and the opening fillers - allows the wall or roof to be connected to the windows. Such an entry can be more transparent and also allows for automatic recalculation of the area of the opaque construction if the number or size of the windows within it changes.

The program offers two ways to create a dynamic link between the opaque construction and the windows:

- or you can proceed in a very traditional way by first entering the individual hole fillers in the zone on the form **Hole fillers in contact with outside air** and then assigning these constructions to walls and roofs on the form **Opaque constructions in contact with outside air**;
- or not only walls and roofs, but also hole fillers located in them, are entered directly on the form **Opaque constructions in contact with outside air**.

Method 1

The first mentioned option requires that all windows and doors in the zone are first specified, including correct orientations and other properties.

Then, on the wall and roof entry form, the **gross area** is set with **dynamic linking to the windows** and the overall dimensions of the opaque construction including the opening fillers (width and height/length) are entered:

Then the **Edit list of windows in the construction button is pressed** and the window openings that are located in the specified wall or roof are selected in the displayed list of similarly oriented and not yet used elsewhere windows:

List of windows in the construction

Once this is done, a dynamic joint is created between the wall and the window:

Created binding

automatically calculates the net wall area and updates itself as soon as any change occurs in the area of the selected window(s).

Method 2   Entering the zone envelope can be simplified if the hole fillers are entered directly in relation to specific walls or roofs.

Windows and doors are then not entered in advance on the **Openings in Contact with Outside Air** form, but are entered only for the corresponding opaque construction using the **Enter New Openings in Construction** button on the **Select Openings in Construction** window.

Adding windows   By pressing the above mentioned button, the standard form for entering the filling of the opening is called up, in which all the usual parameters of the window or door are entered:

If the entry is complete, the newly created hole filler is assigned to the currently entered wall and is also included in the hole filler file (it can be edited on the **Hole Filler in Contact with Outside Air** form).

Removing windows

You can use the **Delete Selected Fill** button to delete any hole fill from the hole fill file:

Finally, it should be noted that only windows that have the same orientation and that are not already located in any other wall can be connected to the wall (no window can be placed in two or more opaque constructions). If there is an additional change in the orientation of a window that is connected to an opaque construction, the dynamic link between the two constructions is broken.

K. Methods of specifying constructions in unheated space

Two options for entering opaque constructions with windows are also available in the **2019** version of **Energy for** unheated spaces.

K..1 Specification of walls and roofs without reference to windows

Specification of constructions without interconnection

The traditional way is to specify the envelope constructions of the unheated space (both interior and exterior) without any interconnection between the opaque constructions and the opening fillings.

In this case, the individual hole fillers and individual opaque constructions between the unheated space and the interior or exterior are entered in any order on the relevant tabs of the form for the unheated space, e.g.:

For opaque constructions, a **clear area** (i.e. an area without hole fillers) is always entered, which must also be set on the form:

Because there is no connection between the wall or roof and the windows in it, the area of the opaque construction remains the same - even if the number or size of the windows changes.

K..2 Specification of walls and roofs with dynamic link to windows

Specification of constructions with interconnection

Specifying envelope constructions for an unheated space with a dynamic connection between the opaque constructions and the opening fillings requires that all opening fillings between the unheated space and the interior or exterior are specified first.

Subsequently, these fillings can be assigned to individual opaque constructions in the envelope of the unheated space and the program will then recalculate the area of the respective opaque construction whenever the dimensions of the assigned windows are changed.

In order to create a link between the opaque construction and the windows, it is necessary to set up a **rough area** input **with a dynamic link to the windows** and to specify the overall dimensions of the opaque construction including the hole fillers (width and height/length):

List of windows in the construction

Then the **Edit list of windows in the construction button is pressed** and the window openings that are located in the specified wall or roof are selected in the displayed list of similarly oriented and not yet used elsewhere windows:

Once this is done, a dynamic joint is created between the wall and the window:

Created binding

automatically calculates the net wall area and updates itself as soon as any change occurs in the area of the selected window(s).

Only windows that have the same orientation and are not already located in any other wall can be connected to the wall. If there is an additional change in the orientation of a window that is connected to an opaque construction, the dynamic link between the two constructions is broken.

5.

BEHIND THE SCENES OF THE PROGRAMME

The energy demand for heating, cooling and humidity treatment shall be determined by calculation in hourly increments according to EN ISO 52016-1, Chapter 6.5.

The procedures of EN ISO 6946, EN ISO 10211-1, EN ISO 13370, EN ISO 13789 and EN ISO 52016-1 are used for the determination of specific flow rates through penetration and ventilation. The outdoor air flow through leakages shall be determined iteratively in accordance with EN 16798-7.

The energy supplied for lighting is determined using the principles of EN 15193-1. The other energy supplied is calculated from the hourly energy needs, taking into account the efficiencies of energy sources, energy distribution and energy sharing. This is based either on well-known physical principles and relationships (e.g. calorimetric equation, equipment efficiency) or on the relationships given in EN 730331-1.

Primary energy from non-renewable sources shall be determined on the basis of the hourly energy delivered by each energy carrier by multiplying the energy delivered fraction by the corresponding primary energy factor.

Chapter

6.

INPUT, ERRORS AND TIPS

In this section you can find notes on preparing input data and practical tips.

Input data preparation

Before starting to enter the description of the building to be assessed into the programme, it is necessary to have the building documentation, thermal properties of the building envelope and data on the technical installations for heating, cooling, forced ventilation, hot water, humidity treatment and lighting. The following most important principles should be followed in the actual computational modelling of the building:

(1)   Only the part of the building in which the indoor temperature is being adjusted shall be assessed.

Before and during the building entry, it is important to remember that only the heated/cooled part of the building is evaluated. Only this part is a zone. Other spaces are only unheated/uncooled spaces and are not included in the zone. They are only included in the calculation as 'buffer' spaces that reduce heat flow from the zone to the exterior or vice versa (to be entered on the unheated space description form). At the same time, any energy supplied for lighting or forced ventilation of similar spaces is also taken into account.

2.   The first step of data creation is to divide the building into different zones.

Generally speaking, a zone is defined in EN ISO 52016-1 as a part of a building characterised by identical heating and cooling energy sources and more or less identical indoor traffic type in all rooms.

Some buildings are typically single-zone (e.g. family and apartment buildings, where the entire heated part can usually be considered as a single zone), while some buildings are typically multi-zone (e.g. industrial assembly halls with an administrative part, where the administrative part should be considered as one zone and the production part as another zone).

It is always easier to rate a building as single zone. EN ISO 52016-1 therefore sets out the conditions under which a multi-zone building can be considered as single-zone. If you merge several zones into a single zone, you need to determine the internal temperature in this zone by calculation - by weighted averaging over the floor areas, or better the volumes of the sub-zones.

(3)   The building (if it is single-zone) or one zone (if the building consists of several zones) shall always be assessed as a whole. Walls, partitions and ceilings within a zone shall not be entered.

4.   When entering, care must be taken to ensure that all envelope constructions for each zone are entered. If the zones are heated or cooled by significantly different energy sources, the constructions at the interface between the zones may also be entered.

5.   Attention should also be paid to the correct entry of the individual constructions on the forms. All infill openings in contact with outside air must be entered on the form **Infill Openings in Contact with Outside Air**, all opaque constructions in contact with outside air must be entered on the form **Opaque Constructions in Contact with Outside Air**. Constructions in contact with the ground, including entire basements (basement walls, floors) must be entered on the **Floor and Basement** form (the exception may be in some cases an unheated basement, which may be entered as a variation of an unheated space). Constructions in contact with unheated spaces (attics, garages) must be entered on the **Unheated Spaces** form.

Errors when entering constructions into the forms can skew the results quite a bit.

Fixing common errors

Multiplying by ten when entering numbers

If the number you enter increases by a factor of 10 each time you exit an entry, tap **Start**, **Settings**, and **Control Panel**. Tap the **Local Settings** icon (globe symbol) and look at the **Numbers** setting. The format should be set so that the digit group separator is a space and the decimal separator is a comma or period. If this is not the case, set both separators according to the rule above. If this is the case and multiplication by ten still occurs, set the separators again. Press the **OK** button.

Commas in the task name, etc.

Avoid using a comma as a separator in the job name, processor, job, variant, and calculation date. You must use either a period or a slash. The program checks the entry and will not allow the comma to be entered.

Chapter

7.

NEWS IN THE PROGRAMME

In this section you can find basic information about the most important new features of the new version of the program.

Version 2023.10 (August 2023):

Changes in the evaluation of the requirements of the NZÚ in area B

On the basis of planned and confirmed by the SFŽP changes in the requirements for the heat transfer coefficient of windows in new buildings (area B), the **calculation of the required value of the heat transfer coefficient of window fillings** for the purposes of the NZÚ subsidy programme (hereinafter U,NZU) has been modified.

From September 2023, the required U,NZU is to continue to be derived from the reference value U,R (according to the relation U,NZU = 0.6 * U,R), but for this purpose U,R is to be determined using the **coefficient fR = 1.0** (and not fR = 0.7, as would correspond to Decree 264/2020 Coll.). In the program, we are modifying this rule to avoid conflict with the current decree. Therefore, the reference U,R is still set in the programme in accordance with Decree 264/2020 (i.e. with fR = 0.7), but instead of a reduction of 0.6 (in the relation U,NZU = 0.6 * U,R), the programme uses a **reduction of 0.6/0.7** (i.e. U,NZU = 0.6/0.7 * U,R). The resulting U,NZU then complies with the requirements of the SFŽP, while the reference U,R is still in accordance with the applicable decree.

Thus, there may not be problems with PENB, the XML file for ENEX, etc., which would be a risk if the U,R values were modified directly.

Other changes in the programme

In the module for the evaluation of the requirements of the NZÚ subsidy programme, **all values are formatted** to 3 decimal places before comparing the calculated and required heat transfer coefficients of the construction. Thus, the exact values to be printed in the report are still compared with each other.

The calculation of **annual and monthly specific ventilation heat fluxes** for zones with forced ventilation operating only part of the day has been corrected. In version 2023.9, the reduction of part of these values by the annual share of operating hours was inadvertently deactivated. The error had no impact on the calculation results. It only manifested itself in an increase of the ventilation loss in the informative tables with monthly balances in the calculation report and in the informative pie charts in Table E in the PENB.

In the CSV file for the whole building the printing of hourly energies supplied by the first three heat sources **to the building from the surroundings** was corrected. For sources with efficiency above 100%, non-zero values were incorrectly printed to the CSV file.

Version 2023.9 (July 2023):

Bulk definition of custom usage profile parameters

A **Complete Entry by Time Period** button has been added to the form for entering custom usage profiles, allowing you to enter all the operational parameters of the profile at once. When the button is pressed, a new window will appear where you can set the basic operating characteristics of the profile (with or without heating, cooling and humidity treatment, with or without holiday and emergency operation) and enter **all operating parameters** for all types of days considered (weekday, Saturday, Sunday, holiday, emergency operation). The input of the operating parameters of the profile (from temperatures to relative hot water consumption) is done in time **intervals**, which can be up to twelve for each day. The new input method not only

allows better control of the values entered, but also significantly speeds up the definition of the profile itself.

Check compatibility of use profiles in autumn

The compatibility check of operations in subzones is now performed not only when entering subzones, but also when any **change is made to the definition of custom** usage **profiles**. If a change to a custom profile causes the profile to no longer be compatible with profiles in other subzones, the program will warn you. If the profile is not corrected, the program automatically deactivates all subzones with incompatible profiles and excludes them from the calculation.

An overview of the operational parameters of the newly entered/edited subzone has been added to the subzone parameter entry window, which must be compatible with the parameters of the already entered subzones. The required indoor temperature in heating and cooling mode and the required indoor relative humidity for both humidification and dehumidification mode are checked. If any of the checked values are not compatible, the program **will visually indicate** this and display more detailed information about the specific error occurrence. The check described above is performed continuously during subzone entry.

When checking the compatibility of usage profiles in the autumn, the **weeks and days on** which holiday traffic is to be used are now **checked only when** holiday traffic is used outside holidays. The check in other cases was redundant and could have led to the highlighting of real non-existent differences in the profiles.

New options for storing unused electricity from photovoltaics

It is now possible to model the storage of unusable energy from the photovoltaic system in the heating system **storage tank** and in the **cold storage tank**. At the same time, the possibilities of combining individual energy storage (up to 3 different ones - batteries, tanks, storage tanks - within 1 zone) have been extended.

The storage of energy in the storage tank is not calculated throughout the year, but only **during the heating season** or during periods outside the heating season when heating must be started within a maximum of 1 day. The storage of energy in the cold storage tank is treated analogously.

Detailed modelling of flows between the zone and the unheated space

In addition to the existing constant volume flow rate between the zone and the unheated space, the program allows you to specify **time-varying flow rates**. These are optionally derived either from the air flow rate entering the zone, the air flow rate leaving the zone, or the difference between them. The orientation of the air flow across the boundary between the zone and the unheated space depends on the choice described, with the m3/h quantity depending on the specified percentage of the selected flow rate. The result is time-varying flows into/out of the unheated space that respond to how the zone flows change.

If the air flow is oriented from the unheated space to the zone, the **heat recovery efficiency** can optionally be taken into account in the calculation and thus increase the supply air temperature. For flows oriented in the opposite direction from the zone to the unheated space, the calculation automatically reduces the temperature of the exhaust air due to the passage through the ZZT heat exchanger (if this system is in the zone).

The time-varying airflows to/from the unheated zone can either be added to the already entered airflows to or from the zone, or they can partially or completely replace the already entered airflows so that the **pressure ratios in the zone** do not change.

The options for specifying the volume air flow between the unheated space and the exterior have also been extended. In addition to the existing constant ventilation rate, a time-varying forced ventilation flow can now be entered by reference to an already entered **use profile in the unheated space** (on the form for entering additional consumption in unheated spaces).

Tools for processing applications for NFA grants

The program allows you to evaluate **compliance with the requirements of the New Green Savings subsidy program** valid from September 2023. After selecting the subsidy area and the type of supported measures, the program displays an evaluation of all partial requirements and a summary conclusion. The evaluation of requirements in subsidy areas A and B for single-family and apartment buildings is supported.

The program displays in the right part of the task panel in the overview of the entered data **information about the areas of constructions** included in the application for subsidies in the

New Green Savings Programme. The total "subsidy" area and the sub-areas of hole fillers, constructions in contact with soil and other constructions are displayed.

The possibility of saving the protocols required by the SFŽP when applying for subsidies to an archive file has been added. The new function can be called by the command **File - Export files for NZÚ to ZIP format**. It is then possible to select the area of support (A/B), the folder and name of the resulting archive file and, in the case of area A, the path to the job containing the data for the baseline condition of the building before insulation.

Changes to the calculation and output files

It is possible to print the **hourly energy delivered for heating by each heat source** in the building to a CSV file for the building as a whole. This option can be activated via the **Options and Settings** icon on the program toolbar. Data is printed for the first three heat sources entered, with each of them showing both the "consumption" of fuel and the amount of energy supplied from the surrounding environment. From this data, it is possible to derive e.g. the hourly COP values of the heat pumps or the number of hours of operation of additional heat sources, etc.

When calculating the availability of **electricity from cogeneration** in a building, the surplus electricity from the surrounding zones is now also applied in those zones where there is also a cogeneration unit. Previously, surplus electricity from surrounding zones was only applied in zones without CHP.

The printing of the energy supplied for the production of electricity by CHP units in the calculation report has been modified. The energy consumed for the production of electricity used in the building is now printed as one clearly labelled item instead of the previous two less clear items (losses + other purposes).

The calculation of the **time share of the operation of the HVAC** unit or fan, which is printed in Table G in the energy certificate, has been specified. When determining this annual average value, the program now takes into account not only the hours without HVAC operation as before, but also the specified time share of forced ventilation operation in each operating hour. The change, which applies to HVAC units in zones as well as in unheated spaces, has no impact on the calculation results.

The calculation of the average annual **specific ventilation flux** and average monthly specific ventilation fluxes for zones with forced ventilation and with a time share of forced ventilation operation in each operating hour of less than 100 % has also been refined. The change will only affect the informative tables of specific flows and monthly heating and cooling energy needs in the calculation report. It may also have some impact on the specific flow ratios in Table E of the PENB. However, the results of the hourly-step energy calculation are not affected by this change and the annual and monthly ventilation specific flows are not used in the hourly-step calculation. The effect of the proportion of the actual volume flow of exhaust and supply air through the HVAC unit on the heat recovery efficiency is still only considered in the hourly step. Therefore, the **specified efficiency of the RO** is now always considered when determining the monthly and annual specific ventilation heat flows, regardless of how the average monthly or annual flows are calculated from the hourly data. The change may only be reflected in the indicative specific ventilation flows and in the tables of indicative monthly values in the calculation report. It will not affect the results of the hourly step calculation.

Other changes in the programme

The switch **Optimise calculation when a large number of identical constructions are entered** has been added to the calculation options window, which appears by default before the calculation is performed.

The programme no longer allows the setting of the reference building level "new building with almost zero energy consumption", which could only be used **until 31.12.2021**. In order to avoid mistakes in setting the evaluation method, this outdated option has been removed from the reference building level menu.

The incorrect **addition of the "(copy)" suffix** to the name of the unheated space, which the program performed when the buttons **Move form to beginning**, **Move form to end** and **Move form to selected position in the** toolbar of the unheated space entry form, were used to move the unheated space in the unheated space file, has been removed.

Version 2023.8 (April 2023):

Corrections to the calculation of the rated and reference building

Fixed the calculation of energy supplied for forced ventilation for **throttling fans**, which incorrectly assumed full fan operation during all operating hours, even if time-limited operation was specified. For older jobs, the correction will only be active after the operating parameters of the corresponding zone have been updated.

The calculation of the **heating and cooling energy demand of the reference building** has been corrected where the ventilation air volume flows for forced ventilation were not correctly accounted for in certain combinations of the specifications for versions 2023.6 and 2023.7. The error could only occur in buildings with multiple zones ventilated in different ways (combination of natural and forced-air zones) if the forced-air zones were entered first and then the naturally ventilated zones. Single zone buildings or multi-zone buildings with the same type of ventilation did not show the error.

Faster entry of custom usage profiles

When entering all parameters of custom profiles, a quick definition of values by time periods is now available. The new function can be called up by using the command **Quick entry by time periods** from the drop-down menu next to the blue icon with the pencil symbol on the window for entering the parameter progress by hours. You can enter up to **12 time periods of different lengths** during the day and simply press the OK button to transfer them to the Hourly Parameter Entry window. Moreover, the data entered in this way can be easily edited, as the default values are transferred to the window when the window is called up again.

Other changes in the programme

The option to enter values from the Windows clipboard using the **Ctrl+V key combination** has been added to all numeric items on the input windows.

The formatting of printing window dimensions in the specific heat flux table has been modified to reduce the risk of shifting print columns.

Version 2023.7 (April 2023):

Optimization of the calculation when a large number of identical constructions are entered

An optional optimization has been added to the program to significantly speed up the calculation of problems with a large number of separately specified but otherwise identical constructions. Depending on the number of such constructions, the computation time can be reduced to less than half the time without optimization. For problems with a small number of constructions and/or only different constructions, optimization does not take effect.

Other changes and corrections

The CO2 emission factor for electricity from photovoltaics or cogeneration exported to the public grid has been corrected from the no longer valid value of -1.012 kg/kWh to the currently valid value of -0.86 kg/kWh.

The calculation of **electricity exported from CHP** to the public grid has been corrected for buildings with multiple zones where a CHP unit is used and at the same time it is set to use the surplus electricity first in the surrounding zones and then export it to the grid. In this combination, the export to the grid is too high.

Added a **check for invisible characters** (e.g. for Enter) to the comment box in the taskbar. This has eliminated the risk that unintentional insertion of these characters (e.g. when copying text from the Windows clipboard) will mess up the format of the EHX file and the task will not open.

Modified the **checking of the input of floors** on the ground so that the warning for too small or large input exposed perimeter appears less frequently.

Serial numbers **have been added** to all input windows (zone parameters, envelope parameters, etc.) in the list of forms on the top right for better orientation. The numbers of the entered active and inactive zones have also been added to the data overview in the task panel. During the sub-zone procurement, the selection of contract profiles for commercial and sports operations imposes the as yet missing **information on the occurrence of abnormal traffic**. The absence of this information may have complicated the addition of additional subzones to the zone in certain situations.

The program allows you to optionally enter **individual values for the** primary energy factor and CO_2 emission factor for electricity generated in the building and exported to the public grid.

Version 2023.6 (April 2023):

Taking internal constructions into account in the calculation

The program allows any number of **indoor constructions** in a zone to be taken into account in the calculation of heating and cooling energy requirements. The internal constructions can be entered on a new form **Description of internal constructions**, which can be called up using the appropriate button from the form for entering the zone parameters.

Although it is not strictly necessary to specify internal constructions in a zone according to EN ISO 52016-1, in some cases it may be relevant to specify them (e.g. for zones with a small number of external constructions and large internal gains). Taking internal constructions into account in the calculation **refines the results** and usually leads to a slight reduction in heating and especially cooling energy requirements. On the other hand, of course, it slows down the calculation.

New possibilities for modelling building properties and operation

For unheated spaces, their **internal heat capacity** can be redefined to take into account the effect of the heat capacity of equipment, air and internal constructions in the unheated space.

The program allows for **time-varying air changes between zones**. The volumetric air flow from one zone to another is optionally derived either from the flow rate of air entering one or the other zone, or from the flow rate of air leaving the zones, or from the difference between the flow rates of air entering and leaving the zones. The orientation of the air flow across the boundary between the zones depends on the choice described, with the amount m3/h depending on the specified percentage of the selected flow rate. The result is time-varying flows across the boundaries between zones that respond to how the flows in the zones change. This procedure is intended for **zones with forced ventilation**. For naturally ventilated zones, the option to specify a time constant airflow from one zone to another is still available.

For windows and translucent parts of light envelopes it is possible to set **different control mode of movable shading devices** (blinds, shutters, curtains) for cold and warm part of the year. The division of the year into these two parts can be influenced by specifying the average monthly outdoor air temperature limit.

Changes to output files and graphs

The graphical output of the program displays **detailed hourly calculation results** not only for the building being evaluated as before, but also for the reference building. It is still possible to display up to five different variables over a selected time period (one day to one year), and the results of the assessed and reference building can be combined freely.

The printing of the table summarising the **specific heat fluxes through the penetration** and the percentage of heat loss through the penetration in the reference building calculation report has been corrected. For constructions that were marked as 'altered + NZU', the specific heat flux values were inadvertently not printed in this table.

Changes in import from Protech TV

Window constructions with a specified heat transfer coefficient can be imported **without reference to specific window dimensions** (i.e. valid for any size). The dimensions for a window defined in this way are then loaded for each window in the heated/cooled zone envelope separately from the XML file generated by Protech TV, so they may differ from each other.

If the latest version of the XML file (version 3) is generated in Protech TV, the **building address** and cadastral data can be reliably **imported into** Energie.

The import of **opaque hole fillers**, called nick, into the envelope of the heated/cooled zone, which was not supported before, has been added. If a wall construction with an embedded niche appears in the XML file, the niche is imported as a hole filler in the corresponding wall. In the calculation it is independently of its composition taken into account as a very light construction with zero transmittance of direct solar radiation.

Other changes and corrections

The program **does not delete a ZIP file** when automatically copying a job from the working directory to the data directory (this happens when the job is closed), if such a file with the job name exists in the data directory.

The envelope summary table on the zone description entry form displays information about the altered/new construction for the purposes of the NHA grant. Previously, these constructions erroneously displayed that they were unaltered constructions.

The check for **zero value of the thermal resistance** for heat transfer on the inside of the construction is only performed on the form for entering the compositions/types of constructions when entering the composition of the construction, to avoid unnecessary error warnings after importing data from Protech TV.

Additional **checks on the temperature of the air** supplied to the zone by the hot air heating have been added to eliminate the risk of splitting by a zero temperature difference between this temperature and the calculated indoor air temperature.

Removed **locking the drop-down menu** for selecting the artificial lighting mode of operation in autumn during sufficient daylight, which was accidentally left on the custom profiles.

A system menu with a Minimize icon (drops the window to the Windows tray) and a Close icon (has the same function as the existing Cancel button) has been added to the calculation progress window.

The default values in the window for entering **global aperture changes** have been modified. At the same time, when the maximum size of the searched windows is set to 0 m2, it is now assumed that the size limit should not be applied.

The program displays details of **differences in** subzone usage profiles that prevent a new or modified subzone from being added to other subzones.

The optional printout of graphs with the energy delivered in kWh/day and kWh/month in the calculation report of the assessed building has been returned to the program.

The warning about identical names of unheated spaces that appears when closing the form for entering these parts of the building has been modified. The repeated display of this warning for unheated spaces divided into multiple parts has been removed, while the information displayed about unheated spaces and adjacent zones has been refined.

Version 2023.5 (March 2023):

Primary energy for electricity from cogeneration and other adjustments to the calculation

The calculation of **non-renewable primary energy and CO2 emissions for electricity produced in a CHP unit** has been corrected. In the previous calculation, the respective primary energy factor and CO2 emission factor were erroneously zeroed in each hour, so that the resulting primary energy associated with the electricity production was zero, even if the energy carrier was, for example, natural gas.

The blocking of the calculation in case of **entering zero share of** heat **supply** for heating by the first and/or second heating system has been removed. It is now possible to complete the calculation even if 2 or 3 systems are entered but only the last one supplies energy. The same modification has been made for cooling and hot water systems.

Fixed an **incorrect** input data **check** that blocked the calculation when entering a negative pressure fan into an unheated space.

When reading hourly input data from CSV files, the program checks the decimal separator and automatically converts it to the correct type according to the operating system settings. The calculation will be performed even if an incorrect decimal point or dot type is used in the CSV files (e.g. after transferring data from another computer with different number format settings).

Compatibility check of operations in autumn

When adding a new subzone or modifying an existing subzone, the program checks whether the traffic selected for that subzone is compatible with traffic in other active subzones.

Correct composition of a zone from multiple subzones requires that heating, cooling, humidification and dehumidification are required in all subzones at the same hours. When combining subzones where the required heating, cooling, or humidification operations do not overlap in time, the resulting zone operating parameters may be unrealistic. Therefore, each zone should only have subzones that have the same heating, cooling and humidity operation mode, and the specific temperatures and humidities required may vary slightly.

The program now blocks the addition of operationally incompatible subzones and thus reduces the risk of incorrect entry.

Changes in output files

The program prints the **total installed peak power of** the PV panels in the building in kWp derived from the specified panel parameters into Table G in the PENB report.

The informative printout of the average annual **efficiency of heat distribution and storage** for heating and hot water preparation **by CHP units** in Table G in the PENB protocol has been corrected. The value printed so far was too high and the calculation did not use the overall efficiency of the CHP, but only the efficiency of the heat production.

The printing of the informative value of the heat/cooling distribution and accumulation efficiency in Table G in the PENB protocol **for heat/cooling sources located outside the building** has been corrected. Now only the efficiency for distribution and accumulation inside the building is always printed in the sub-table 'system inside the building', not the total efficiency including the efficiency of the distribution outside the building.

Other changes and corrections

Information about the total **resulting battery capacity in kWh** has been added to the window for entering the batteries for the PV system.

The missing CSV file with hourly data for calculating consumption in unheated spaces has been added to all functions for working with the task as a file (Save as, Export to ZIP format, etc.). So far it has not been copied when saving the task under a different name. The same correction has been made for copying the job to the working directory.

The automatic update of hourly data in the CSV file needed for the calculation of energy consumption in unheated spaces has been added. This update will take place after any change to the actual usage profile if it has been used in any of the unheated spaces. It is no longer necessary to reopen the form for entering the consumption in unheated spaces to update it.

A check for the presence of a CSV file containing data for the calculation of energy consumption in unheated spaces before the calculation is performed has been added. If this automatically generated file is missing, the program will re-generate it before the calculation.

When changing the HVAC unit with the specified heat recovery efficiency to an exhaust fan or to a fan in the hot/cool air supply system, the **efficiency of the ZZT is automatically reset**. This prevents confusing printing of the efficiency of the ZZT in the PENB report for those types of air handling equipment where the ZZT does not make sense.

When **inserting a new file with hourly climate data into** the climate data catalogue, the program checks whether it contains all the necessary data. If it detects that any of the required parameters (temperature, humidity, solar radiation intensity, wind speed) are missing from the file, it blocks the file from being inserted into the catalogue.

The program saves the window and light envelope shading parameters specified in the **Global changes of the aperture shading** window to the Windows registry. The next time this window is opened with the command "Input data - Global changes of the aperture lining", the saved parameters are automatically loaded and displayed.

Version 2023.4 (March 2023):

Energy supplied for the operation of unheated spaces

The evaluation of the energy supplied for lighting and forced ventilation of unheated spaces was completely revised.

The input data input for this calculation is now fully **compatible with the hourly** calculation **step** - the required illuminances and expected airflows for individual hours during weekdays, weekends and holidays can be defined (similar to the definition of traffic in zones).

The calculation of the energy supplied for lighting and forced ventilation is then carried out on an hourly basis, similar to that of the heated zones, which also allows the calculation of non-renewable primary energy to take into account the new **use of electricity from photovoltaic systems** or cogeneration even in unheated spaces.

When entering the parameters of the lighting system in an unheated space, a **verbal description of the predominant type of light sources** can be entered, which is then printed in Table G in the energy certificate report.

In addition, additional, **exceptional hourly electricity consumption** in the building can be defined on the form for entering consumption in unheated areas. These can be entered into Energy 2023 either via the Windows clipboard or by loading from a file. This new feature allows the impact of electricity consumption that is not normally included in the energy balance (e.g. consumption for charging electric vehicles) to be taken into account in simulation calculations.

Other changes in the calculation

The program automatically **neglects very thin layers** with negligible thermal resistance and heat capacity (foils, coatings, squeegees, etc.) when generating finite elements for the n-node computational model. This modification, which has no major impact on the calculation results, increases the numerical stability of the n-node model.

A control for the difference between the annual average indoor and outdoor temperature, which is used in the calculation of the actual hourly additional loss through the ground, has been added to the calculation of the indicative effect of underfloor heating on the heating demand. The program now does not take this additional loss into account if the temperature difference is less than 5 C. This removes the risk of the corrected soil fluxes being unrealistically high (due to division by too small a number). At the same time, in one relation of this calculation, the incorrectly used prevailing design internal temperature has been replaced by the correct annual average internal temperature.

The calculation of the total delivered energy has been corrected, which in the case of hot air heating and/or cooling by air was mistakenly including the **delivered energy for transporting hot or cold air** twice. The error could have been more noticeable especially in large buildings with a higher proportion of hot air heating and was evident from the fact that in the logs and PENB the total energy delivered did not correspond to the sum of the partial energies delivered.

The calculation of the use of electricity produced by a photovoltaic system or a cogeneration unit in zones without photovoltaics/cogeneration was corrected, which incorrectly determined the share of the use of electricity in the third and other zones without photovoltaics/cogeneration in the distribution of the produced electricity in the ratio of consumption. For two-zone buildings, the calculation was correct.

The calculation of the informative value of the **daylight dependency factor**, which is printed in Table G in the PENB report, has been changed. Instead of the existing average of all values determined for hours with the required illuminance, it is now calculated as the average of the values determined for those hours with the required illuminance where the outdoor illuminance is simultaneously higher than 0 (daylight). The change has no impact on the calculation results.

Changes in output files

The calculation of the **shares of heat and cold sources** in the energy supply for heating, cooling and hot water printed in Table G of the energy certificate has been modified. The change does not affect the results of the calculation, it is only an adjustment of the **informative printout in the PENB**. In older versions of the programme, unrealistic percentages could be printed in certain combinations of input sources if the calculation was carried out at the same time with the influence of nominal outputs and the sources had insufficient output.

Other changes and corrections

The missing informative printout of the reference specific input of the HVAC equipment in the reference building calculation report has been added.

On the sub-zone parameter input form it is now possible to set the mode in which the artificial lighting will operate in a situation where the natural daylight illuminance is sufficient (higher than the required illuminance). It is implicitly assumed that the artificial lighting will be switched off in this case (the only option considered so far). If the artificial **lighting is switched on even when**

the daylight is sufficient, it is possible to redefine what proportion (in the range 10-100 %) of the required illuminance the artificial lighting should provide.

The printing of the battery capacity for storing unused electricity from the PV system in Table G of the energy certificate has been corrected. It was still printing Wh instead of the correct kWh by mistake.

The solar transmittance value is now not printed in the calculation reports of both the assessed and reference building for openings with **zero glazing factor**, as it is not used in the calculation.

The PV panel input check has been corrected to evaluate the combination of the Sandia thermal model and zero nominal operating temperature as the correct input (not needed for the calculation in this case).

A check for specifying the exposed floor **perimeter** has been added. The program now tests whether this value is within realistic limits to eliminate the risk of subsequent problems with the numerical stability of the clock model.

The control of the input of unheated spaces has been extended in order to eliminate the risk that the program will perform the calculation even if the input lacks envelope constructions for the interior and exterior.

The data loading into the graphical output module has been modified to work also in the situation when more than one zone is specified for the assessed building, but only one of them is active (included in the calculation).

When entering the sub-zones, the program automatically calculates the **minimum nominal flows** corresponding to the maximum ventilation air flows for each change in the contractual usage profile and enters them into the form.

In the PENB protocol, the **link to the catalogue of** energy-saving measures was **changed from the** no longer functional address www.kataloguspor.cz to www.uspornaopatreni.cz.

Version 2023.3 (January 2023):

Various fixes and changes from solar collectors to data import

The calculation of energy **use from solar collectors** in zones that do not have solar collectors and at the same time do not consume **any hot water** has been corrected. For this combination, the availability of solar energy in a multi-zone building with solar collectors in one of the zones and with solar energy use in all zones (i.e. also in zones without collectors) could be incorrect.

The missing output file **XY_HodinovaData_CelaBudova.csv**, where XY is the name of the job, was added to the list of files to be saved to the archive using the **File - Export to ZIP format** command in the main menu of the program.

The list of weeks from which it is possible to select when extraordinary (or possibly even holiday) operation is valid when defining your own usage profile has been added to the list of weeks, which so far is missing the **last day of the year** by mistake. It has been added to the 52nd week, which is now an atypical week (Monday to Monday). At the same time, a warning has been added to the tab with the selection of the mentioned weeks, that when extraordinary and holiday traffic coincide on the same day, the **holiday traffic** takes **precedence**. Furthermore, the function of the switch "all available weeks of the year" on the same tab has been slightly changed. Now, unchecking the switch will only **unlock the list of weeks**, it will not reset it.

The control **formatting of the** PENB processing **date entered** on the **Building Data, PENB and Documentation** tab of the Basic Building Description form has been added to prevent problems when loading data for calculation in case of entering incorrect or non-standard data.

The import of custom usage **profiles** from Energy 2020/21 has been refined. The change will be reflected in the import of data for forced ventilation, internal gains from people, internal gains from appliances and moisture production where these data were originally entered as either a single annual value or twelve monthly values along with a time share. The program will now take into account the **originally entered time share by** reducing the imported value accordingly and will formally set the new time share to 100 %. Thus, for example, if the original year-round internal gains from appliances were 3 W/m2 with a time share of 20% operation, these data are imported as 0.6 W/m2 with a time share of 100% (i.e. for the hourly step, a heat output of 0.6 W/m2 is further considered for all hours in the year).

Version 2023.2 (January 2023):

Modification of the calculation of floors with underfloor heating

The calculation of the effect of underfloor heating on the energy performance of the building has been revised. In versions 2023.0 and 2023.1, the effect of underfloor heating has so far only been taken into account in the monthly step to determine the annual losses through the construction printed in Table E in the PENB and in the summary tables in the calculation report. In version 2023.2, the effect of underfloor heating is also taken into account **in the hourly calculation step as an indication, using the** modified relationships from ISO/TR 52019-2 for this purpose. The calculation is only indicative, as neither the base standard EN ISO 52016-1 nor related standards (e.g. EN ISO 13370) provide any methodology to be used to account for the effect of underfloor heating in the hourly calculation step. Therefore, the relationships from ISO/TR 52019-2 were used for the calculation, which, although intended for a monthly step, allow, after modification to an hourly step, to determine a surcharge to the ground heat flux at each time step.

At the same time as the described modifications, a **calculation protocol was added to better show how** much of a premium is due to the effect of underfloor heating. The printing of the percentages in the summary table of specific fluxes through building constructions at the end of the report has also been modified to correctly reflect the increased flux through the floor with underfloor heating.

Other changes and corrections

A check for division by zero has been added to the calculation of the availability of electricity from a photovoltaic system for hot water in zones without photovoltaics, the absence of which could lead to freezing of the calculation in certain situations.

The loading of forced ventilation parameters when importing tasks from Energy 2020/21 has been refined. The program better checks air flows and more accurately verifies their nominal values.

Fixed an error in the **storage of days with extraordinary operation** for heat gains from persons in their own profiles, which caused incorrect budgeting of gains to individual hours in the year. The error only appeared in profiles with specified extraordinary traffic considered only on certain days of the week.

The fixed **date of energy certificate processing**, which can be optionally set when entering building data and which was previously used only for PENB generation, is now also inserted into the XML file with data for the ENEX database instead of the existing calculation date.

The calculation of indicative monthly and annual losses and gains printed in the tables in the calculation report and in Table E in the energy certificate has been modified. The program now checks for all months whether the heating demand determined by the hourly step is lower than the losses determined by the monthly step (the monthly and annual losses cannot be determined in any other way). If it is higher (which means that for a given building the monthly step underestimates the heat loss), the **heat loss through ventilation** is automatically **increased so that the** sum of the losses is equal to the heating demand (and the usable gains are therefore zero). While such situations are very rare (e.g. in buildings with very lightweight construction and negligible gains), if they do occur, the heat balance would be meaningless without the described adjustment (e.g. the usable internal gains would be negative).

Version 2023.1 (January 2023):

New possibilities for modelling building operation

For forced-ventilated subzones, it is now possible to specify what percentage of **each forced ventilation operating hour** the HVAC is actually in operation. If this percentage is less than 100 %, it is assumed that the subzone is naturally ventilated during the remaining time at a ventilation rate corresponding to the flow rate defined for that hour in the operating profile. This makes it easier to specify, for example, intermittently negative pressure ventilated sanitary facilities and similar areas.

In the case of custom profiles with negative pressure ventilation, it is possible to choose whether to consider supply air from the exterior **to be drawn in through the vents** in the building envelope (with a flow rate corresponding to the difference between exhaust and supply) or

whether to assume supply only through leaks in the envelope. So far, only the latter option has been automatically assumed.

For floors on the ground, **additional edge insulation** placed simultaneously in the horizontal and vertical direction can now be specified and evaluated by calculation.

The distribution of the electricity produced by the photovoltaic system between the individual consumption points (lighting, cooling, hot water production...) can be redefined not only as before with the help of set priorities, but also proportionally. The electricity produced is then distributed in each hourly step among all selected purposes in proportion to the respective energy supplied. This makes it easier to model situations where the priorities of the consumption of the generated electricity cannot be determined.

The specification of the way of using the generated electricity was further supplemented by the option to **use the generated electricity only instead of electricity from the grid**. If this switch is checked, the electricity from the PV system will be used only as a substitute for grid electricity. Both of the above new options are also available for specifying the use of electricity produced **in CHP units**.

For storing unused electricity from the PV system, a **combination of batteries and** hot water **storage** in one zone can now be used while prioritizing one of these methods.

In addition to the internal calculation, the program allows **direct input of known hourly** electricity **production** by the PV system. Hourly production measured or calculated in an external program (e.g. PV*SOL) can be entered into Energy 2023 either via the Windows clipboard or by loading from a file. The new option to directly enter known hourly productions can also be applied when **entering solar collectors**.

Adjustments and corrections to calculations and protocols

An error was corrected **in the calculation of the reference zone (under)pressure**, which in zones with significant negative pressure ventilation increased the flow through leaks in the building envelope and caused a consequent increase in the hourly heating demand for both the assessed and reference building.

The program now shows the **remaining calculation time** on the progress window. This is an approximate estimate, which is usually about 30-50% higher than the actual calculation time (unfortunately, a more accurate estimate is not possible in advance). The actual **total duration of the calculation** is shown by the program on the final information window after the calculation is completed. At the same time, it also shows it in the evaluation results overview on the task panel and prints it at the end of the calculation report for both the evaluated and reference building.

The calculation of the primary energy of the reference building has been corrected, which due to an error in the name of the energy carrier did not include the **primary energy associated with the operation of unheated spaces** (i.e. primary energy for lighting and forced ventilation of unheated spaces). At the same time, the primary energy for electricity generation by a generator, which was mistakenly counted for buildings without a connection to the public grid, was removed from the unheated areas of the reference building.

The missing informative printout of the entered parameters of the **lighting system in the unheated space in** Table G in the energy certificate has been added.

The printing of heat source shares in Table G in the energy certificate has been modified for the case of **hot air heating with a fixed percentage of recirculation**. For such an input, in certain combinations the PENB printed the shares of sources that did not add up to 100 %. The same adjustment was made for the cooling sources in the air cooling system with a fixed recirculation rate.

Fixed an error check in the calculation of the floor on the ground that could cause the calculation to terminate in certain situations, even though there was no error in the floor input.

The printing of translucent and opaque parts of lightweight envelopes in Table F of the energy certificate has been corrected. By mistake, the parameters of the whole LOP were printed there again instead of the parameters of the subparts.

The missing **share attributable to the production of heat** stored in the hot water tank by the photovoltaic system was added to the energy supplied for hot water production. The correction will only affect buildings with a PV system storing unused electricity in the hot water storage tank.

The missing printout of the overall evaluation of compliance with the requirements of Decree No. 264/2020 Coll. in the case of the evaluation of the building change according to §6, point 2c and 2d was added to the energy certificate.

Numerical stability testing of the calculation has been modified to better highlight situations where the calculation of temperatures in constructions loses accuracy. The calculation with the

general n-node model is particularly sensitive to numerical stability, and in such situations it is necessary either to replace it with a more stable 5-node model of opaque constructions or to modify the specification slightly in a formal way (e.g. by splitting some of the construction into two parts).

Fixed the **printing of PV panel** and solar collector **logs**, which blocked when printing more than 3 collector types in a zone due to insufficient declaration of the cycle control variable.

The energy certificate generator in PDF format has been modified to print correctly the still problematic ü and ö characters. At the same time, the incorrect reference to the article of Decree 264/2020 Coll. in the heading of the part of Table I for changed/new technical systems has been corrected.

The iteration for the determination of the resulting vacuum/pressure in the zone has been modified to prevent any combination of input data from being divided by zero and subsequently blocking the further calculation procedure.

Further corrections and changes

The orientation setting has been changed when changing the type of opaque construction in contact with the outside air. The orientation is now automatically set to "horizon" when the construction type is changed to a flat roof or floor over the outdoor space, and to "east" when the change is from a flat roof or floor to another construction type. In other cases, the orientation will remain the same.

Fixed an **error when importing data from Energy 2020/21**, which occurred if the orientation "contact with soil" was set for a construction in an unheated space. Although the data was imported, it was not possible to open the form to enter and modify unheated spaces. Along with the error described above, an error in the setting of the **imported absence factor** (parameter for the calculation of the delivered energy for lighting) was corrected. For all contract profiles it was assumed to be derived from the occupancy, while for some profiles (e.g. communications) it was assumed to be considered as a constant.

The check of the input of the nominal outputs of heat sources has been changed when a calculation with the influence of the nominal outputs of technical equipment is required. The program now only requires the nominal output for heating and/or hot water to be entered when the source is used for the relevant purpose.

The insertion of a construction from the construction catalogue into the form for entering types of opaque envelope constructions has been modified to work the same as in older versions of the program.

Graphs showing the daily progression of input variables during the definition of custom operating profiles have been modified to more clearly show any negative or missing values.

The comparison of the parameters of the changed technical equipment in each zone has been modified to better identify which equipment is identical and which is not. This reduces the risk of printing the same equipment again in the final PENB table.

Version 2023.0 (September 2022):

Calculation of energy requirements with hourly increments

For the determination of all energy requirements (for heating, cooling, humidification and dehumidification), a calculation with **hourly steps** according to EN ISO 52016-1 is now used. The calculation can take into account the temporal changes of all relevant variables over the whole year (i.e. over 8760 h). In this way, not only climatic data (air temperature and humidity, solar radiation intensity, wind speed, etc.) but also the size of internal gains, ventilation intensity or operation of blinds can be defined and included in the calculation in detail. The calculation results are printed both in traditional tables in the calculation report (by month) and in a separate **CSV file** that can be opened in MS Excel and contains all the calculated hourly data.

The heat propagation through opaque building constructions is evaluated non-stationarily in the calculation at **two levels of accuracy**. Less accurate results, but a faster calculation, can be expected when using the 5-node model of building constructions according to EN ISO 52016-1. A slower calculation with more accurate results can be obtained by using a general n-node model with exact consideration of the specific compositions specified. In both cases the solution is obtained by **the finite element method**.

The accuracy of the calculation of heating and cooling energy needs was tested in detail against **ASHRAE 140** (2017), which is used as an international benchmark for building

energy simulations. The results of **Energy 2023 typically fall between the** minimum and maximum values obtained from other tested international programs (e.g., TRNSYS, ESP-R, DOE, etc.).

The results of the calculation of heating and cooling energy needs shall include information on the **minimum required capacity of** the heat and/or cooling source to cover the energy demand and the distribution and sharing losses. This value is of course always valid for the reference climate year used and the specified hourly usage profiles.

Calculation of delivered and primary energy with hourly steps

The hourly calculation step is used in **Energy 2023** not only to determine energy needs, but also to determine the resulting partial energy delivered, total energy delivered, primary energy from non-renewable sources and CO_2 emissions.

The more detailed hourly calculation model allows for **many previously neglected factors** to be taken into account, such as the effect of the heat or cold source output on the resulting zone temperature, the effect of the current outdoor illuminance on the energy supplied for lighting, or the effect of the outdoor temperature on the heat pump output and the associated need to switch on a bivalent heat source.

The assessment of the **usability of the energy produced** in the building is considerably more accurate. For both thermal energy from solar collectors and electricity from photovoltaic panels or cogeneration, the production and availability of the energy is balanced by the hour, always taking into account the currently available capacity of the accumulators (batteries) or hot water storage tanks. Optionally, the use of electricity from the photovoltaic system or cogeneration for the operation of appliances in the building can also be evaluated.

A major expansion of modelling possibilities

All building operating parameters (required indoor temperatures, ventilation rates, heat production, steam production, hot water consumption, required humidity, etc.) can be defined **down to the level of individual hours** per year. Contract hourly operating profiles are available for conventional buildings, taken from the publication "*Hourly climatic data and parameters of typical use of buildings and zones with cooling, humidity treatment or electricity generation for the calculation of delivered energy and auxiliary energy in accordance with Section 4(1) of Decree No. 264/2020 Coll., on the energy performance of buildings*" (K. Kabele et al., STP Praha 2022), the elaboration of which was initiated by the MIT of the Czech Republic for the purpose of creating energy performance certificates. The **contractual hourly profiles** more or less correspond to the monthly usage profiles used so far according to ČSN 730331-1 and their use in the program is similarly simple: all data are activated **by simply selecting the** profile name from the drop-down menu.

Custom hourly usage **profiles** can be defined for buildings with less common operations. The procedure is basically the same as in Energy 2020-21 (i.e. weekday, Saturday, Sunday and holiday operation can be defined separately, plus emergency operation), only the input of the required illuminance and the required relative humidity of indoor air in humidification and dehumidification mode has been modified. It is also possible to select in more detail the time intervals at which the holiday and exceptional operation type is to be used.

For heat and cooling sources, not only can the percentage of the energy supply to the building be entered as previously estimated, but now the **main source and secondary sources of heat and cooling** can also be selected. In this case, the program automatically evaluates whether the power of the main energy source is sufficient to cover the current hourly energy demand. If so, the secondary sources are not used. If not, the first, and possibly the second secondary source if specified, is used. A prerequisite for this procedure is the careful specification of the rated capacities of all heat and cold sources (or the power curve for heat pumps).

Movable shading elements (blinds, roller shutters) with detailed properties and **different types of control** can be specified for opening fillers. For each hour, the position of the blind (pulled down/up) is then set automatically depending on the current solar radiation intensity. In this context, the average daylight factor of the assessed zone is also adjusted and the current need for artificial lighting is evaluated.

For photovoltaic systems, there are **two ways of storing** unused electricity: either in batteries (as before) or in a hot water storage tank (new), and the type of storage can be different in each zone. For the hot water storage tank, the total thermal capacity of the tank and the efficiency of heating the water with electricity from the PV system are taken into account.

The storage of unused energy in the hot water tank can also be considered for solar thermal systems (optionally either in a separate solar tank or in a standard hot water tank with bivalent or flow-through reheating). In all cases of energy storage, **a balancing of** energy consumption, energy storage and available storage capacity for each hour of the year shall be carried out.

Detailed determination of indoor environment parameters

As part of the calculation of the heating and cooling energy demand, the **operational indoor temperature** and the temperature and relative humidity of the indoor air in each zone are also determined. By default, these values are determined for the unrestricted capacity of the heating and cooling sources, i.e. for a capacity that is always sufficient to cover the current hourly heating or cooling demand.

Optionally, however, the indoor environment parameters for a zone **without any energy sources** can also be calculated (for the so-called free-float mode). In this way, it is easy to check what temperatures in winter or summer can be expected in a zone without functional energy sources.

Another option is to take into account the **real rated capacities of the** heat and cooling sources. In this case, the program always compares the available power of the energy source with the actual hourly demand... and if the power is insufficient, it automatically determines what temperature can be expected in the zone with the given energy source. If a heat source is used in more than one zone, the calculation also takes into account how much of the source's power has already been used in the other zones.

The program also prints **brief statistical summaries** in the calculation report, e.g. the duration of a certain relative humidity of the indoor air per year or the number of hours per year during which the temperature in the zones exceeds 30 °C. This draws attention to the risk of overheating of the zone in summer (at temperatures above 30 °C) or to the increased likelihood of mould on the internal surface of the constructions (at humidity levels above 80%).

Input data entry

While the calculation has changed quite substantially between the 2020/21 and 2023 versions, the input data input has deliberately remained **virtually the same**. Especially for users who were used to using only the usage profiles from CSN 730331-1, very little has changed in terms of input. The input procedure and its overall construction have remained unchanged, with the addition of various optional, optional data and data describing in more detail the behaviour of various devices over time (e.g. blinds and shutters or heat pumps).

Extensive graphic outputs

The module for displaying graphical outputs has been completely redesigned, which now allows to display **detailed hourly** graphs of selected variables in addition to the existing graphs. The variables can be selected from a list of more than 30 items (from climate data to calculation results) and it is possible to combine the display of **up to 5 different variables** with a scale on the main or secondary vertical axis according to the user's choice. Both hourly values and daily average or summed values can be displayed - either for the whole year or for any selected time period.

Graphical outputs can optionally be added to the **calculation report**, which can be extended to include, for example, a comparison of the outdoor and indoor air temperature during the year, a display of temporal changes in the energy requirements for heating, cooling and humidity treatment, or a graph with daily energy delivered.

Import data from previous versions and other programs

Although the input data of the 2023 version has a **different format than** data from previous versions of the program, the program allows easy **import of tasks from Energy 2020/21**. In most cases, there is no need to add more data after import. An exception is the import of tasks with custom usage profiles, which unfortunately cannot be fully imported and require re-entering custom profiles.

Importing data from **Protech TV** in XML format is still fully supported. If usage profiles from CSN 730331-1 are entered, the appropriate hourly profiles are set automatically. If the usage profile cannot be set, the program will alert you to the problem. It will also warn about missing

orientation of external constructions with respect to cardinal points - the calculation with hourly steps no longer allows such input.

New catalogue of usage profiles

The catalogue of usage profiles has been significantly redesigned and now shows hourly runs of **all operating parameters** for weekday, Saturday, Sunday, holiday and emergency operation. The catalogue contains all hourly profiles from the publication "*Hourly climatic data and parameters of typical use of buildings and zones with cooling, humidity treatment or electricity generation for the calculation of delivered energy and auxiliary energy in accordance with Section 4(1) of Decree No. 264/2020 Coll., on the energy performance of buildings*" (K. Kabele et al., STP Prague 2022) and can be supplemented with additional user profiles. It is mainly used as an aid for creating own profiles.

Facilitating the input of design parameters

A checkbox has been added to the form for entering unheated spaces and to the form for entering energy consumption in unheated spaces to allow the choice of whether or not to include the current entry in the calculation.

The specified method of window or light curtain shading by movable shading devices (blinds, shutters, etc.) can be added to the **list of shading types** by pressing the **Save current shading** button. This list can be expanded and modified without restriction (change values, delete types). After pressing the button **Select aperture from list**, the list is displayed and allows easy selection and use of the saved aperture type when entering the hole filling.

The program supports **global changes to the aperture shading parameters** throughout the building being evaluated. The function can be called by the command **Input data - Global changes of aperture shading** in the main menu of the program. After entering the desired combination of shading properties, it is possible to select in which zones, for which orientations, for which sizes and for which translucent constructions the change is to be made.

The specified fixed shielding obstacles or shielding correction factors can be added to the **list of shielding types** by pressing the **Save Current Shielding** button. This list can be expanded and modified without restriction (change values, delete types). After pressing the **Select shielding from list** button, the list is displayed and allows easy selection and use of the saved shielding type when entering the design.

The catalogue of building constructions has been substantially revised. It now allows the storage of building construction compositions with 15 layers, including correction for thermal bridges, solar absorption and emissivity. Alternatively, for **opaque constructions,** only the heat transfer coefficient and data characterising the thermal inertia of the construction can also be stored. For **infilled openings, in** addition to the resulting heat transfer coefficient, the parameters of the glazing, the window frame and their connections can also be stored in the catalogue. The catalogue now also allows the storage of **lightweight envelopes** (again either in detail or simplified with the heat transfer coefficient). New opaque and translucent constructions can be added to the catalogue either manually or by importing data from the relevant forms.

Other modifications and changes

More than 10 envelope constructions between the unheated space and the interior and between the unheated space and the exterior can be imported from **Protech TV**. In this case, the program automatically creates multiple unheated spaces with the same name and divides the envelope constructions between them. In the calculation, the subparts of the same unheated space are combined.

When entering a task containing recommended measures and alternative energy supply systems, you can now choose to enter **only alternative systems**. This option is sufficient according to § 7a, point 4e) of Act No 406/2000 Coll. in its current version for buildings that already achieve class A classification for total delivered energy and for non-renewable primary energy in their default state. The recommended measures do not then need to be designed and described, only the alternative systems need to be described, specified and evaluated.

The functionality of the **Delete Current Form** button on the toolbar located on the right side of the forms for entering input data has been extended. If only one form exists, pressing this

button will completely reset that form. So far, in such a situation, only a warning that the form cannot be deleted has appeared.

The Energy Specialist data entry on the **Program Options** window has been expanded. It is now possible to enter this data twice if required: once for the specialist as a natural person and a second time for the specialist as a legal entity. When filling in the initial form, it is then easy to switch between the **two specialist positions** and the program will automatically fill in the fields with the pre-set data if entering the specialist data in a new job is enabled.

On the **Program Options** window, the existing option to insert or not to insert the energy specialist's signature in the PENB has been replaced by two **separate options for the signature** on the first page and for the signature on the last page.

An optional permanent **directory for building images** has been added to the **Program Options** window. If this directory is set, the building images will always be searched first in this directory.

In **addition to the calculated** values, the average heat transfer coefficient, the total energy supplied and the primary energy from non-renewable sources are now displayed in the task panel in addition **to the calculated values**.

Calculation speed and hardware requirements

Due to the significant increase in numerical operations (e.g. the calculation of the heat demand for heating now requires up to 26,280 steps instead of the previous 12), it is unfortunately necessary to take into account a **significant increase in** calculation time. In some cases, this can be up to tens of minutes - especially for multi-zone buildings with a large number of constructions.

The calculation speed is generally higher for buildings with fewer zones, fewer constructions and fewer layers. It is therefore recommended that careful **consideration is given to the way the** building **is zoned** and that the number of zones is minimised wherever possible. If speed of calculation is a priority (and accuracy is not so crucial), it is recommended to use a 5-node model for the calculation of opaque constructions, or to specify only the heat transfer coefficient for the constructions rather than the composition (same effect).

The program displays a **window with various options** before starting the calculation, which allows you to select not only the type of protocol or the type of calculation model of opaque constructions, but also the scope of the calculation. In addition to the standard complete calculation of the assessed and reference building, there is a reduced calculation of the assessed building in two levels (without and with delivered and primary energy), an extended calculation of the energy demand with the influence of the performance of the technical equipment and an additional calculation of the internal temperature waveform in free-float mode (without heat and cold sources).

Although the program does not require any over-configured hardware, for reasonably fast calculation it is necessary to recommend a **powerful processor** like Intel Core i7 or i9. The difference in calculation time compared to less powerful processors can be significant.

Chapter

8. ATTACHMENTS

In this section you can find brief procedures for working with the program, notes on the material catalogue and a description of the initialization settings in the Windows registry.

A. Work procedures

For complete beginners, here are brief work procedures. Before you start, **an important warning**. The program has contextual help for all menu items and most other controls. If you are not sure what is expected of you, feel free to press the **F1** key.

Working with a new task

1.   select **New Job** from the **File item** on the main horizontal menu.
2.   Enter the name of the job.
3.   In the job panel (window), press the **Input Data** button.
4.   Complete the basic form with a description of the building and boundary conditions.
5.   Press successively the buttons **Types of opaque constructions**, **Types of openings** and **Types of lightweight envelope** (according to the occurrence of the respective constructions in the building under evaluation) and enter the compositions of opaque constructions and parameters of openings or LOP in the building
6.   Press the button **Technical equipment in the building under assessment** and enter all technical equipment (heat sources, cooling sources, HVAC units, etc.) that are present in the building
7.   If you know that you will be evaluating a building with operations that do not match any of the contracted use profiles, click the **Use Profile Types** button and enter the appropriate operating parameters
8.   Press the **Enter zone parameters** button. Fill in the form for the zone description and subsequent forms for specifying its envelope constructions (using the buttons on the **Constructions and Bindings** tab).
     If you are evaluating a building with multiple zones, move to the second zone (e.g., using the F4 button) after entering all envelope parameters of the first zone and enter the basic parameters of the second zone and its envelope in the same way. Continue until all zones have been entered.
9.   Exit the zone description form using the **Close** command.
10. Exit the 1st form via the **Close** command.
11. Press the **Calculation** button on the task bar.
12. View the   results in the view module and print them if necessary.
13. Exit the viewer by pressing **Esc** or selecting **Exit** from the **File item** of the main menu.
14. Press the **Graphics** button on the taskbar.
15. Try out all the options of the graphics module of the program.
16. Exit the graphics module by pressing the **Esc** key or by selecting **Exit** in the **File item** of the main menu.
17. Repeat any of the previous steps in any order.

Working with an existing task

1.   select **Open Job** from the **File** item on the main horizontal menu.
2.   Select the name of the task, or even the directory, in the dialog box.
3.   In the job panel (window), press the **Input Data** button.
4.   If necessary, edit any information on any form.
5.   After you have closed all input data entry forms, press the **Calculation** button on the job panel.
6   View the   results in the view module and print them if necessary.
7.   Exit the viewer by pressing **Esc** or selecting **Exit** from the **File item** of the main menu.
8.   Press the **Graphics** button on the taskbar.

9. Try out all the possibilities of the graphic module of the program.
10. Exit the graphics module by pressing **Esc** or selecting **Exit** from the **File** item of the main menu.
11. Repeat any of the previous steps in any order.

B. DEMO example

The installation of the program includes a simple demonstration example - a house in its initial state and after the implementation of the recommended measures.

The data corresponds to the building shown in the following figures:

1ST NP

2. NP

Cut
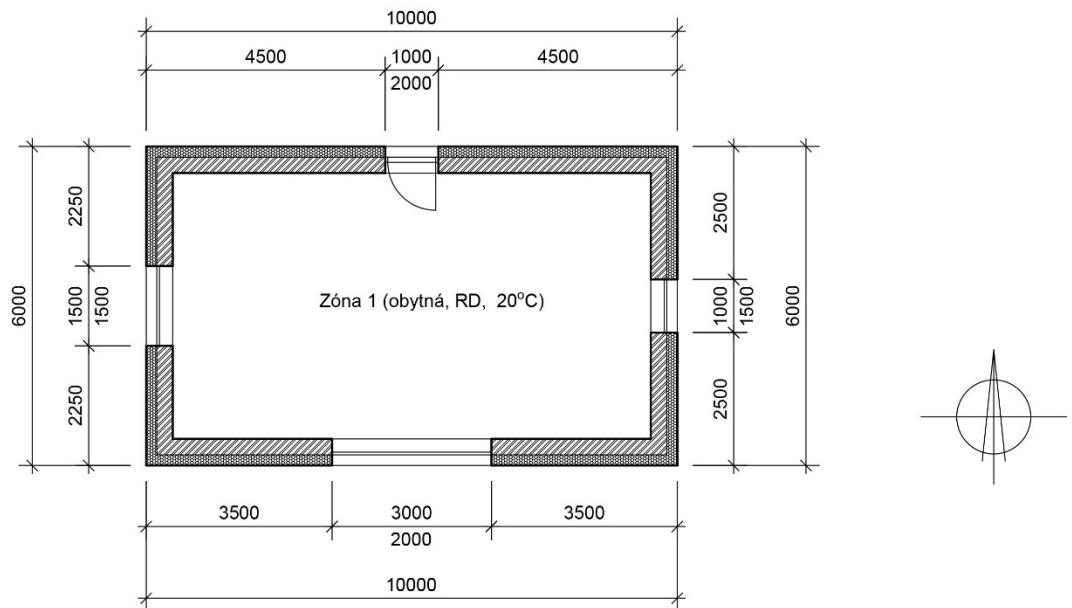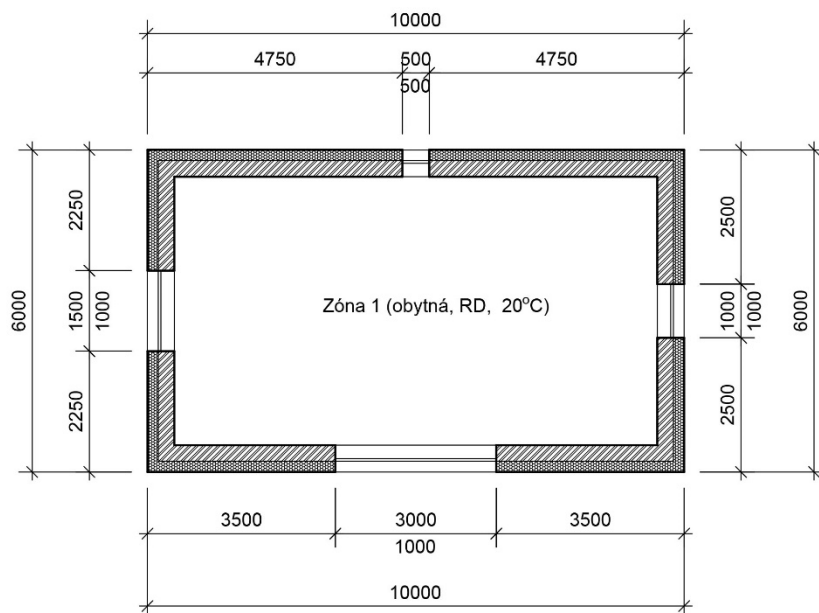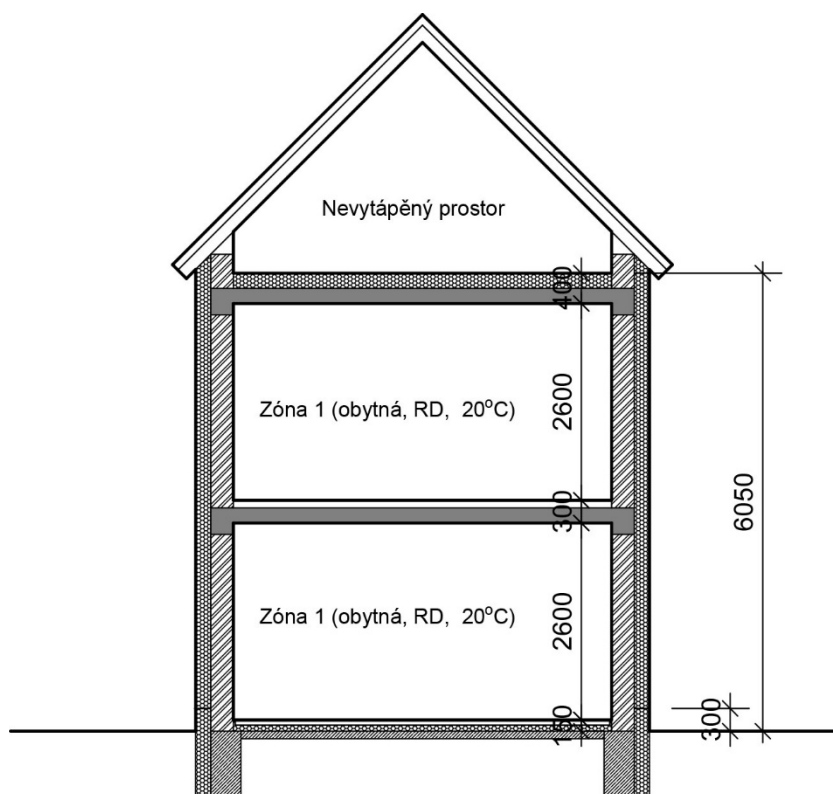
C. Catalogue of materials

Catalogue of materials

The material catalogue is a tool that allows you to specify the parameters of the individual layers of the construction by simply selecting the material in the database. The materials contained in the catalogue are stored in the database files **KATAL32.MDB** and **KATAL32BP.MDB**, which are in the format of the Microsoft Access database program. The catalogue of materials contains:

Bookmarks for catalogue selection	The **Custom Catalogue** tab contains a link to a database of building materials that can be freely edited and added to, while the **Standard Catalogue** tab contains a link to a database that is only edited by the program supplier. Any changes you make to the custom catalog (i.e., the **catalog32.mdb** file) will not be reflected in the standard catalog (i.e., the **catalog32bp.mdb** file). If a new version of the standard catalog is released in the future, you will be able to use it without losing the changes in the custom catalog.
Catalogue updates **Program updates**	**Practical procedure for updating the catalogue in version 2011 and later:** If you download only the update of the standard catalog from www.kcad.cz - i.e. the new file **katal32bp.mdb** - it is enough to copy it to the program directory instead of the original file of the same name. If you are installing a new version of the program, copy your original catalog **catalog32.mdb** into the directory containing the new version instead of the new catalog of the same name. This will preserve the changes you have already made to your own catalog, and you will also have the new standard catalog.
Quick search button	The quick catalogue search button allows you to search the catalogue by material name. After pressing the **Search material** button, any part of the material name can be entered and the program will then offer a list of all materials whose name contains the entered string.
Panel with a list of material categories	The material category list panel is used to search the material catalogue. **You can move** between categories using the up and down arrow keys, PgDn (page down), PgUp (page up), CTRL+Home (top) and CTRL+End (bottom). Of course, you can also use the left mouse button. If you press the **Enter** key on the category name, the **category will open** and all building materials that are included in the category will appear in the panel. Double left-clicking on the category name or simply left-clicking on the plus sign to the left of the category name has the same effect. You can **close a category** using the same procedure: by pressing the **Enter** key or by double-clicking on the category name, or by simply clicking on the minus sign to the left of the category name. You can move between materials using the same procedure as between categories. Once you select a material in the category panel, its parameters and name will automatically appear on the **tabs on the** right side of the catalog.
Cards	Four tabs arranged in a row contain the parameters of the selected material in the input items and can be switched between them using the tabs at the top. Parameters listed in the individual input items can be edited directly on the tabs; movement between items can be realized by left mouse button or by **Enter** (to the next item), **Tab** (the same) and **CTRL+left arrow** (to the previous item).
First card - Draft. values	The first card contains the design values according to CSN 730540-3 for the material: - *the design value of the **thermal conductivity coefficient Lambda*** - *the design value of the **specific gravity Ro*** - *design value of **specific heat capacity C*** - *the design value of the **diffusion resistance factor Mi*** - *the design value of the **diffusion resistance coefficient Delta**.* All values are taken either from CSN 730540-3 or from other sources (other source than CSN 730540 is listed on the Note tab). A conversion relation $\mu = 0.18824.10^9/\delta$ is introduced between Delta and Mi. There is a switch at the bottom of the tab that allows the user to select whether they want to use the thermal conductivity coefficient as a design value, a characteristic value, or whether they want to calculate it based on the coefficients of the conditions of action.
Second Card - Terms of Action	The second card contains the characteristic values according to CSN 730540-3 for the material: - *the characteristic value of the **thermal conductivity coefficient Lambda***

- moisture coefficient of the material Z_u
- mass moisture content of $u_{23/80}$
In addition, a switch for **the type of construction**, a switch for the interior vapour **pressure** and the operating conditions can be found on the tab:
- material coefficient Z_2
- practical humidity at_{exp}
For more detailed meaning of all parameters, it is necessary to consult directly DIN 730540-3.

Third Card - Thickness

The third tab contains a list of production thicknesses of the selected material. If the material is produced in only one thickness, this thickness is automatically set as the current thickness. If the material is produced in a wider range, all thicknesses appear in a list from which you can select one of them. Once one of the thicknesses is set as the current one, it is automatically entered into the input form when the material is used, along with other parameters.

Fourth Card - Note

The fourth card contains a text box in which you can write any note related to the material. Here the user can find information about the source of the data given in the catalogue, the thickness of the waterproofing strips, or the dimensions of the walling materials.

The catalogue also contains four buttons for working with the material catalogue.

Apply Material button

When you press this button, the currently displayed material will be inserted into the current row on the form.

Return button without selection

Pressing this button will return to the form environment without inserting the displayed material into the current row.

Add Material button

By pressing this button you can add more material to the catalogue.
First, a window will appear where the user selects a category in which to place the new material (you can select from existing categories or enter a completely new category).
Next, the user fills in the input items on the first, second and third card, if applicable.
Finally, he presses either the **Save Material** button (the material is added to the catalogue) or the **Don't Save** button (the material is not added).
Please note: A material name can only exist once in the catalogue!

Delete Material button

After pressing this button it is possible to delete the currently displayed material from the catalogue.

D. Catalogue of constructions

The construction catalogue is a tool that allows you to enter opaque and translucent constructions by simply selecting them in the database. The constructions contained in the catalogue are stored in the database files **KatKci32.MDB** and **KatKci32BP.MDB**, which are in the format of the Microsoft Access database program.

Catalogue of constructions

At the time of installation of the **Energie** program, the catalogue contains window and door constructions taken from ČSN 730540-3, insulation systems and compositions of standard wooden walls and roofs of selected companies. Each user can supplement the catalogue with additional translucent and opaque constructions as required.

Bookmarks for catalogue selection

The **Custom Catalogue** tab contains a link to a database of building constructions that can be freely edited and added to, while the **Standard Catalogue** tab contains a link to a database that is only edited by the program supplier.

Any changes you make to the custom catalog (i.e. **KatKci32.mdb**) will not be reflected in the standard catalog (i.e. **KatKci32bp.mdb**). If a new version of the standard catalog is released in the future, you will be able to use it without losing the changes in the custom catalog.

Catalogue updates

Practical procedure for updating the catalogue in version 2023 and later:
If you download only the update of the standard catalogue from www.kcad.cz - i.e. the new file **KatKci32bp.mdb** - it is enough to copy it into the program directory instead of the original file of the same name.

Program updates

If you are installing a new version of the program, copy your original **KatKci32.mdb** catalog into the new version directory instead of the new one of the same name. This will preserve the changes you have already made to your own catalog, and you will also have the new standard catalog.

Quick search button

The quick catalogue search button allows you to search the catalogue by design name. After pressing the button **Search construction**, any part of the construction name can be entered and the program will then offer a list of all constructions whose name contains the entered string.

Panel with a list of construction categories	The panel with the list of construction categories is used to search the construction catalogue. **You can move** between categories using the up and down arrow keys, PgDn (page down), PgUp (page up), CTRL+Home (top) and CTRL+End (bottom). Of course, you can also use the left mouse button.
	If you press the **Enter** key on the category name, the **category will open** and all the building constructions that are included in the category will appear in the panel. Double left-clicking on the category name or simply left-clicking on the plus sign to the left of the category name has the same effect. You can **close a category** using the same procedure: by pressing the **Enter** key or by double-clicking on the category name, or by simply clicking on the minus sign to the left of the category name.
	You can move between constructs using the same procedure as between categories.
	When you select a construction in the category panel, its parameters and name automatically appear in the right part of the catalogue.
	The catalogue also contains four buttons for working with the construction catalogue.
Apply design button	When this button is pressed, the currently displayed construction will be inserted into the corresponding entries on the forms for entering the types of opaque constructions, types of opening fillers and/or types of lightweight envelopes. The button is active only when the selection of the construct makes sense given the context.
Return button without selection	When this button is pressed, the form will return to the form environment without inserting the displayed construction.
Add construction button	By pressing this button, you can add another construction to the catalogue. First, a window will appear where the user selects the category in which the new construction will be placed (you can select from existing categories or enter a completely new category). Next, the user fills in the parameters of the construction. Finally, the user presses either the **Save construction** button (the construction is added to the catalogue) or the **Don't save** button (the construction is not added). **Please note**: The name of a design must only be in its category once!
Clear construction button	After pressing this button it is possible to delete the currently displayed design from the catalogue.

E. Catalogue of hourly climate data

The Hourly Climate Data Catalogue contains available hourly climate data sets. At the time of installation, data for all major regional cities in the country and general contract data for PENB processing are available.

All climate data are stored in CSV format **in the RKR subdirectory** in the main folder of the Energy 2023 programme. The data construction corresponds to the so-called reference climate year (RKR) according to the Czech Hydrometeorological Institute (CHMI).

Catalogue of hourly climate data

The catalogue of hourly climatic data can be supplemented by additional climate data sets from the Czech Hydrological Office of Meteorology (CHMÚ), if the user purchases them for his/her needs.

The catalogue of hourly climate data includes:
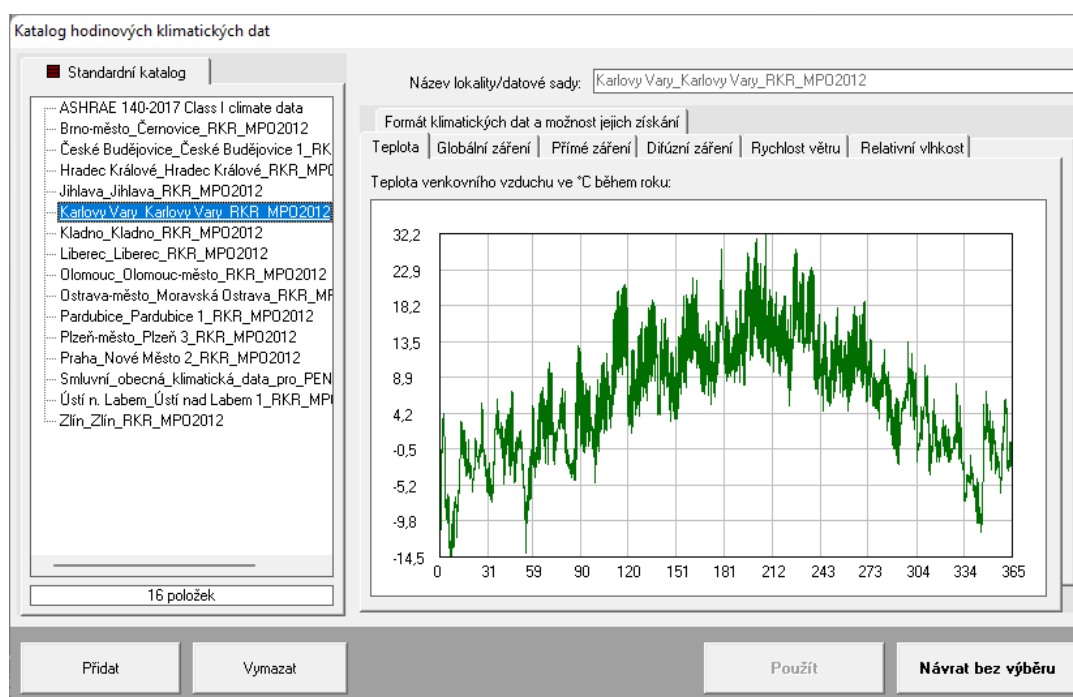
Panel with a list of locations

The panel with the list of available sites shows clearly what data is available.

You can **move** between locations by using the up and down arrow keys, PgDn (page down), PgUp (page up), CTRL+Home (to start) and CTRL+End (to end). Of course, you can also use the left mouse button.

When you select a site in the category panel, its parameters and name will automatically appear in the **tabs on the** right side of the catalog.

Cards

The six tabs in a row contain a graphical representation of the annual course of all climatic parameters of the selected location and can be switched between them using the tabs at the top.

The catalogue also contains four buttons.

Apply button

After pressing this button, the climate data relevant to the currently displayed location will be entered into the corresponding entries on the form

Return button without

Pressing this button will return to the form environment without inserting the displayed data.

Add button

By pressing this button you can add another site to the catalogue.

Delete button

By pressing this button, you can delete the currently displayed location from the catalogue.

F. Catalogue of usage profiles

The usage profile catalogue is a tool that allows you to enter various parameters related to the operation of a zone by simply selecting a room/operation in the database.

The hourly usage profiles contained in the catalogue are stored **in the HPU subdirectory** in the main Energy 2023 folder.

Catalogue of usage profiles

At the time of installation of the **Energie** program, the catalogue contains contractual hourly usage profiles taken from the publication "*Hourly climatic data and parameters of typical use of buildings and zones with cooling, humidity treatment or electricity generation for the calculation of delivered energy and auxiliary energy in accordance with Section 4(1) of Decree No. 264/2020 Coll., on the energy performance of buildings*" (K. Kabele et al., STP Praha 2022). Each user can supplement the catalogue with additional use profiles as needed.
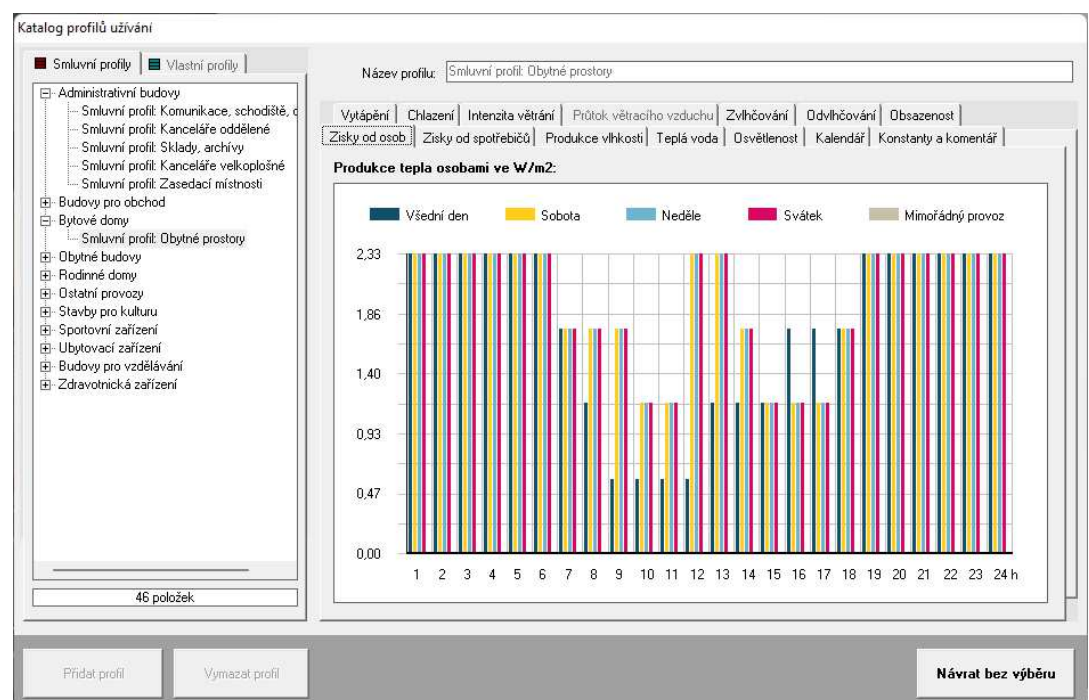
Bookmarks for selection

The Custom Profiles tab displays the usage profiles entered into the catalogue by the user, and the **Contract Profiles** tab displays the contract hourly profiles from the above publication.
All profiles - contractual and custom - are saved in CSV format in the HPU subdirectory. Contractual profiles are marked "Profile_Building_Type_Operation_Number", custom profiles are marked "UP_Category_Name".

==Please do not interfere with the contract profiles!==

Category list panel

A panel with a list of categories of usage profiles is used to search the catalogue.
You can move between categories using the up and down arrow keys, PgDn (page down), PgUp (page up), CTRL+Home (top) and CTRL+End (bottom). Of course, you can also use the left mouse button.

If you press the **Enter** key on the category name, the **category will open** and all profiles that are contained in the category will appear in the panel. Double left-clicking on the category name or simply left-clicking on the plus sign to the left of the category name has the same effect. You can **close a category** using the same procedure: by pressing the **Enter** key or by double-clicking on the category name, or by simply clicking on the minus sign to the left of the category name.

You can move between profiles using the same procedure as between categories.

When you select a profile in the category panel, its parameters and name will automatically appear in the **tabs on the** right side of the catalog.

Cards

Fourteen tabs arranged in a row typically contain a graphical representation of the parameters of the selected profile and can be switched between them using the tabs at the top.

The catalogue also contains four buttons for working with the catalogue of usage profiles.

Apply Profile button

After pressing this button, the data characterizing the operational profile will be entered into the corresponding entries on the form.

Return button without selection

After pressing this button, you will be returned to the form environment without entering the operating data.

Add profile button

By pressing this button you can add another usage profile to the catalogue.

Adding custom profiles is supported only when the catalog of usage profiles is retrieved **from the custom profile entry form**. You can always add the currently displayed custom profile to the catalog.

First, a window will pop up to select the category in which the new profile will be placed. Next, the input fields on all tabs are filled in. Finally, the profile can be saved to the catalogue using the **Save Zone** button.

Please note: The profile name must only appear once in its category!

Delete profile button

After pressing this button, it is possible to delete the currently displayed profile from the catalogue.

G. Catalogue of thermal joints

The thermal joint catalogue is a tool that allows you to enter linear and point heat transfer coefficients for selected thermal joints by simply selecting from the catalogue.

Catalogue of thermal joints

At the time of installation of the **Energy** program, the catalogue of thermal couplings contains approximately 140 typical thermal couplings. The thermal coupling catalogue contains both the complete set of thermal couplings from EN ISO 14683 and about 60 additional thermal couplings.

Thermal joints taken from EN ISO 14683 cannot be modified - only their heat transfer coefficients can be used under the conditions specified in the catalogue note. Thermal couplings that are in the catalogue in addition to the standard ones can be modified.

The individual thermal relationships that appear in the catalogue are described by three files with the extensions **apf**, **tep** and **psi**. All of these files are stored by default in the CTB subdirectory of the main **Energy** program directory after installation.

Notice

The details included in the catalogue after installation are only diagrams of common construction solutions. However, they are in no way a design recommendation and the program author assumes no responsibility for any errors that may appear in the details.

The thermal coupling catalogue window contains:

List of detail categories — Detail diagram
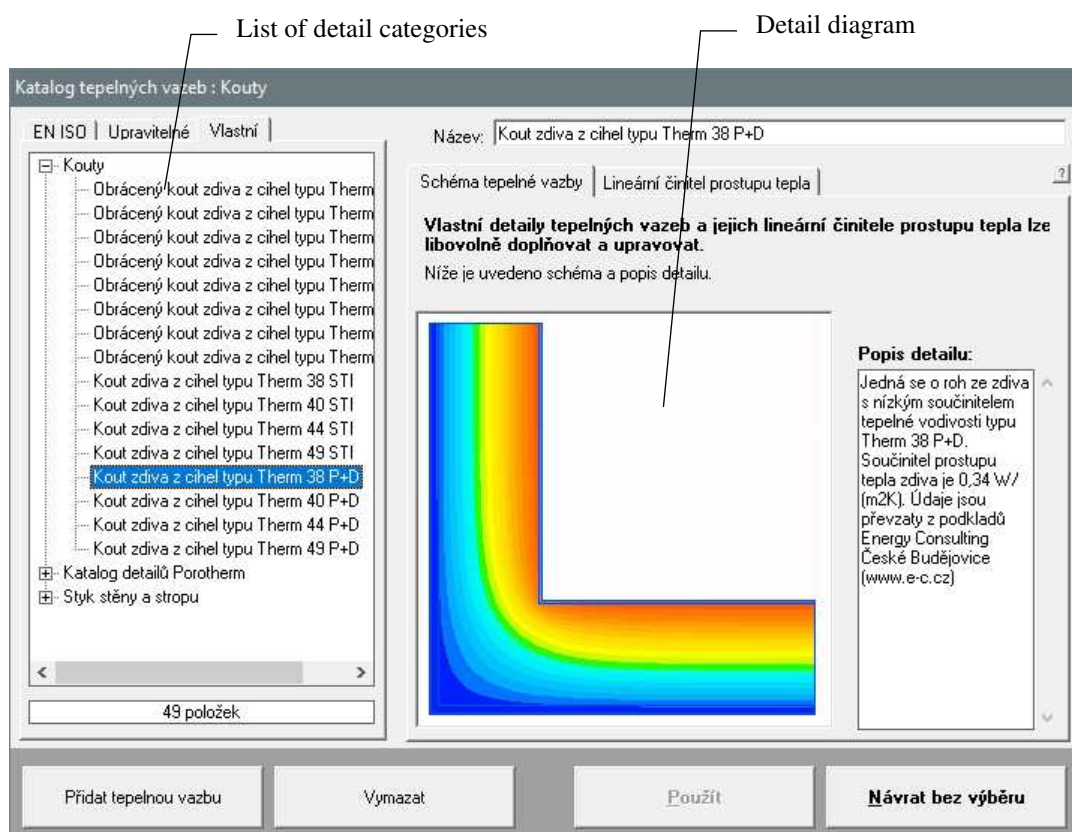
Panel with a list of categories of bindings

A panel with a list of thermal constraint categories is used to move between detail categories. **You can move** between the different categories of thermal constraints using the up and down arrow keys, PgDn (page down), PgUp (page up), CTRL+Home (to start) and CTRL+End (to end). Of course, you can also use the left mouse button.

If you press the **Enter** key on the category name, the **category will open** and all the thermal constraints contained in the category will appear in the panel. Double left-clicking on the category name or simply left-clicking on the plus sign to the left of the category name has the same effect. You can **close a category** using the same procedure: by pressing the **Enter** key or by double-clicking on the category name, or by simply clicking on the minus sign to the left of the category name.

You can move between the thermal constraints using the same procedure as between the categories.

Once you select a thermal link in the category panel, its parameters, schematic and name will automatically appear in the **tabs on the** right side of the catalogue.

Note that the panel with the list of thermal constraints is divided into three tabs - **EN ISO** details, **Editable** details and **Custom** details.
By switching these tabs you can select the type of thermal joints - the EN ISO type details are taken from EN ISO 14683 and cannot be edited, the editable details can be edited and finally the custom details can be added or removed at your discretion.

Linear transmittance   **The Linear transmittance** tab shows the values of the linear heat transfer coefficients for the selected thermal joint for the internal dimensions, external dimensions and total internal dimensions.

Attention   Before transferring the linear transmittance value from the catalog to the input form, you must set the type of dimensions to be considered. By default, external dimensions are assumed.

In the lower part of the catalogue window there are four buttons for working with the thermal coupling catalogue.

Apply button   When this button is pressed, the linear heat transfer coefficients corresponding to the currently displayed thermal bridge will be entered into the corresponding entries on the form

Return button without selection   Pressing this button will return to the form environment without inserting the displayed linear transmittance factors.

Edit heart rate button. bridge   After pressing this button you can edit the selected thermal bridge and insert the newly created detail into the thermal bridge catalogue (see above).

Delete button   After pressing this button, it is possible to delete the currently displayed thermal bridge from the catalogue.

Edit your own details   If you select one of the editable thermal constraints (**Editable** tab), you can modify it in some way.
Press the **Edit Thermal Binding** button and perform all the operations that the Thermal Binding Edit Wizard asks you to perform.
First, changes in dimensions and material characteristics are defined. For these changes, the thermal constraints editor is used, which contains a detail diagram and input items into which the desired changes can be entered.

Thermal Joints Editor

The Quick Detail Editor is a powerful tool that allows you to quickly change the material characteristics and dimensions of the detail areas. The editor does not allow you to add or delete areas. You can select the area you want to edit either via the drop-down list on the top right, or by directly clicking on the area in the detail scheme with the mouse. The displayed parameters can be overwritten with any allowable values in each item. The material catalogue, which can be called up using the **Material Catalogue** button, can be used for input.

Once you have adjusted the area parameters to your liking, you must press the **Save Parameter Changes to Memory** button. Otherwise, the changes made will not be taken into account.

Changes in dimensions

When the dimensions of a given area are changed, the corresponding dimensions of other areas and the location of boundary conditions are implicitly changed.

These changes may change related areas in an unacceptable way. It is often possible to arrive at the desired dimensions of all interrelated regions by repeatedly entering target values. The changed dimensions usually approach the desired dimension iteratively over time.
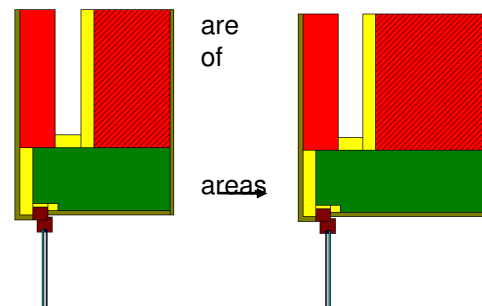
To automate this iterative process, the program allows you to specify on the **Settings** page which area must not change dimensions when changing the selected area. It is sufficient to select the number of the area whose dimensions remain constant on the **Settings** tab, then select the area and select its new dimensions on the **Area Parameters** tab. Next - after pressing the **Save parameter changes to memory** button - an iteration will take place, which will result in changing the dimensions of the second area while maintaining the dimensions of the first area.

If you need to change a single area, press the **Settings** tab and adjust the switches located there accordingly:

Calculation of the bridge
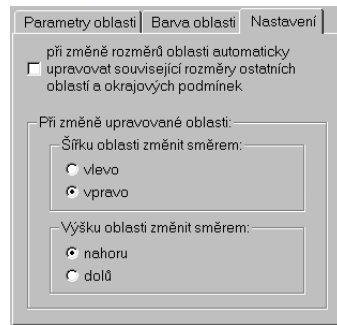
Once you adjusted thermal as

have the coupling
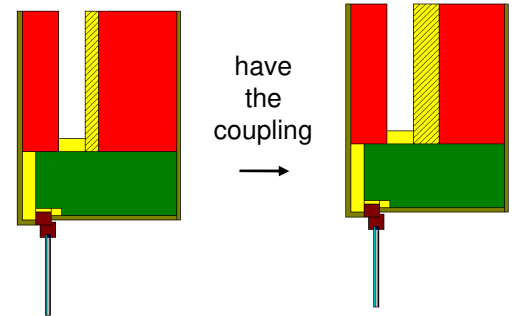
necessary, you can perform the second step - calculating the heat conduction through the thermal coupling.

Save detail

After the calculation, the third step remains - saving the modified detail to the catalogue. It is necessary to select the category to which the detail will be saved and the name of the detail. It is also possible to add a brief comment to the detail.

After pressing the **Apply** button, the modified detail is saved in the thermal constraints catalogue and its parameters can be transferred to the input form.

H. Initializing program settings Energy

As usual with MS Windows programs, the **Energy** program has its settings stored in the Windows registry. You can usually find these settings in the section **This computer\ HKEY_CURRENT_USER\ SOFTWARE\ VB and VBA Program Settings\ Energie2023**. The section contains the following information in individual subsections:

1. Data Directory

The name of the data directory is found in the section called **[Data Directory]** and has the format: ***Directory=directory***. This directory can also be set from the **Energy** program.

2. Materials catalogue directory

The name of the materials catalog directory is found in the section called **[Catalog Directory]** and has the format ***CatDirectory=directory***.

Next in this section appears the ***Enabled=setting*** item, where ***the setting*** can be either **TRUE** or **FALSE**. If the setting is **TRUE**, the catalog can be edited.

Neither of these items can be set from the **Energy** program. If you wish to edit these items, please use the **REGEDIT.EXE** program.

3. Construction catalogue directory

The name of the design catalog directory is found in the section called **[Windows Catalog Directory]** and has the format ***WinCatDirectory=directory***.

Next in this section appears the ***Enabled=setting*** item, where ***the setting*** can be either **TRUE** or **FALSE**. If **TRUE**, the catalog can be edited.

Neither of these items can be set from the **Energy** program. If you wish to edit these items, please use the **REGEDIT.EXE** program**.**

4. Boundary Conditions Catalog Directory

The directory name of the boundary conditions directory is found in the section called **[Boundary Directory]** and has the format ***BDirectory=directory***.

Next in this section appears the ***Enabled=setting*** item, where ***the setting*** can be either **TRUE** or **FALSE**. If **TRUE**, the catalog can be edited.

Neither of these items can be set from the **Energy** program. If you wish to edit these items, please use the **REGEDIT.EXE** program**.**

5. Radiation Intensity Catalogue Directory

The name of the radiation intensity catalogue directory is found in the section called **[Sun Directory]** and has the format *Directory=directory*.
Next in this section appears the *Enabled=setting* item, where *the setting* can be either **TRUE** or **FALSE**. If **TRUE**, the catalog can be edited.
Neither of these items can be set from the **Energy** program. If you wish to edit these items, please use the **REGEDIT.EXE** program**.**

6. Directory of thermal bridges catalogue
The name of the thermal bridges directory is found in the section called **[Thermal Bridges Directory]** and has the format *Directory=directory*.
Next in this section appears the *Enabled=setting* item, where *the setting* can be either **TRUE** or **FALSE**. If **TRUE**, the catalog can be edited.
Neither of these items can be set from the **Energy** program. If you wish to edit these items, please use the **REGEDIT.EXE** program**.**

7. Names of last processed tasks
This information is found in the section called **[Recent Files]** and has the format *RecentFileX=file*.

8. General settings
The following information is located in the general settings - under **[Settings]:**
in the *Control=setting* item it is stored whether the input data control is performed,
in the *Advice=setting* item it is stored whether context checking is offered during input,
in *Date=setting* item it is stored whether the current date is inserted into the new form,
in the *Name=setting* item it is stored whether the user name is inserted into the new form,
in the *User=name* item the user name is stored,
in *Insider=setting* it is stored whether the internal calculation log editor is used,
in the *Show=setting* item it is set whether the log is shown after the calculation is finished,
in the *Print=setting* item it is stored whether the calculation report can be printed,
in the *Edit=name* item, the name of the external calculation log editor is stored,
in the *DirDat=settings* item it is stored whether the data directory can be set from the program,
in the *CSN=setting* item it is stored whether the function can be used to compare the results with the requirements of CSN 730540.

9. Window position
The current position of the program window before it is closed is stored in the **[Window Position]** section in two items *Left=position* and *Top=position*.

10. Window size
The current size of the program window before it is closed is stored in the **[Window Size]** section in two items *Width=position* and *Height=position*.

If you want to use the same material catalogue **KATAL32.MDB, the** same construction catalogue **KCE32.MDB** or the same boundary conditions catalogue **OPODM32.MDB** from several programs of our company, you need to set the path to the directory with these files in the **[Catalogue Directory], [Windows Catalogue Directory]** and **[Boundary Directory]**.

Or - more conveniently - use the **Catalogs - Catalog Settings** command in the main menu of the program and set the path to the catalogs via the window:

I. Programme limitations

The Energy Programme can be used to assess virtually unlimited building sizes. However, the number of zones in the building is limited - the maximum number is 99.

J. List of literature used

[1]   ČSN 730540 Thermal protection of buildings, Prague 2007-2011

[2]   ČSN EN ISO 52016-1 Energy performance of buildings - Energy required for indoor heating and cooling and sensible and latent heat loads - Part 1: Calculation procedures, Prague 2018

[3]   ISO/TR 52016-2 Energy performance of buildings -- Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads -- Part 2: Explanation and justification of ISO 52016-1 and ISO 52017-1, CEN 2017

[4]   ČSN EN ISO 13370 Thermal behaviour of buildings - Heat transfer through soil - Calculation methods, Prague 2018

[5]   ČSN EN ISO 13789 Thermal behaviour of buildings - Specific heat fluxes through heat transfer and ventilation - Calculation method, Prague 2018

[6]   ČSN EN ISO 14683 Thermal bridges in building constructions - Linear heat transfer coefficient - Simplified methods and indicative values, Prague 2018

[7]   ČSN EN 16798-7 Energy performance of buildings - Ventilation of buildings - Part 7: Calculation methods for determination of air flows in buildings, including infiltration (Modules M5-5), Prague 2018

[8]   Decree No. 264/2020 Coll. on the energy performance of buildings

[9]   ČSN 730331-1 Energy performance of buildings - Typical values for calculation - Part 1: General part and monthly calculation data, Amendment 1, Prague 2020.

[10]   ČSN EN ISO 13788 Thermal-humidity behaviour of building components and building elements - Internal surface temperature to exclude critical surface humidity and condensation inside the construction - Calculation methods, Prague 2013

[11]   ČSN EN ISO 13790 Energy performance of buildings - Calculation of energy consumption for heating and cooling, Prague 2009

[12]   ČSN EN 15316-4-3 Energy performance of buildings - Calculation method for determining energy needs and system efficiency - Part 4-3: Heat generation, photovoltaic and solar thermal systems, Prague 2017

[13]   Matuška, T.: Description of the mathematical model for the VYKON_SK program, CTU Prague 2017

[14]   Staněk, K.: Photovoltaics for buildings, Grada Praha 2012.

K. Link to manufacturer and distributor

If you need to contact the manufacturer or distributor of the program for any reason, please use the following contacts:

K-CAD s.r.o.
Radúzova 11
162 00 Prague 6   **tel.:**   **220 610 287, 220 611 917**
                          fax: **235 364 107**
                          e-mail:kcad@kcad.cz
                          blog: **blog.kdata.cz/building-physi**

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5 May 3242
272 01 Kladno   **m. tel.:**   **606 227 420**
                          e-mail:svoboda@kcad.cz
                                              svoboda.zbynek@quick.cz