

Software for  
Noise Calculation

Computer Aided  
Noise Abatement

Cadna<sup>®</sup>  
A



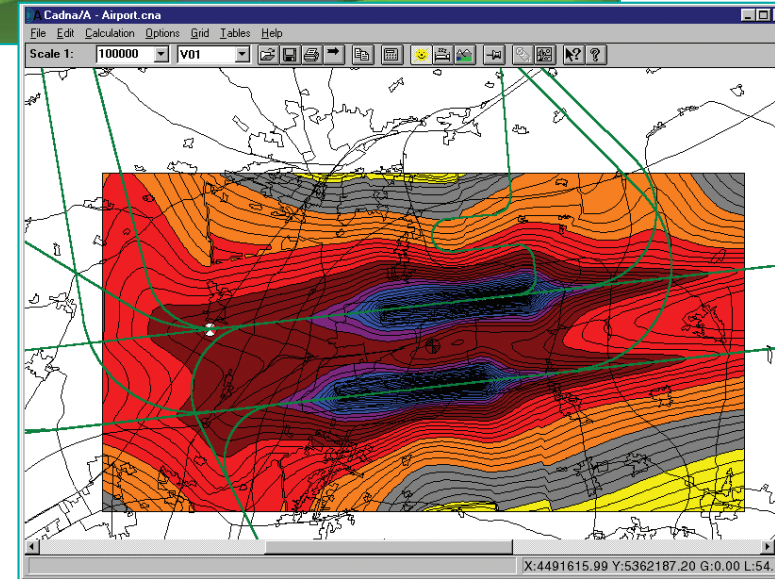
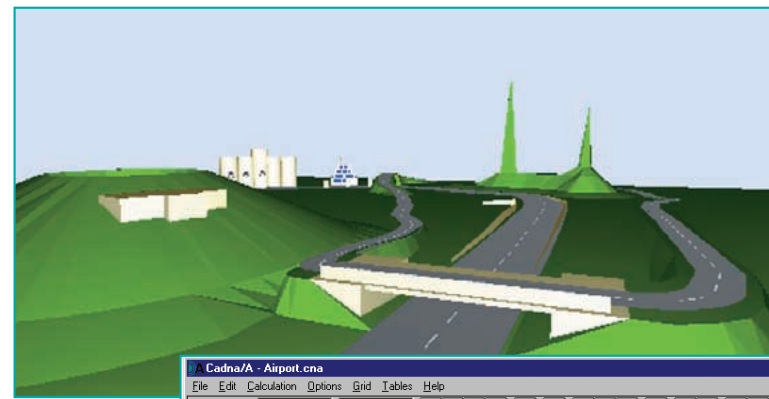
**Cadna A** for Windows is a software program for prediction and assessment of noise levels in the vicinity of:

- ☒ industrial facilities,
- ☒ sport- and leisure facilities,
- ☒ roads and railways,
- ☒ airports and
- ☒ any other noisy equipment.

The program provides for easy entry and configuration of landscapes with all that influence sound emission and propagation, the calculation and the documentation of the noise levels in accordance with national regulations, and the presentation of the results with noise contour plots and coloured noise maps.

Very effective and easy-to-use Windows program:

- ☒ **Cadna A** is a 32-bit MS Windows program
- ☒ graphic user interface with easily understood symbols
- ☒ all objects like roads, railways, parking areas etc. can be geometrically generated by coordinate input with mouse, digitizer or keyboard, with the possibility of using these devices parallel
- ☒ polygons (e.g. buildings, noisy areas) and polylines (line sources, roads, screens etc.) can have any shape
- ☒ for the most important noise sources like roads and railways the emission levels are calculated from the noise-relevant parameters
- ☒ modification of noise source parameters results in a real time update of emission values - a very quick way of testing noise abatement measures
- ☒ import of many data-formats such as DXF, SICAD, Atlas Gis, ArcView etc.
- ☒ export of tables and graphic presentations to the clipboard and therefore import with two keystrokes into other Windows applications like text- and spreadsheet-programs. Export also in DXF, ASCII, RTF format
- ☒ open connection database interface to all databases like dBase, MSAccess, FoxPro, Paradox, SQL etc. This allows the updating of data in external databases, if these data are also to be used by other applications
- ☒ all devices with Windows driver can be used



### Successful symbiosis of acoustics and software

**Cadna A** has been developed by acoustic and software programming experts - this being a prerequisite for the creation of such an effective tool in noise abatement. With its flexible logic structure the program will prove of high value to experts who regularly tackle noise problems as well as to those who are responsible for environmental questions but are unfamiliar with the technical aspects of noise propagation.

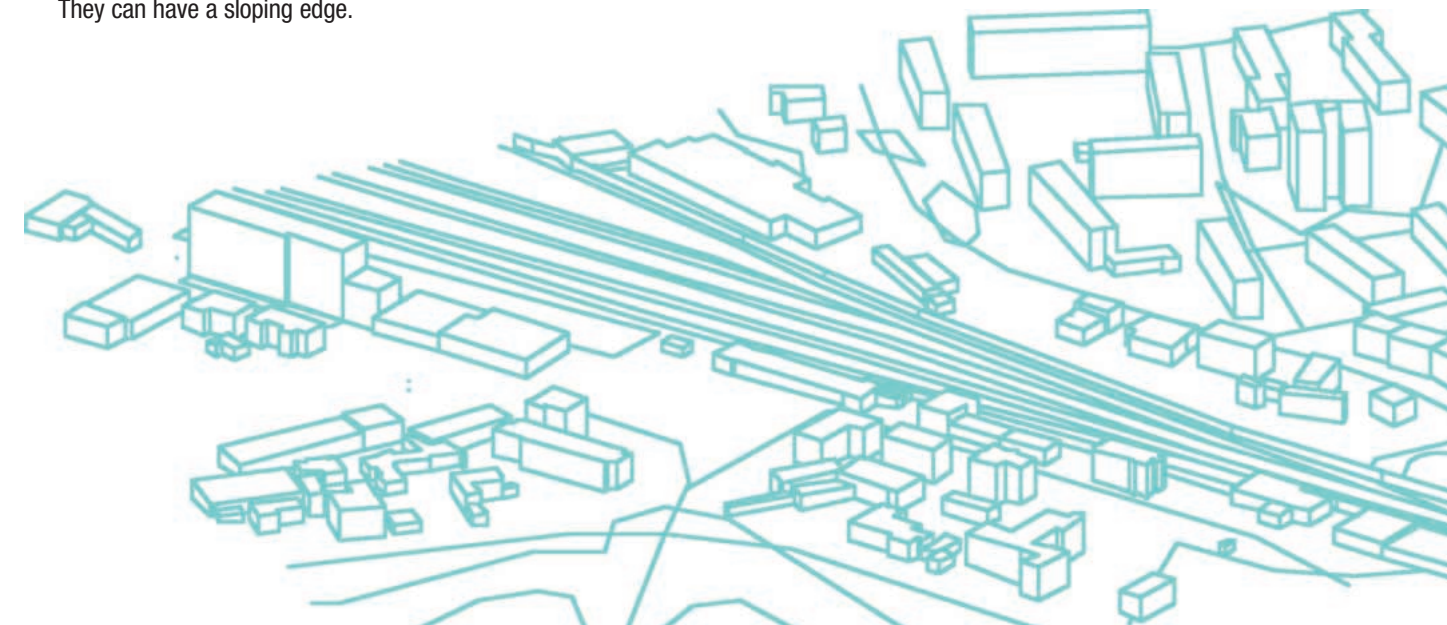
**Cadna A** allows the assessment of noise immissions in accordance with national regulations.

### Projects with Cadna A®

- ☒ All data of a project are handled in one file and can be saved and loaded by typing the filename. This allows a very simple administration of variants.
- ☒ No practical limitation in number of sources and immission points. A large refinery with thousands of sources is just as easily assessed as the calculation of the height of a wall that is necessary to screen a single loading platform.
- ☒ Noise sources of any complexity can easily be modelled by point-, line- and surface-sources. Emission values of these sources and their calculation carried out alternatively with A-weighted levels or in frequency bands.
- ☒ Effective support of frequency-dependent calculations by databases with spectrum of sound pressure levels and transmission loss
- ☒ Use of emission values related to ISO 3740 standards. This allows the use of sound power levels stated by the machine manufacturers.
- ☒ Parametric input for roads, railways, parking areas and airports. From these parameters the emission values are calculated.
- ☒ Crossings controlled by traffic lights are easily defined in the computer model by clicking the traffic light symbol into the crossing-area. The appropriate roads are recognized by the program automatically.
- ☒ Local and global definition and edition of the occupancy of railway tracks.
- ☒ Area sources with emission values are calculated by the program in such a way, that permissible immission values are not exceeded for an unlimited number of immission points in the vicinity (optional).
- ☒ Buildings with arbitrary outline are included as screening and if necessary as sound radiating objects.
- ☒ The object Building has the property "acoustical transparency" quantified by a parameter value in percent. This feature allows the modeling of more or less open structures that are in reality an accumulation of pipes, vessels and other technical equipments that can be penetrated by sound energy.
- ☒ Screens are represented by a sequence of straight lines. They can have a sloping edge.



- ☒ The reflection coefficient of screening objects can be defined or selected from a predefined list.
- ☒ Wooded areas and groups of buildings, that are not modeled separately, can be defined with arbitrary shape.
- ☒ Modelling of the landscape by contour lines and break lines.
- ☒ Input of areas with arbitrary shape and a defineable sound power level per square meter. **Cadna A** subdivides this area dynamically with respect to acoustic needs. This is very helpful when industrial zones in the vicinity of residential areas are planned and noise levels need to be predicted.
- ☒ PCSP – Program Controlled Segmented Processing – **Cadna A** is able to process more than 16 million objects per object type without any problems, even models of cities (with option XL). Therefore the limit for the size of a processable file is normally defined by the capacity of the computer. With PCSP even this limit is broken. Program controlled segmentation with user-defined partitioning allows to load the segments one after another automatically for calculation. Thus the RAM is able to work without hard disk access. If several **Cadna A** computers are at disposal for calculation, e.g. within a network, they can work on the same project file parallel. PCSP by **Cadna A** automatically organizes and manages the required processes.

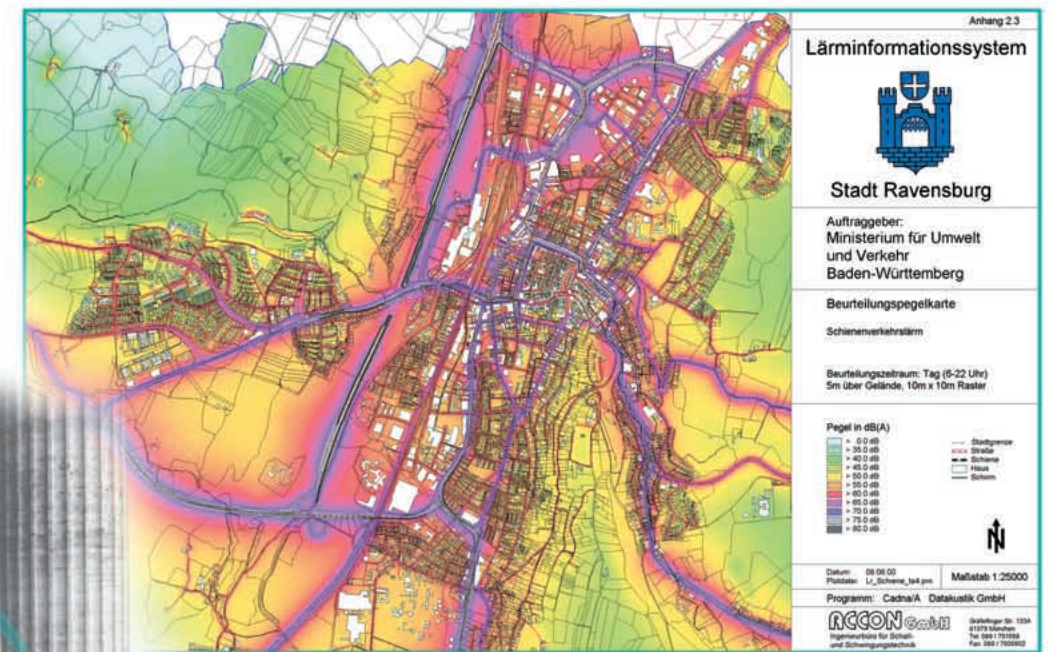
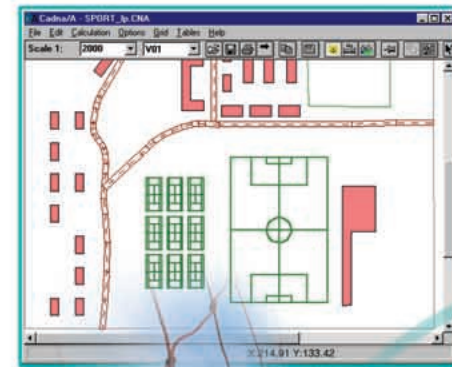


## The output of Cadna A® - expertise capable

- Generated or user defined tables and graphic presentations are suitable for certification and qualified evaluations. For defineable immission points all interim results of the different calculation steps can be presented in the tables. This is important for the presentation of results to authorities, enabling them to easily verify the correctness of the calculations.
- Cadna A** can calculate noise levels on grids with a defineable density of immission points. From these levels, calculated for thousands of points, contour lines of constant noise levels, or areas with noise levels in defineable intervals, are developed and presented as coloured noise maps. It is easy to edit these noise maps and to plot them with text and legend.

## Working with objects

- Objects in **Cadna A** can be edited, deleted, modified, shifted, copied, changed in shape, multiplied or even converted to other objects with simple mouse operations. With these possibilities it is easy to cut out all objects for a limited area from the complete set of data of a big city, to calculate noise levels for intended modifications and insert the modified data and objects once more.
- For each object a smaller or bigger object with parallel contour lines can be produced at the click of the mouse. This makes it easy to produce screens or contour lines parallel to given roads or railway-routes.
- Sectional views along free defineable lines give an effective control of the shape of the surface previously modelled using contour lines.
- Many predefined 3-dimensional views. Through the entry of two angles the modelled situation can be viewed from any perspective.
- The 3D-special view allows to move inside the virtuell scenery to check the model. The animation properties can be changed like camera position and animation speed or even create a movie file by recording it on a video.
- Presentation on screen and plotting to any scale by entering the desired value or by selection from a pre-defined list.



## Standards

**Cadna A** is an universal program for the calculation of noise levels. With it's open architecture it is designed so as to allow easy adaption to national standards in different countries. This adaptation is carried out step by step, it is therefore recommended you seek the advice of the national representative concerning required modification and relevant time schedules. Along with the German, Austrian and Swiss guidelines there are also integrated CRTN, CRN (U.K.), NMPB-Routes 96 (France) and Nordic Prediction Method.

Please ask for the current version.

## Language

**Cadna A** is multiple lingual – for the time being you can run **Cadna A** in German, English, French and Italian. Please ask for the current version.

## Calculation

➤ The calculation method can be configured by the user - he defines e.g. if and up to which distance of the receiver or source point reflexion will be calculated and up to which order.

## Some examples of use of Cadna A

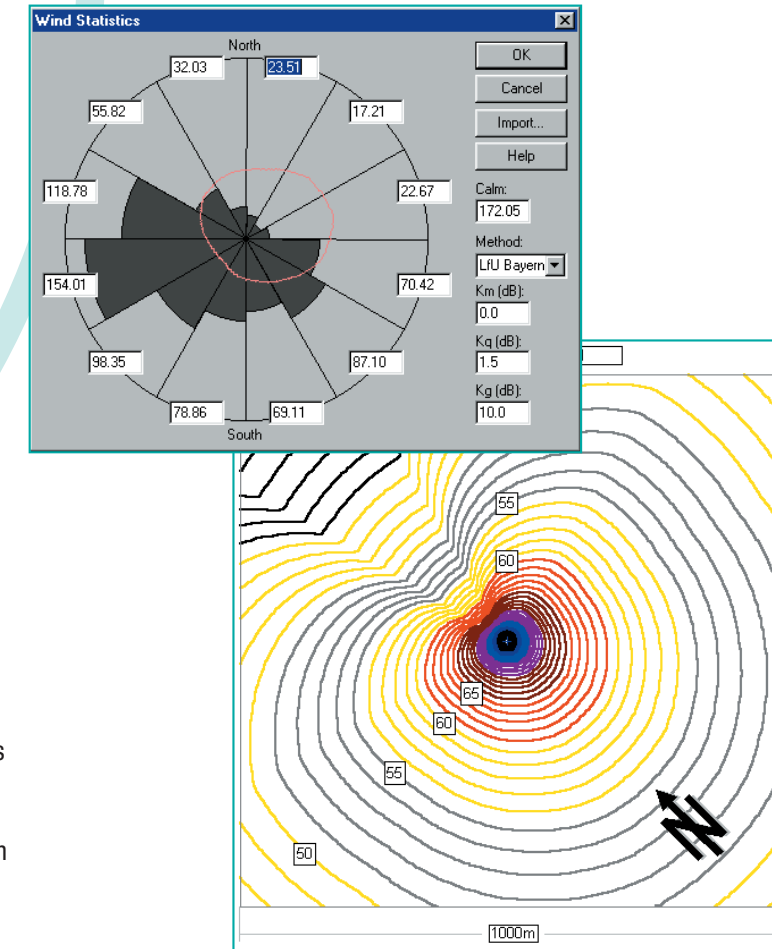
### Highways and railway routes

➤ If highways or railway routes are planned or are to be modified, the noise levels in the surrounding residential areas should be calculated. If permissible values are exceeded, necessary measures like walls, noise reduction surface or measures carried out on the buildings themselves can be scaled and tested. The result of such a study comprises a list of these measures, coloured noise charts for presentation, and tables with the noise levels for any number of immission points.

### Industry

➤ The program makes it easy to update and compile all emission data for factories and any industrial facilities. If the databased model of an industrial region is available as **Cadna A**-project, it is easy to determine necessarily changes in noise immission in the surroundings resulting from planned modifications. The manufacturer or supplier of technical equipment such as machines, ventilation systems, car wash plants or cooling towers can provide the necessary information about noise levels in the vicinity.

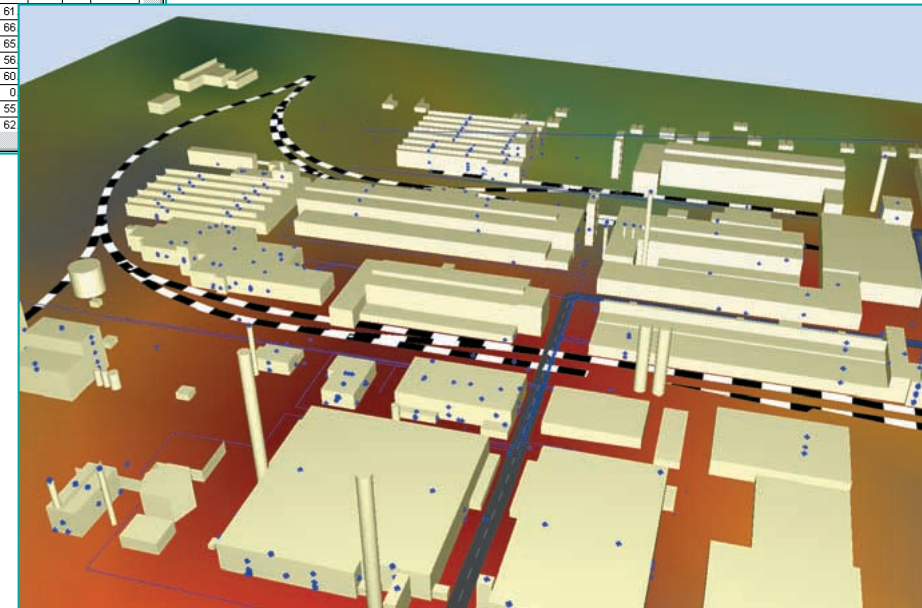
➤ The Option **Cadna A SET** is an expert system to find the sound power spectra for many noise sources like motors, gears, vans, ventilation systems, cooling towers on the basis of given technical parameters. With **Cadna A SET** you can create modules with up to 10 input and 10 output channels for sound power spectra. You can define the creation of a sound power spectrum by your own algorithms. If such a module is defined, it can be referenced with all sources in **Cadna A**. More than 100 predefined modules based on a many years experience and on many standards give you a tremendous knowledge in the modelling of plant noise in one step. The modules can be coupled output-input, so that even complex plants are simulated correctly in your **Cadna A** project. Ask for our expert seminars for **Cadna A SET** and for Noise Modelling of Industrial Plants.



Partial Level		Partial Level Day			
Name	M	ID	Astr.1 EG	Astr.3 EG	Astr.5 EG
Astrasse		str_0001_001	66.7	66.7	66.5
Betrieb Meier Produktion Nordwest-Wand Tor off.		gg460_pnrw_003	64.4	65.2	65.2
Betrieb Meier Lkw-Fahrtweg		gg460_aufw_001	50.6	49.8	49.1
Betrieb Meier Mech.Fert. Nordwest-Wand Türe		gg460_mfrw_003	44.7	44.5	43.6
Brasse		str_0002_001	39.8	39.4	40.0
Betrieb Meier Produktion Nordwest-Fenster Profil		gg460_pnrw_001	32.9	34.0	34.5
Betrieb Meier Produktion Dach Trapezblech		gg460_pnda_001	32.8	33.6	33.9
Betrieb Meier Mech.Fert. Dach Trapezblech		gg460_mfda_001	31.1	31.2	30.6
Betrieb Meier Mech.Fertigung Südwest-Wand Gasbeton		gg460_mfsw_001	29.7	30.0	29.3
Betrieb Meier Produktion Nordwest-Wand Gasbeton		gg460_pnrw_002	29.0	30.0	30.4
Betrieb Meier Mech.Fertigung Südwest-Wand Profil		gg460_mfsw_002	28.0	28.1	27.4
Betrieb Meier Versand Südost-Wand Gasbeton		gg460_vssso_001	9.5	0.0	-5.5
Betrieb Meier Produktion Nordost-Wand Gasbeton		gg460_pno_001	8.7	9.3	9.6
Betrieb Meier Mech.Fertigung Nordost-Wand Gasbeton		gg460_mfno_001	7.6	7.4	6.9
Betrieb Meier Versand Dach Trapezblech		gg460_vdsa_001	6.8	6.4	5.5
Betrieb Meier Versand Südwest-Wand Gasbeton		gg460_vssw_001	5.1	4.7	3.6
Betrieb Meier Büro Dach		gg460_bgda_001	-10.8	-9.7	-9.0
Betrieb Meier B...					

Sound Reduction Indices (global)		Octave Spectrum (dB)										Source
Name	ID	31.5	63	125	250	500	1000	2000	4000	8000	Rw	
none	E_R01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1
Roof, Steel Gravel Concrete 100 mm	E_R02		36.0	36.0	41.0	51.0	59.0	65.0			47	VDI 2571
Roof, Steel Gravel Concrete 150 mm	E_R03		39.0	41.0	50.0	57.0	63.0	71.0			54	VDI 2571
Roof, Steel Gravel Concrete 180 mm	E_R04		44.0	46.0	52.0	61.0	65.0	68.0			57	VDI 2571
Roof, Steel Stone Ceiling 165 mm	E_R05		35.0	39.0	42.0	46.0	50.0	60.0			46	VDI 2571
Aerated Concrete-Ceiling Plates 240 mm	E_R06		33.0	37.0	38.0	47.0	53.0	57.0			45	VDI 2571
Roof Prestressed Concrete Hollow Plate	E_R07		36.0	39.0	45.0	50.0	56.0	57.0			49	VDI 2571
Roof, Pumice Concrete Hollow Plates	E_R08		36.0	37.0	45.0	51.0	57.0	63.0			49	VDI 2571
Timber Roof 115 mm	E_R12		16.0	25.0	26.0	24.0	30.0	36.0			27	VDI 2571
sand-lime Brick 115 mm	E_R13		37.0	39.0	43.0	52.0	58.0	61				
sand-lime Brick 240 mm	E_R14		43.0	45.0	51.0	57.0	63.0	66				
honeycomb brick 115 mm	E_R15		34.0	37.0	42.0	49.0	55.0	65				
lightweight concrete hollow block 175	E_R16		31.0	35.0	40.0	47.0	52.0	56				
pumice hollow block 240 mm	E_R17		40.0	41.0	44.0	51.0	55.0	60				
pumice hollow block 240 mm	E_R17	0.0	0.0	0.0	0.0	0.0	0.0	0				
pumice concrete stone 115 mm	E_R18		32.0	35.0	35.0	43.0	49.0	55				
pumice concrete stone 365 mm	E_R19		44.0	44.0	50.0	56.0	59.0	62				



### Noise maps for cities

➤ **Cadna A** is an ideal tool for communities. All necessary information pertaining to noise reality is available, and the noise factor can be taken into account in all stages of planning. If industrial zones are planned in the vicinity of residential areas, the possible noise emission is calculated in minutes. With this knowledge it is easy to decide what type of industry is compatible with given environmental requirements.

### Aircraft Noise

➤ The noise around airports is calculated from the emission data of the relevant classes of aircraft. This calculation is currently based on German standards. These are only some of the many features that **Cadna A** offers to make noise prediction quick and easy. The program's features are constantly being improved. Your representative will be happy to inform you of latest updates.

**Cadna A** is a comprehensive product - all sources can be integrated in a calculation with the basic version.

**Cadna A** basic program - 1000 buildings and 1000 barriers will be taken into each screening calculation, no restriction to number of sources and immission points. Arithmetic for calculated noise maps

### Options:

#### ➤ **Cadna A/XL**

to calculate noise maps of cities, maps of conflicts, population density and evaluation. No restriction in respect of number of objects.

#### ➤ **Cadna A/BMP**

scanned maps and other pictures can be integrated into the graphic presentation.

#### ➤ **Cadna A/BPL**

emission of different areas, which are permissible without exceeding limiting noise levels in the vicinity, are calculated and optimized.

#### ➤ **Cadna A/SET**

Description of sound emission and transmission.

#### ➤ **Cadna A/AZB -**

Calculation of noise contours around airports.

If you do not have our demo program yet or if you need more information just ask for it.

