FORMSHEET

DESIGN DATA MANAGER

A proposal

draft
2/9/98
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FORMSHEET , A NEW KIND OFCAD PROGRAM

The sheets presented here introduce Formsheet, as the program and its major interface tool will be called, as a companion in the design process. Their arrangement ressembles a tutorial. The best way to get a good feel of the program is to read them in sequence which is also the way they have been written: one aspect leading to another and each sheet raising questions dealt with in the next. At the same time, once the basic principles of the interface have become familiar, sheets can be read by itself and the table of contents provides access to issues the reader is curious about or wants to return to.

Sections distinguish larger topics. We begin with the primary handling of objects in space: how to change their size and how to position them relative to other objects including grids. (B)

The next section shows how objects can be grouped in part/whole relations - one object being the compositon of a number of other objects - capable of forming hierarhies of considerable depth, while embedded parts remain accessible and manipulable at all times. (C)

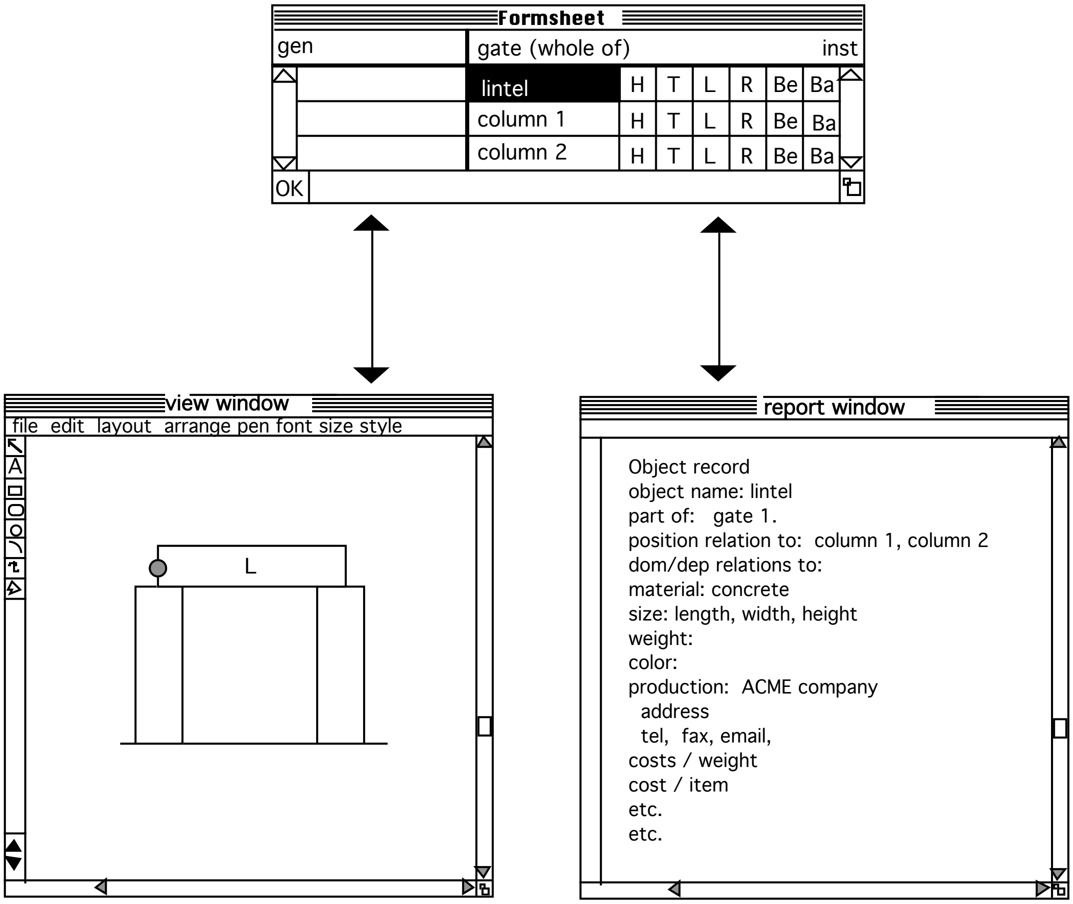
Section D deals with abstraction. It shows how a complex grouping can be represented by a single volume or shape to peform as a part in a much larger whole. Formsheet remembers, however,the initial organization and can return it at all times when we need to zero in for a more detailed view.

Generic objects - genobs for short - play an important role. Just as we build buildings in real life from parts we already know as types or basic elements, but make something new and original by transforming and combining them, we can make complex and original designs from a library of predefined objects by their transformation and combination. Such already known parts (including the information they carry with them about physical properties, on ownership, costs, dimensional constraints, etc.) are called genobs. They do not exist yet in any design, but can be called into existence. Formsheet helps us to organize large numbers of genobs and to make instances from them in our design and to adapt them to our purposes. (E)

Section F. discusses the creation of new objects, be they genobs or instances. It introduces a number of basic kinds of objects, distinghuished by the way they behave as forms, and makes their introduction easy.
Once objects are understood we can rule about the relations they have with one another. Objects can be endowed with a number of basic relationships that we are all familiar with, allowing Formsheet to help us to observe and maintain such relations. (G)

Finally, in section H, we discuss how the program can help us to structure the complexity of the design process by keeping track of the actors involved and their acts, by managing data and producing information of any kind when we need it, by managing the most advantageous representations of the design (views) in the phase where we need them, and providing the genobs, and other information we need in each design phase.

An important aspect of that last section is the management of relations, not between individual objects, but between large groups of objects, forming classes or systems, stating general rules of relation and behavior between them. Here, it seems to me, the potentioal of the data management approach is greatest. It is also the least explored in the sheets offered here. Reasons are not only lack of time or the limited scope of this draft. It has also to do with the difficulty we have in understanding such complex form behavior. Once an environment like Formsheet would be in place, we would be in much better shape to explore such issues and learn better to understand complex form behavior ourselves, before we can instruct Formsheet to assist us.



gen	gate (whole of)						inst
	lintel	H	T	L	R	Be	Ba
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

Object record
object name: lintel
part of: gate 1.
position relation to: column 1, column 2
dom/dep relations to:
material: concrete
size: length, width, height
weight:
color:
production: ACME company
address
tel, fax, email,
costs / weight
cost / item
etc.
etc.

The Formsheet computer aided design program works on the premise that designing is generating new information and that therefore a CAD program should be driven by a database capable of storing and processing all information so generated.

Like all databases and spreadsheets, Formsheet offers an interface by which information can be added or modified.
With Fornsheet, this interface comes in three interrelated ways: the 'Formsheet window', the 'view window', and the 'report window'.
The Formsheet window is a tool with which we can create, select, and group parts and give instructions about their spatial properties and relations.
The View window has all the graphic capabilities of extant CAD programs , but it is basically another means to show information from the database and enter information into it. There are no 'drawings' stored as such in Formsheet. We can instruct Formsheet to show us, in the view window, any plan, section, or elelevation, at any time to be viewed, modified, or printed. Such views then, are instantly produced from the data available.
The Report window allows us to call up and enter textual and numeric information about the forms we design.

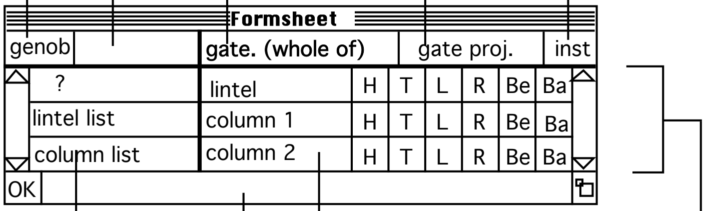
Name of a list,
or group,
of generic objects

Button to the generic
objects database.
Generic objects
are stored in the
database to be
drawn upon when
we design
genobs are types

Name of a list,
or group,
of instances

name of the
design project

Button to the Instances
database.
Instances are the objects
that are part of the
actual design.
Instances are individuals.



genob | | gate. (whole of) | gate proj. | inst

?	lintel	H	T	L	R	Be	Ba
lintel list	column 1	H	T	L	R	Be	Ba
column list	column 2	H	T	L	R	Be	Ba

Names of generic
objects or of lists of
generic objects.

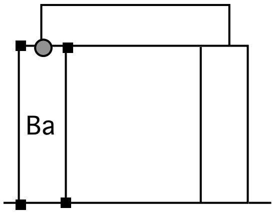
name of an instance
or of a group of
instances

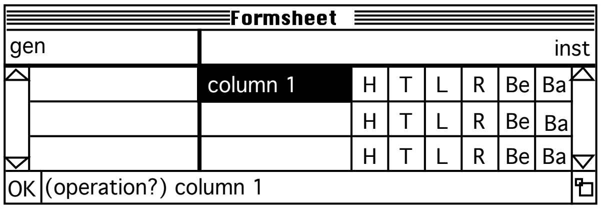
Codes for
the six sides of
objects relate to
'orientation handles'
by which we can
state relations
between objects

Text box which
gives us information we
ask for, and in which we
can enter written or numeric
information relative to instances
or their relations.

Formsheet at a glance.
It is a data input device consisting of two lists. The generic objects lists gives access to the library of parts we have in store to draw upon and to add to for later use. The instances list gives access to the objects already incorporated in the design at hand and allows us to manipulate their sizes, positions, and their relations among one another.

sheet no. 4 Orientation handles date: sept. 2, 1998





Formsheet

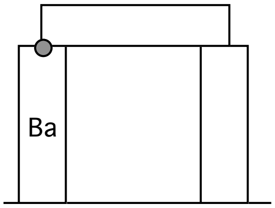
gen		inst					
	column 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

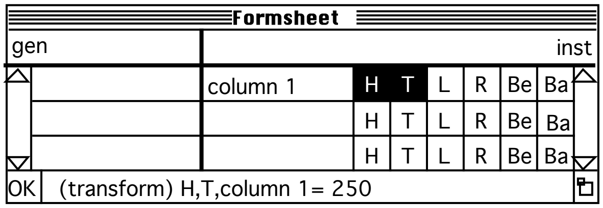
OK (operation?) column 1

When an object is selected in the view window, its handles appear as usual in cad programs, but also a dark dot (●) indicates its 'head' (H). In addition, the side in view (Ba = back) is indicated.

At the same time, the name of the object appears highlighted in Formsheet and we are asked to select the operation we want to perform.
The text: (operations?) is a menu of possible operations. (sheet 6)

Both windows are fully reciprocal: they show the same data in different ways.
Any change in the view window is registered in the database and viewable in Formsheet.
Likewise, any information entered or changed in Formsheet will immediately show in the view window.
Changes in the view window are done in the ways familiar from cad programs.
In our demonstration we will focus on the manipulation of the form through the formsheet window.
Therefore, the four handles needed for manipulation in the view window will usually not be shown.
A preference menu may offer the user the option to turn such handles off or on.



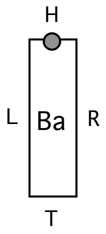


Formsheet

gen		inst					
	column 1	**H**	**T**	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

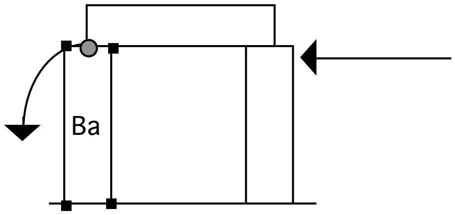
OK (transform) H,T,column 1= 250

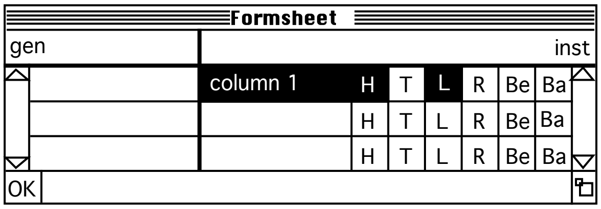
Orientation handles may be used to find out dimensions of an object:
Hold the shift key and select H and T (head and tail) of column 1 in the instance list.
Formsheet tells us the 'length' is 250
Similarly we may ask for the 'width' (left to right, L,R = 60) and the 'depth' (belly to back, Be,Ba = 50)



Orientation handles will help us to dimension an object and to establish spatial relations between objects.

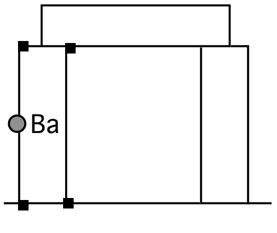
Rotating Orientation Handles

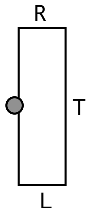



Formsheet

gen	inst						
	column 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

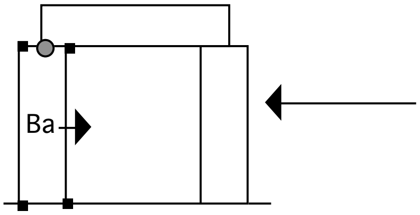
OK

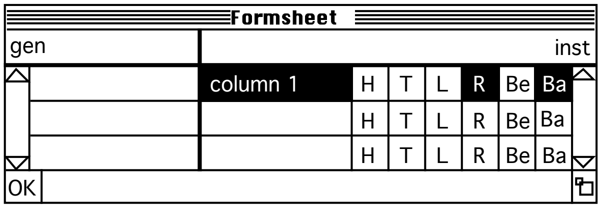




When one orientation handle is shifted to another place, the three other orientationhandles in that plane will shift accordingly.

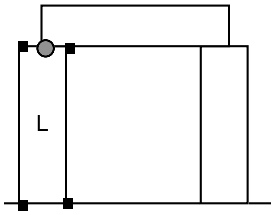
The distribution of orientation handles for an object can be changed.
To change the position of the head, hold the shift key and select the object name, the head symbol, and the symbol of the orientation that must become the head.

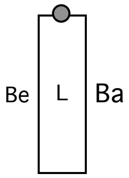



Formsheet

gen	inst						
	column 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK





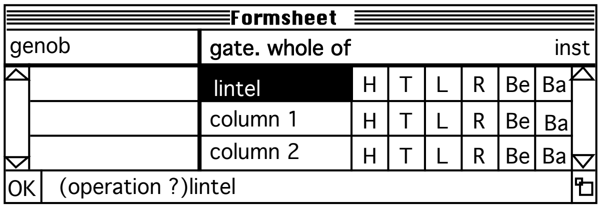
In the same way we may rotate the orientation indication of the side by holding dowh the shift key and selecting the row name, the side indication we want to rotate (Ba) and the handle which place it must take (R). In the example the side in view will now become L.

By convention, the side selected first is the one that will move to the position first taken by the side selected second

NB. this operation does not rotate the object, only the orientation handles. To rotate the object, select the object name and choose 'rotate' from the (operation?) menu. In case of rotation of the object the orientation handles rotate with it, remaining attached to the same side of the object.

sheet no. 6 (operation?) menu date: sept. 2, 1998

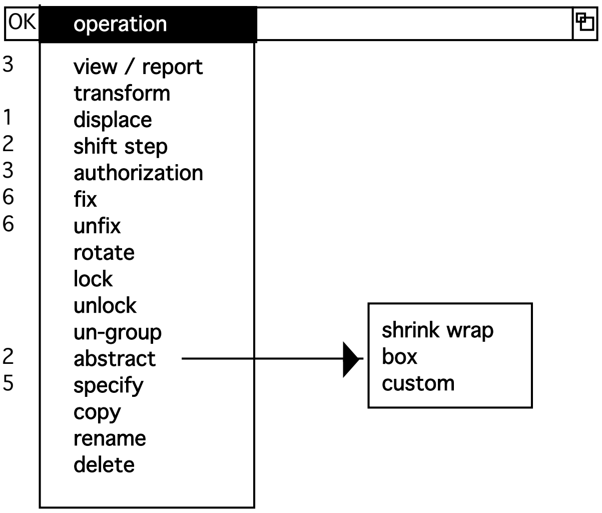
If a single object is selected Either in the drawing or in the formsheet, formsheet asks what operation you want to perform on it.



Formsheet

genob	gate. whole of						inst
	lintel	H	T	L	R	Be	Ba
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
OK	(operation ?)lintel						

Press the (operation?) text and the operation menu appears.



	OK operation
sheet 33	view / report
8	transform
11	displace
12	shift step
13	authorization
16	fix
16	unfix
	rotate
	lock
	unlock
	un-group
22	abstract → shrink wrap / box / custom
25	specify
	copy
	rename
	delete

Shortcuts:

if you select one side or two opposite sides of an object (keeping down the shift key) Formsheet will directly move in the 'transform' mode. (sheet 8)

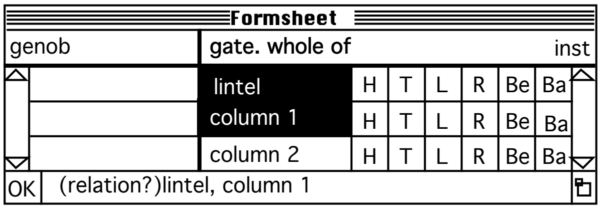
If you select the side of one object and a side of another, (keeping down the shift key() Formsheet will move into the 'adjust' mode.

If you select the object and one side (keeping down the shift key), formsheet will directly move in the 'displace' mode. (sheet 11)

The operations: 'rotate', 'lock', 'unlock', un-group, 'copy', 'rename' and 'delete', are familiar from conventional cad programs. They will not be discussed further.

The other operations are discussed in sheets indicated to the right of the menu as shown above.

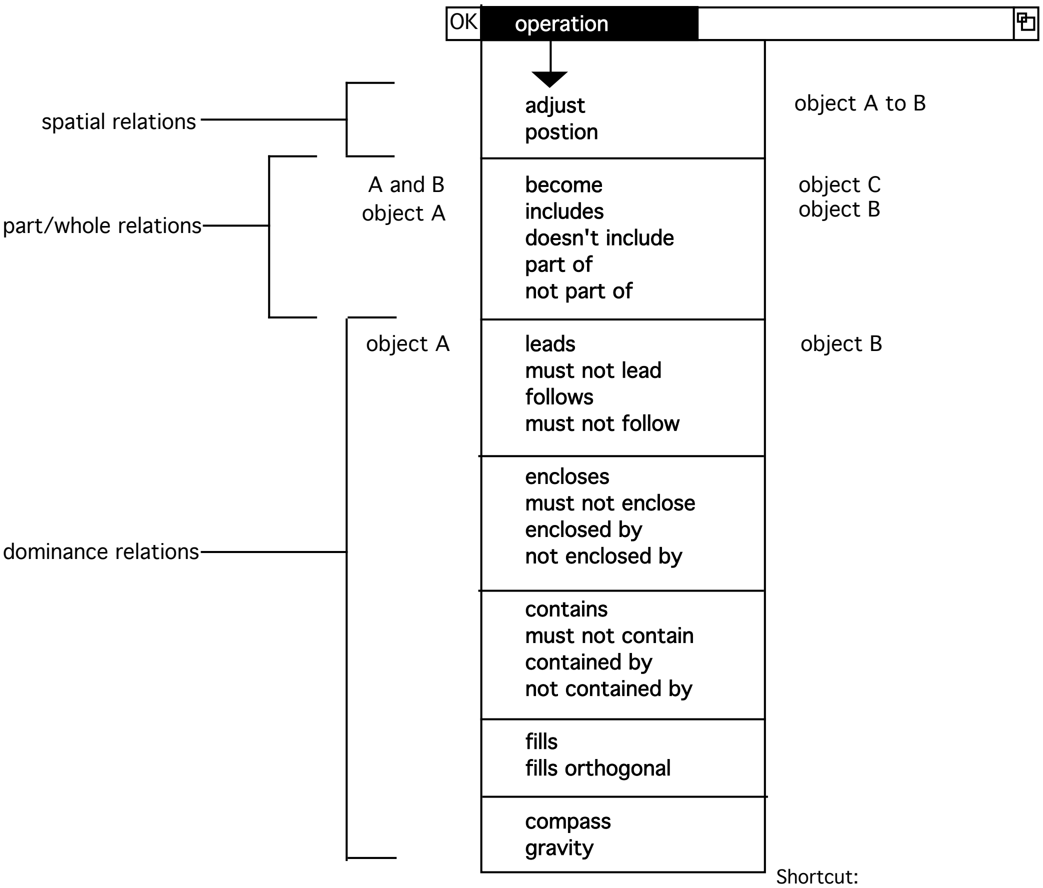
if two objects are selected formsheet understands a relation is to be established and asks what relation you have in mind, offering a menu of possible relations to choose from.



Formsheet

genob	gate. whole of						inst
	lintel	H	T	L	R	Be	Ba
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

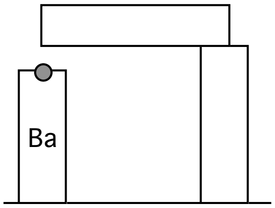
OK (relation?)lintel, column 1

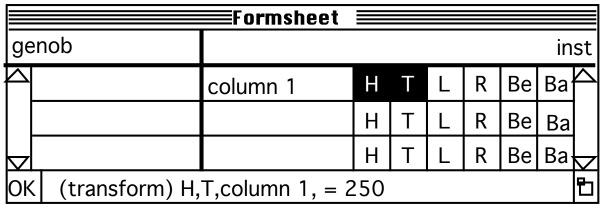


Shortcut:
if you select sides of two different objects, formsheet will
assume you want to adjust one to the other and move into the 'adjust' mode.

The various relational modes will be discussed in subsequent sheets.

sheet no. 8 'Transform' operations date: sept. 2, 1998

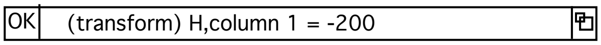




Formsheet

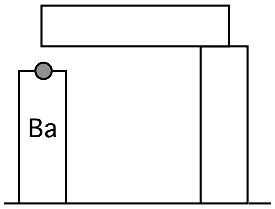
genob	inst						
	column 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

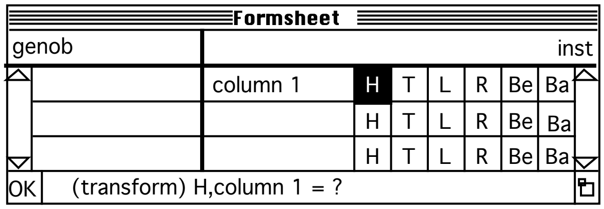
OK (transform) H,T,column 1, = 250



OK (transform) H,column 1 = -200

Selecting (H) and (T) of column 1 makes formsheet assume the transform mode and tellus the length of the column.
We want to shorten the column and therefor type '200' instead of '250' in the dialogue box.
The result is that the column shrinks 50 on the H end, because H is the side we first selected. If we had selected T,H the tail end would have moved.

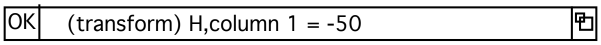




Formsheet

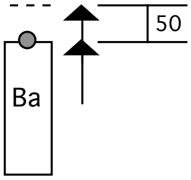
genob	inst						
	column 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (transform) H,column 1 = ?



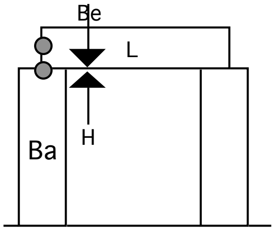
OK (transform) H,column 1 = -50

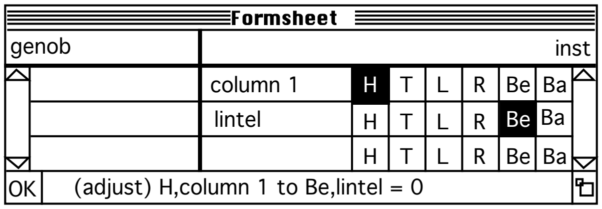
an alternative way is to select H only in the column 1 row.
Now formsheet knows we want to move H and asks how much. We answer by typing in -50



The convention followed here is that a side stands for an arrow reaching from the inside to the side of the object.
That arrow now retreats 50.

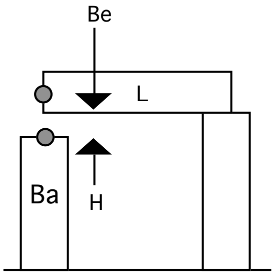
Selecting one or two orientation handles in the row of a same object, without selecting the object itself, is a shortcut to bring us in a 'transform' mode.
We could also have entered this mode by opening the (operation?) menu and choose 'transform'. Then select orientation handles to instruct Formsheet.
See sheet 7 about this menu.

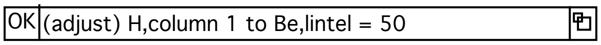



Formsheet

genob							inst
	column 1	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

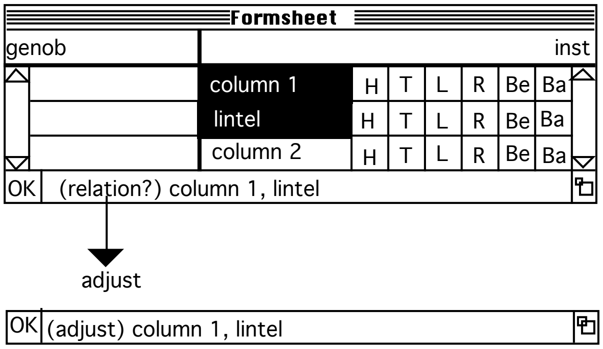
OK (adjust) H,column 1 to Be,lintel = 0




OK (adjust) H,column 1 to Be,lintel = 50

Another way to make column 1 shrink is to adjust the distance between the head of the column and the belly of the lintel.
Select simultaneously the head of column 1 and the belly of the lintel while keeping the shift key down.
Because we have selected the head of the column first, formsheet knows that we want to adjust the position of this head relative to the belly of the lintel, and tells us this distance is now zero.

type in 50 instead of zero, and the head shrinks 50


Formsheet

genob							inst
	column 1	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

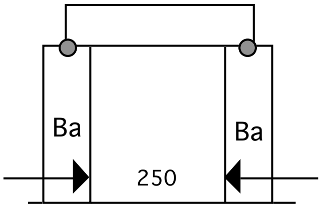
OK (relation?) column 1, lintel

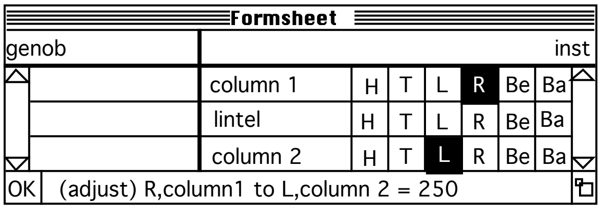
OK (adjust) column 1, lintel

When we select two orientation handles from different objects we have made a shortcut.
If we do this formsheet understands we want to make an adjustment of the position of the first side relative to the second side.
We can also enter into the 'adjust' mode by selecting the two objects and choosing 'adjust' from the (relation?) menu.

For more about the (relation?) menu see sheet 7.

'Position' relation



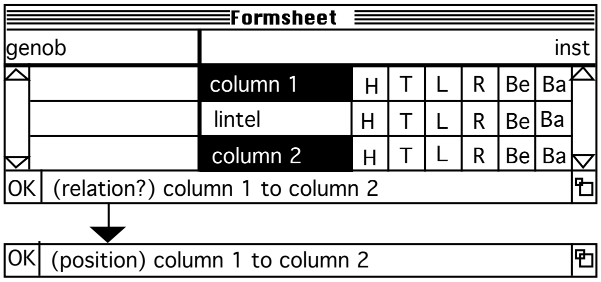


Formsheet

genob	inst						
	column 1	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

OK (adjust) R,column1 to L,column 2 = 250

How to move if we want to change the distance between the two columns without changing the columns themselves? If we would click R,column 1 and L,column 2, formsheet would assume we want to adjust the right side of column 1, making the column thinner or wider, but not move the entire column.



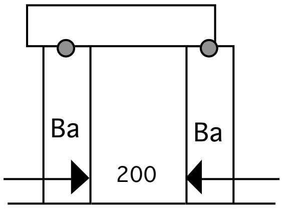
Formsheet

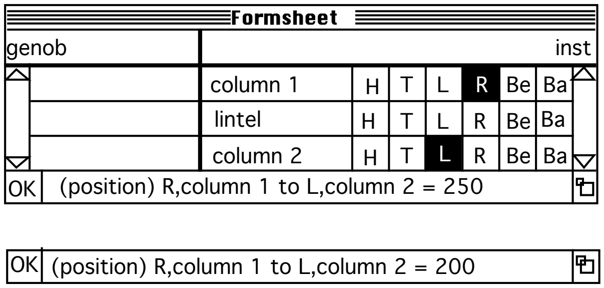
genob	inst						
	column 1	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

OK (relation?) column 1 to column 2

OK (position) column 1 to column 2

To indicate we want to relate the columns entirely, we must select their names, open the relation menu as done before, and choose the 'position' relation.





Formsheet

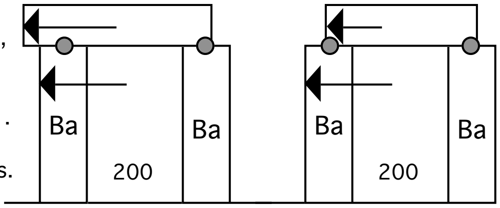
genob	inst						
	column 1	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

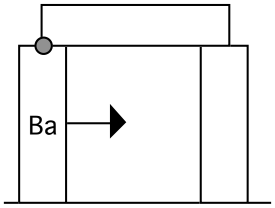
OK (position) R,column 1 to L,column 2 = 250

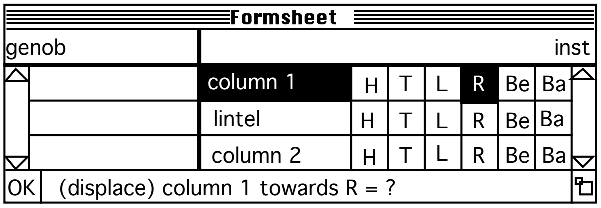
OK (position) R,column 1 to L,column 2 = 200

we now select the sides between which we want to change the distance, as done before, but now formsheet knows it must move column 1 entirely, because this object's side was chosen first and we are working in the 'position' relation mode.

Next, we may adjust the lintel's length to the new span.
Select 'H' in the lintel row and get: (transform) lintel, H ?,
and channge the question mark in -50.
Or:
Select the head of the lintel and the left side of column 1.
This gets: (adjust) H, lintel - 20 = L,column 1
which reflects the present relation between the two sides.
Change this into: (adjust) H,lintel +30 = L,column 1







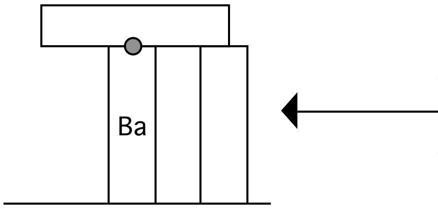
Formsheet

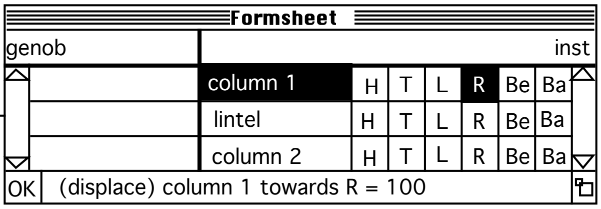
genob inst

column 1	H	T	L	R	Be	Ba
lintel	H	T	L	R	Be	Ba
column 2	H	T	L	R	Be	Ba

OK (displace) column 1 towards R = ?

To move an entire object, select simultaneously the object and the side in the direction of which it must move:
formsheet will recognize this as a 'displace' operation and ask how far the displacement must be.
Formsheet will move the object.



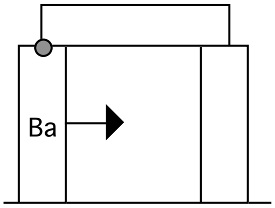


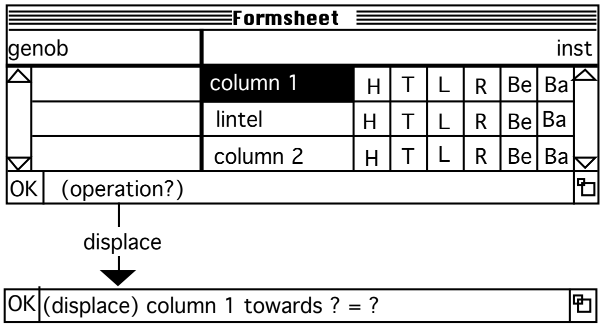
Formsheet

genob inst

column 1	H	T	L	R	Be	Ba
lintel	H	T	L	R	Be	Ba
column 2	H	T	L	R	Be	Ba

OK (displace) column 1 towards R = 100





Formsheet

genob inst

column 1	H	T	L	R	Be	Ba
lintel	H	T	L	R	Be	Ba
column 2	H	T	L	R	Be	Ba

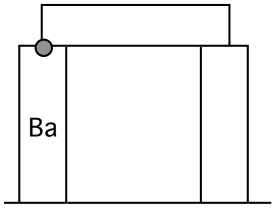
OK (operation?)

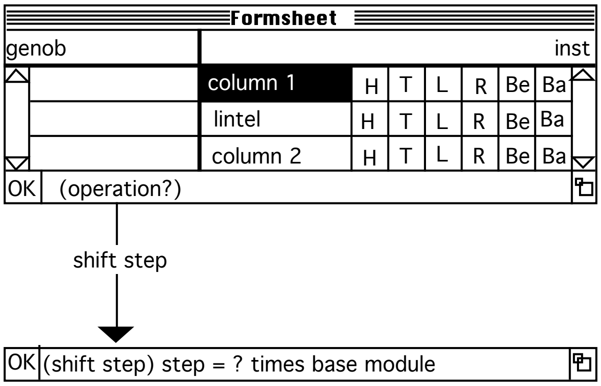
displace

OK (displace) column 1 towards ? = ?

Selecting the object name and one side is an shortcut. It makes Formsheet assume the 'displace' mode.
The alternative is to select the object and choose 'displace' from the (relation?) menu. This will put Formsheet in the 'displace' mode and ask how much the object must be moved and towards what side.
For the (relation?) menu see sheet 7

sheet no. 12 shift steps date: sept. 2, 1998





Formsheet

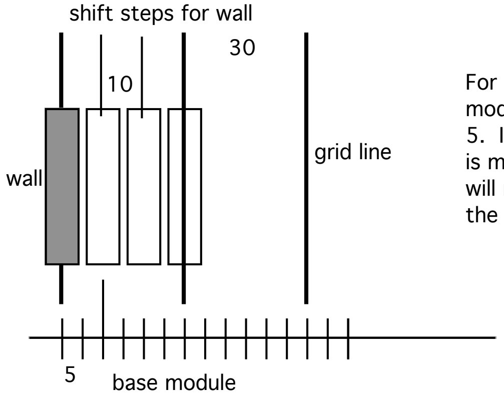
genob	inst						
	column 1	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

OK (operation?)

shift step

OK (shift step) step = ? times base module

The shift step is the unit of displacment by which an object will move when we manipulate the arrow keys on the key board. The shift step is a multiple of the base module of the grid. (see 'grid')
To determine the shift step, select the object and choose 'shift step' from the (operation?) menu. Fill in the multiple times the base module the step must be.



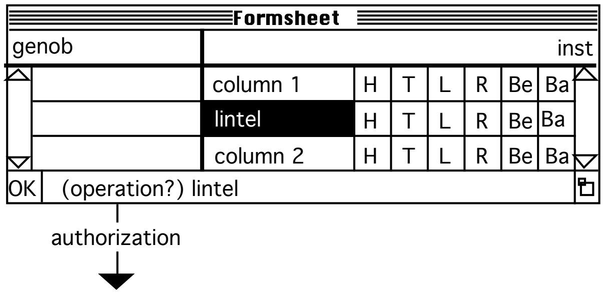
For example: a design has a design module of 30 and a base module of 5. If the shift step for the wall object is made 2X base module, the object will move 10cm each time we press the arrow key.

NB. shift steps are a property of the object and related to the base module of the grid. If another grid base module is chosen, the shift steps will change. If another design module is displayed, the shift step will remain the same.
Usually properties like the shift step are given to generic objects when designing them. They are inherited by the instances made form them. (see sheet 26, generic objects). But with the shift step option in the (operation?) menu, we always can change this.

Coosing 'authorization' in the (operation?) menu for a specific object will get a form showing who can do what with this object in the design process at hand.

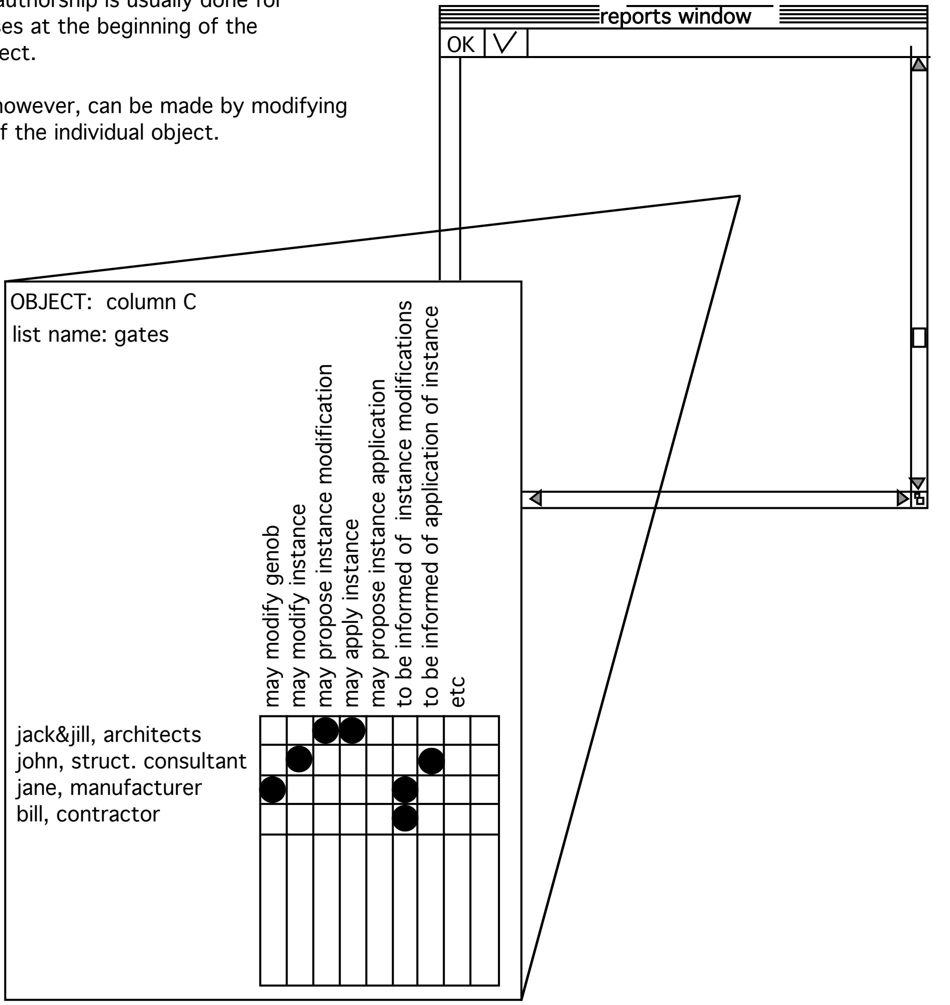
Allocating authorship is usually done for whole classes at the beginning of the design project.

Exeptions however, can be made by modifying the chart of the individual object.



column 1	H	T	L	R	Be	Ba
lintel	H	T	L	R	Be	Ba
column 2	H	T	L	R	Be	Ba

(operation?) lintel



OBJECT: column C

list name: gates

	may modify genob	may modify instance	may propose instance modification	may apply instance	may propose instance application	to be informed of instance modifications	to be informed of application of instance	etc	
jack&jill, architects			●	●					
john, struct. consultant		●					●		
jane, manufacturer	●					●			
bill, contractor						●			

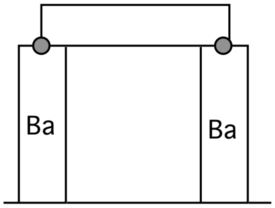
PART WHOLE RELATIONS

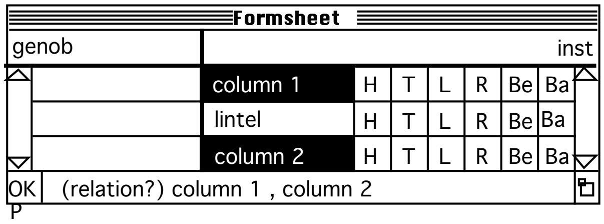
Groups of objects can aquire a name and be entered as such in the instances DB.
This means that Formsheet remembers the composition of groups and that therefore we can manipulate objects that belong to the group, or change the relations among such objects, without the cumbersome procedure of opening the group and then reconstructing it.
Formsheet knows objects by their name and therefore we can call the group and manipulate it as a single object, but we can also call an object that is part of the group and work with it.

The formal structure of groups is that of part-whole relations and by composing and naming groups we can handle complex hierarchies of part-whole organizations on all levels without having to de-compose them.

At the same time, Formsheet will help us remember how the hierarchies are composed and find our way in them.

'Parts whole' relation





Formsheet

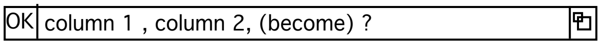
genob							inst
	column 1	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

OK (relation?) column 1 , column 2

P

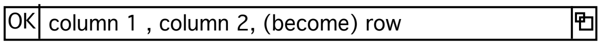
We now will examine grouping of objects. That is to say: making a part/whole hierarchy.

When we select the two columns in the gate design, formsheet wants to know what relation we want to establish.
Choose ' become ' from the (relation?) menu.
This produces:



OK column 1 , column 2, (become) ?

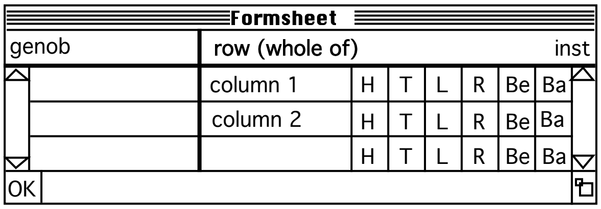
Formsheet wants to know the name for the group we have in mind. We will type in:



OK column 1 , column 2, (become) row

Formsheet responds by showing the object list called 'row'

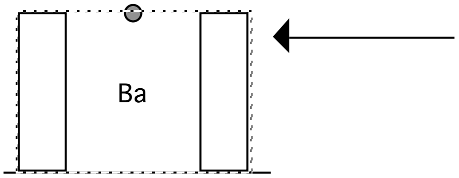
We have now a part/whole organization. The name of the whole is the name of the list of the parts.

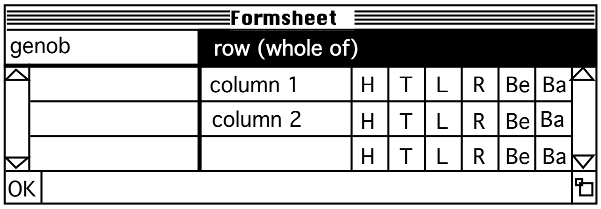


Formsheet

genob	row (whole of)						inst
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK



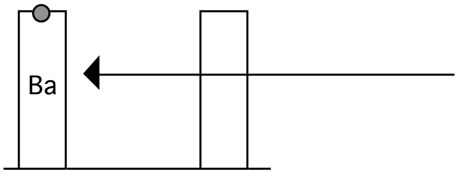


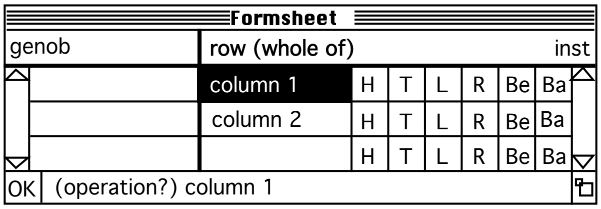
Formsheet

genob	row (whole of)						
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK

Select the name of the list and in the drawing the group is highligted. Note that the new object 'row' has been given a set of default orientation handles. (see sheet 5)





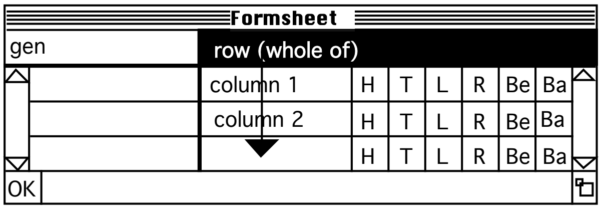
Formsheet

genob	row (whole of)						inst
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

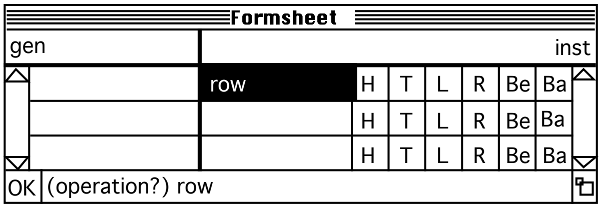
OK (operation?) column 1

Select the name of a column and this column is highligthed in the drawing.

sheet no. 15 Group as single object date: sept. 2, 1998



gen	row (whole of)						
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

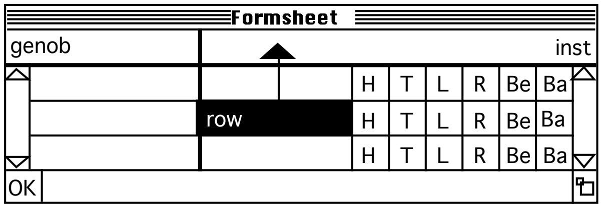


gen	inst						
	row	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

(operation?) row

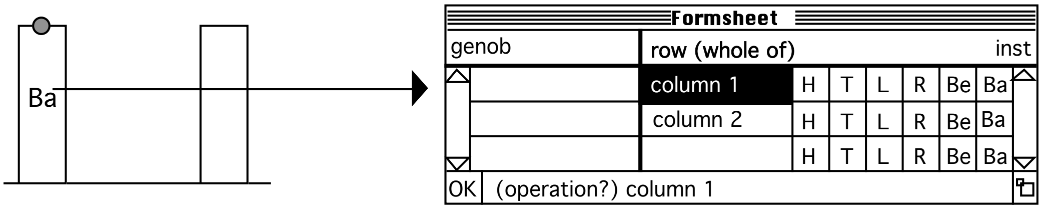
Dragging the name of a part/whole list to an empty instance line makes Formsheet show the group under that name as a single object and ask us what operation we want to perform. This object can now be operated upon as a group in a conventional CAD program. IF we select a part of it in the view window, the whole group will be highlighted.

Dragging the group name to the head of the list will return to the display of the group list as shown above and indidvidual parts can be selected and operated on.



genob	inst						
		H	T	L	R	Be	Ba
	row	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

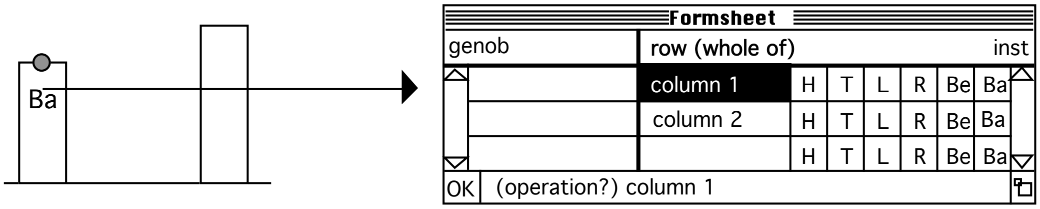
sheet no. 16 Changing a group, 'fix' and 'unfix'. date: sept. 2, 1998



genob	row (whole of)						inst
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?) column 1

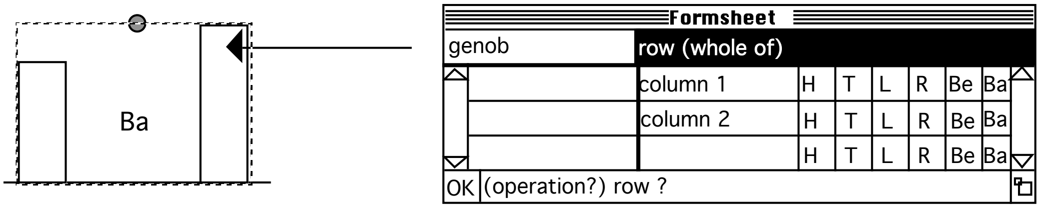
When we select a column in the view window whithout the row shown as an object in Formsheet it will be highlighted individually and will appear in Formsheet as part of the group it belongs to. This is different from conventional cad programs where we would get the whole group if we point at one of its parts.



genob	row (whole of)						inst
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?) column 1

The column can be operated upon as we have done before, while it remains a member of the group.



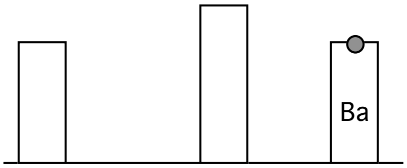
genob	row (whole of)						
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

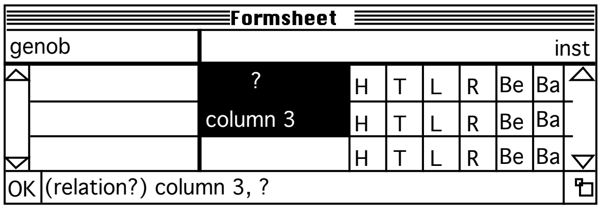
OK (operation?) row ?

When, after manipulation of the column we call the group again by selecting the row name, the changed column will figure as a member of the group and the circumference of the group will be shown accordingly, following the conventions of grouping already in use.

'Fix', 'unfix', operation.
The above is different from what happens in conventional CAD programs where groupings need to be un-grouped for the parts to be manipulated and the program has no memory of the group.
However: One can select the row name and choose 'fix' from the (operation?) menu.
This will make the row as a whole the lowest manipulable object in the hierarchy. When a part is selected in the view window or in the instances list, the whole group will be highlighted as in conventional cad programs and the 'row' name will appear as an item in the instance list. Bringing the 'row' name up to the heading will display the list of its parts again, but these parts cannot be operated upon unless 'unfix' is selected from the (operation?) menu.

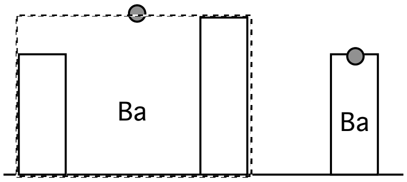
sheet no. 17 add to and subtract from a group date: sept. 2, 1998

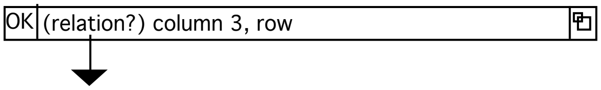



Formsheet

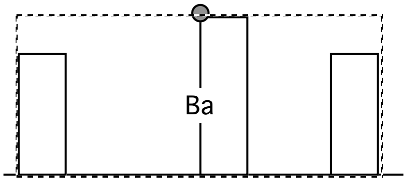
genob	inst						
	?	H	T	L	R	Be	Ba
	column 3	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

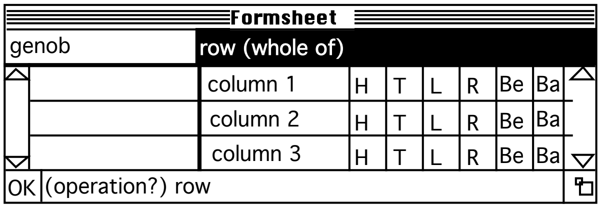
OK (relation?) column 3, ?




OK (relation?) column 3, row

part of



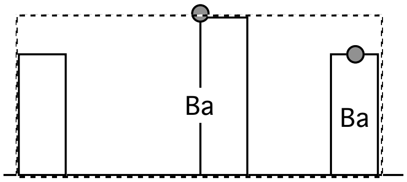

Formsheet

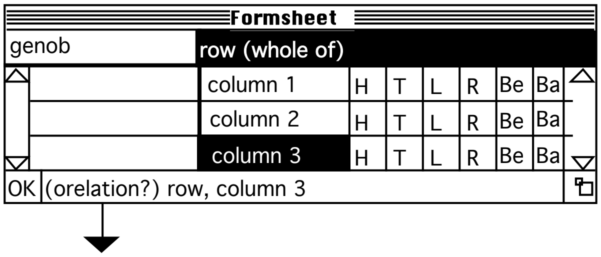
genob	row (whole of)						
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
	column 3	H	T	L	R	Be	Ba

OK (operation?) row

Formsheet will normally display an instance called '?' on the top cell of the instance list. This 'empty cell' serves to call for relations with yet to be identified objects.
To add a third column to the row: select column 3 and select the empty instance cell. Formsheet will asl fort the name column 3 must relate to. Type in 'row' and choose 'part of' from the (relation?) menu. Formsheet will make column 3 part of the row and display the new row list and highlight the expanded group in the drawing.

Alternatively one can select both the third column and the row (either in the view window, or in the instance list) and choose 'part of' in the (relation?) menu.




Formsheet

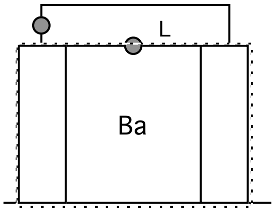
genob	row (whole of)						
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
	column 3	H	T	L	R	Be	Ba

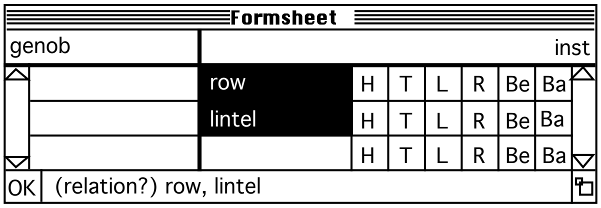
OK (orelation?) row, column 3

doesn't include

To take column 3 out of the group: select first the row name and next the column 3 name and choose 'doesn't include' from the (relation?) menu.
Or select first column 3 and next the row name and choose 'not part of' in the (relation?) menu.

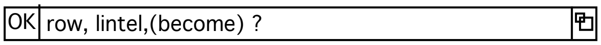
sheet no. 18 Group within group date: sept. 2, 1998

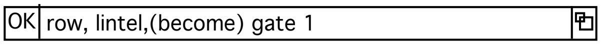


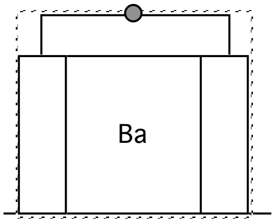

Formsheet

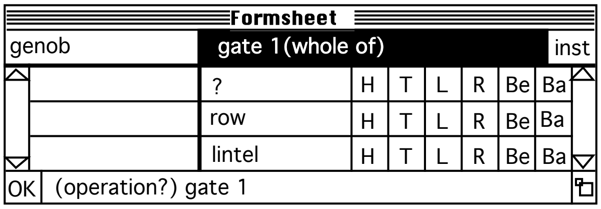
genob	inst						
	row	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (relation?) row, lintel


OK row, lintel,(become) ?


OK row, lintel,(become) gate 1

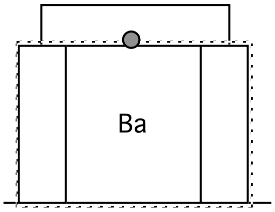


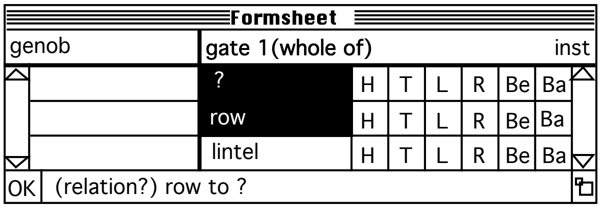

Formsheet

genob	gate 1(whole of) inst						
	?	H	T	L	R	Be	Ba
	row	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba

OK (operation?) gate 1

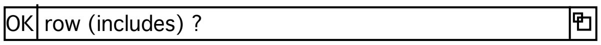
We may now make another group, called 'gate 1' of which the row is a part.
We repeat the grouping action done earlier by selecting both the row and the lintel in the drawing.(or select lintel and empty cell and type in 'row' when queried by Formsheet.)
Formsheet will ask what relation we want them to have and we will choose 'become'.
We are now prompted to give the name of the new whole and when we type in 'gate 1' we obtain a list called 'gate 1(whole of) in which the row and the lintel are parts.



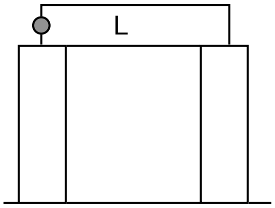

Formsheet

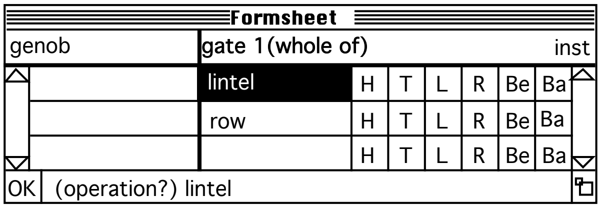
genob	gate 1(whole of) inst						
	?	H	T	L	R	Be	Ba
	row	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba

OK (relation?) row to ?


OK row (includes) ?

Selecting the row object in the list we will see in the view window that it comprises several elements.
we now can relate it to the empty instance cell and choose relation 'includes' to get the row list.
Or we may drag the 'row' name to the head of the instance list and get the same result.
In this way we can make a hierarchy of parts and wholes and move up and down in it.

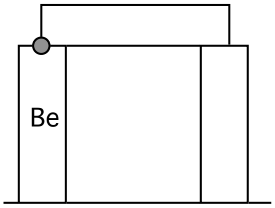


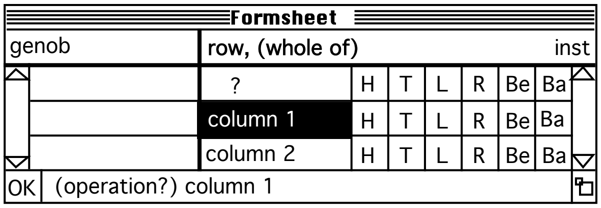

Formsheet

genob	gate 1(whole of)						inst
	lintel	H	T	L	R	Be	Ba
	row	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?) lintel

if we now select the lintel in the drawing, formsheet will show its name but also tell us it is a part of the whole called 'gate 1'

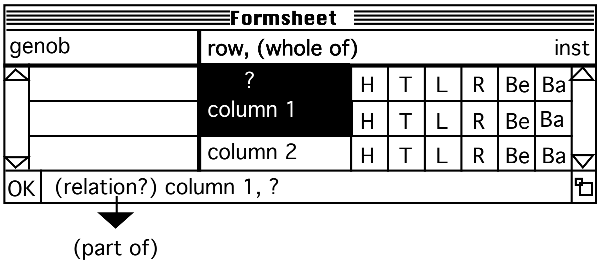



Formsheet

genob	row, (whole of)						inst
	?	H	T	L	R	Be	Ba
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

OK (operation?) column 1

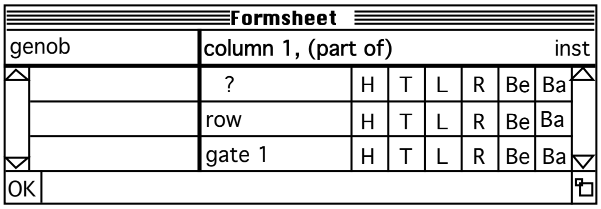
When we select column 1 in the drawing, formsheet will show its name but also tell us it is a part of the
whole called 'row'.


Formsheet

genob	row, (whole of)						inst
	?	H	T	L	R	Be	Ba
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

OK (relation?) column 1, ?

(part of)

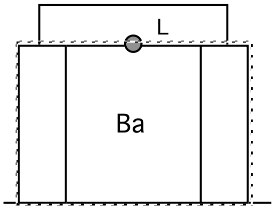

Formsheet

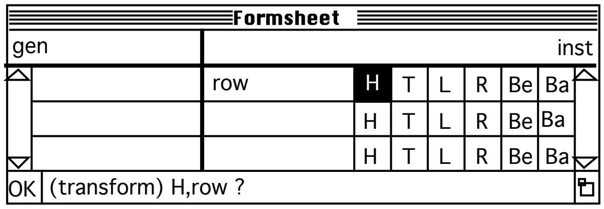
genob	column 1, (part of)						inst
	?	H	T	L	R	Be	Ba
	row	H	T	L	R	Be	Ba
	gate 1	H	T	L	R	Be	Ba

OK

When we relate column 1 to the empty instance cell and choose (part of) from the (relation?) menu, formsheet will list the groups column 1 is part of.
Selecting any of these wholes will show it in the view window
Relating the 'row' instance to an empty instance cell and choosing (incluces) from the (relations?) menu will produce the 'row' list of parts. Dragging the 'row' name to the heading of the list will produce the same result.

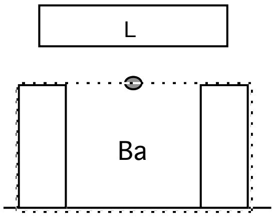
sheet no. 20 transforming a group date: sept. 2, 1998

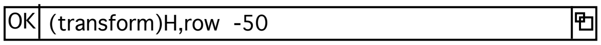




gen		inst					
	row	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (transform) H,row ?

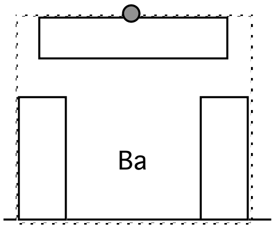



OK (transform)H,row -50

We now may shrink the two columns of gate 1 by selecting H of object 'row' and replacing the question mark with -50

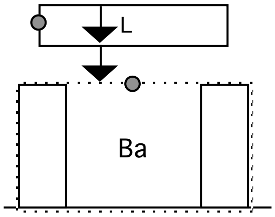
In changing the size of a group, formsheet will follow the same conventions as already in use in traditional cad programs.

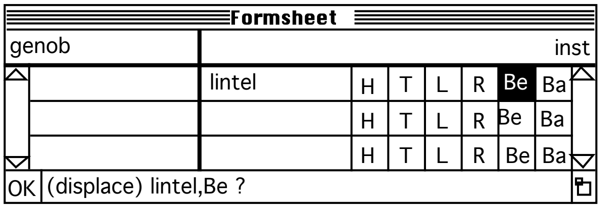
Of course, the group can also be altered by re-distributing or re-sizing the individual objects in it as we have seen in sheet 15.



While the subgroup 'row' has been altered, the group 'gate 1' remains valid as before.

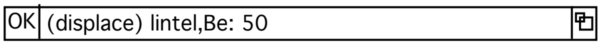
re-positioning or displacing an object



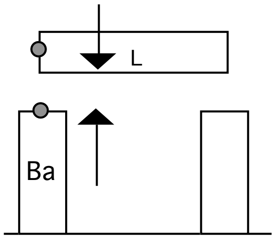

Formsheet

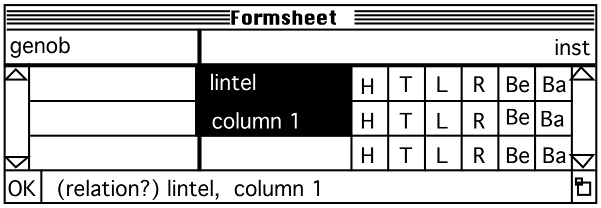
genob		inst					
	lintel	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (displace) lintel,Be ?


OK (displace) lintel,Be: 50

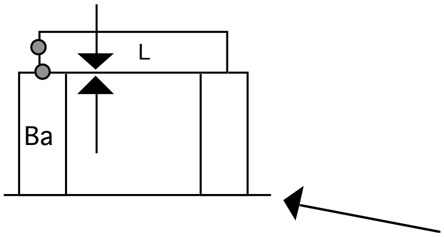
We now may want to bring the lintel towards the columns. There are again a number of ways: select the lintel in the drawing and choose 'displace' from the (operation?) menu.
Then select Be to indicate the direction in which the displacement must go, and replace the question mark with +50. This operation works when we already know the distance between lintel and row. (see sheet 11)

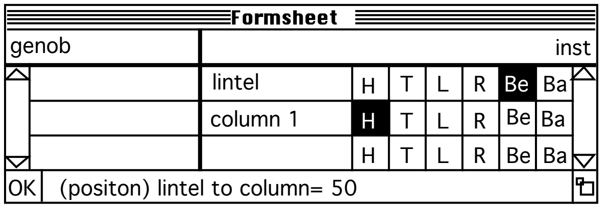



Formsheet

genob		inst					
	lintel	H	T	L	R	Be	Ba
	column 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

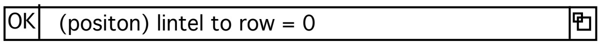
OK (relation?) lintel, column 1




Formsheet

genob		inst					
	lintel	H	T	L	R	Be	Ba
	column 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (positon) lintel to column= 50


OK (positon) lintel to row = 0

A second way to obtain the same result is to select both lintel and column.
We need not select 'position' from the (relation?) menu but can directly select the belly of the linte and the head of the column, for formsheet to enter in the 'positon' mode and to tell us that the distance is 50

When we change 50 to zero, the lintel drops to the head of the row.
(see sheet 10)

ABSTRACTION

By means of the abstraction operation a group of many parts is replaced by a single object bearing the same name as the group it represents.

Abstraction makes it possible to incorporate many grouped objects in a larger context without the need to drag with them information that is not relevant on that scale. A house design, for instance, can figure in an urban design scheme in an abstracted mode. Or a fully detailed window may be shown abstracted in a facade view.

Basically , by abstraction, we create one single representation that stands for what by itself is a complete, and often complex, design. The potential for efficient use of memory (and time to display it) is considerable.

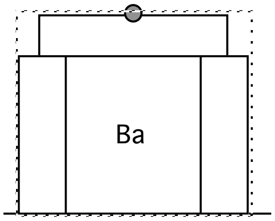
Conceptually the abstraction operation reflects the way we tend to see things. When we consider a facade we are working on a composition of windows. Each window itself may be the result of a fairly detailed and complex design. Similarly, when we have designed an object like a house and want to study the urban design in which the house must figure, we will not think of the many parts the house consists of.

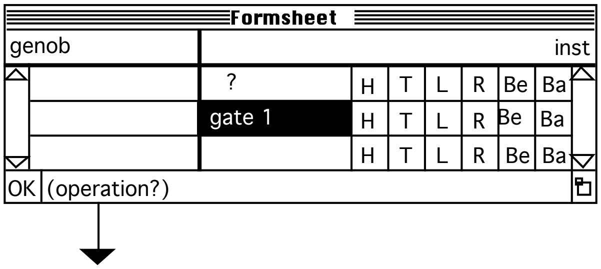
This suggests that abstraction works two ways and indeed, we will see that we may begin with a simple form standing for something yet to be designed in detail and later specify this simple form by a separate design of which it becomes the abstraction.

In both cases a link is made between a complete design (the specification) and the representation of a part (the abstraction). The link is the name: both items must bear the same name. Thus the design of the 'jackson house' will relate to a simple object also called 'jackson house'.

Abstraction can link two separate databases so that calling for the specification of a abstracted representation means loading an entirely new database. In other cases, the information supporting the specification will be part of the database of a the comprehensive design.

Abstraction





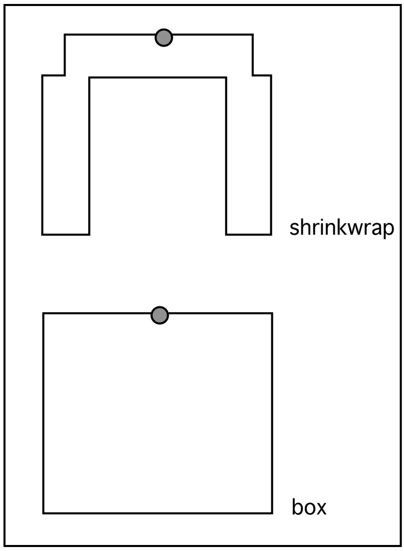
Formsheet

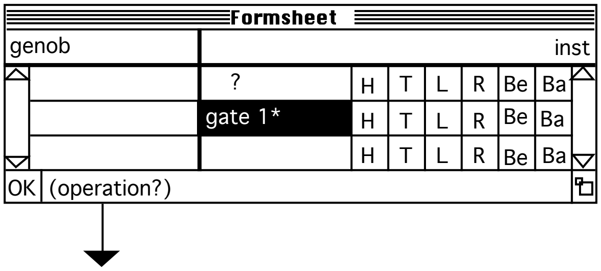
genob	inst						
	?	H	T	L	R	Be	Ba
	gate 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?)

Abstract

shrinkwrap
box
custom



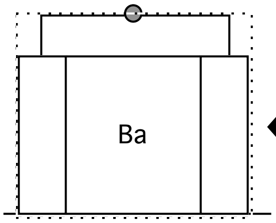


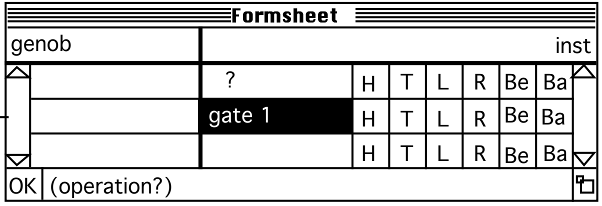
Formsheet

genob	inst						
	?	H	T	L	R	Be	Ba
	gate 1*	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?)

specify





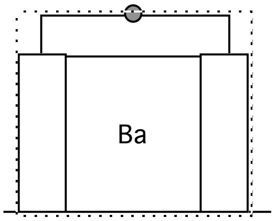
Formsheet

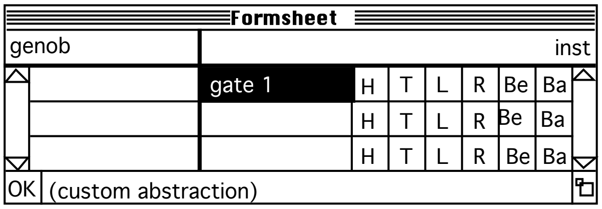
genob	inst						
	?	H	T	L	R	Be	Ba
	gate 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?)

Any grouping of objects that has a name, can be abstracted into a single object. Select the object and choose 'abstract' from the (operations?) menu. A choice of three ways to abstract is offered: 'Shrinkwrap' will draw the contour of the group. 'Box' will draw the smallest ortogonal volume in which the
group fits. "Custom' allows you to draw whatever representation you want.(see next sheet)
An abstracted representation will bear the same name of the group it represents, but the name will have an asterix (*) to indicate it is an abstraction. From now on there ar two objects, each a representation of the same design : 'gate 1' and 'gate 1*' and the designer is free to enter either one in the view at hand.

custom abstraction

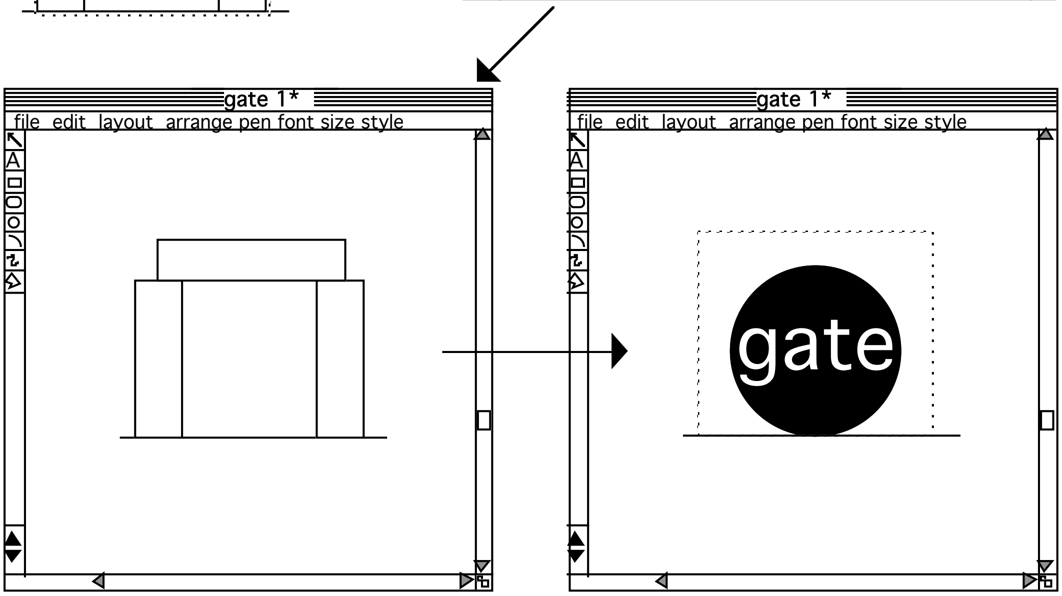




Formsheet

genob	inst					
	gate 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (custom abstraction)

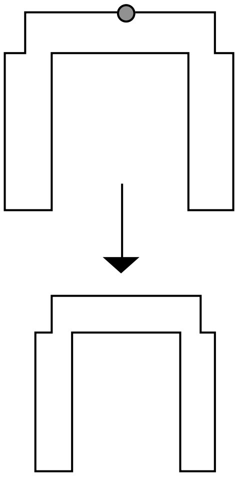

gate 1*
file edit layout arrange pen font size style
gate 1*
file edit layout arrange pen font size style
gate

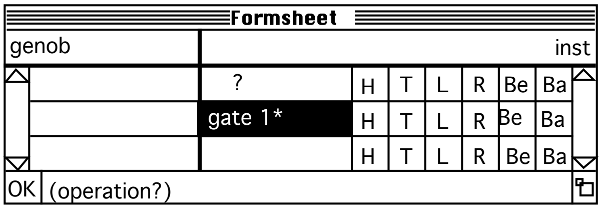
If 'custom' is selected from the 'abstract' option in the (operation?) menu, formsheet produces a separate view window called 'gate 1*' in which a copy of the gate 1 group is shown. With the help of the tool box in the view window we can create the alternative design we want to replace the initial design with,
When satisfied, close the 'gate 1*' window, and the new representation will figure in the original view.
When the 'gate 1*' object is selected in the design and 'specify' is chosen from the (operation?) menu, the orignal 'gate 1' group will replace the abstraction.

NB
Formsheet knows only volumes. The shrink wrap and box mode offer volumes that can be viewed like any other object including in cross sections.
(For calling alternative views of the same object, see sheet 61
The 'custom' representation can be any other design even one consisting of many parts, although that would defeat the abstraction purpose. The example shown here basically offers a invisible box volume and various views of that invisible box can be adorned with any picture one wants (such views may also including sections). These pictures need not have the size of the invisible box, but for purposes of dimensional information and relations with other objects the invisible box will serves.

For instance: a custon abstraction for a window or door may have two sides and two sections (horizontal and vertical) drawn in.

change of dimensions of an abstraction

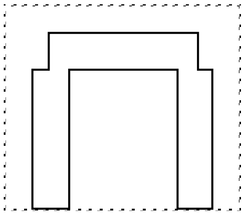


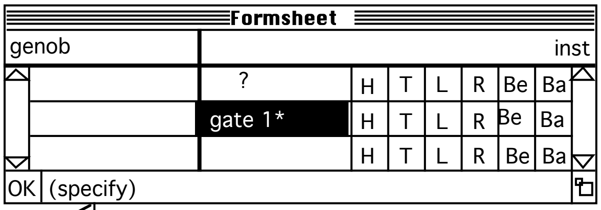


Formsheet

genob	inst						
	?	H	T	L	R	Be	Ba
	gate 1*	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?)

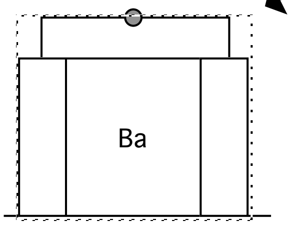


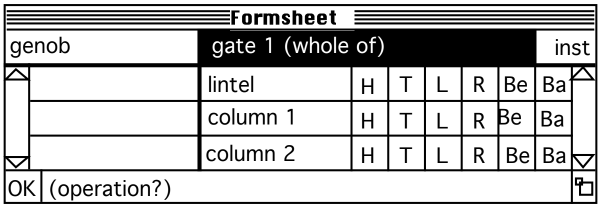


Formsheet

genob	inst						
	?	H	T	L	R	Be	Ba
	gate 1*	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (specify)





Formsheet

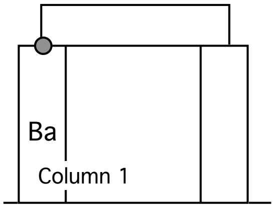
genob	gate 1 (whole of)	inst					
	lintel	H	T	L	R	Be	Ba
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba

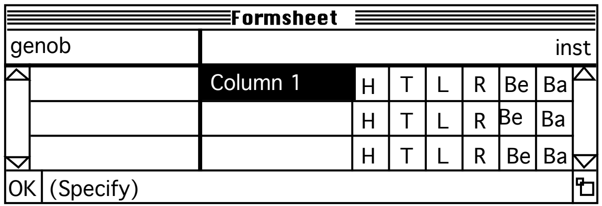
OK (operation?)

An object which is an abstraction can be manipulated, grouped, and changed as any other object. However, when we change its size, we will only change the representation of the original group, not its 'true' size. If, for instance, we shrink gate 1, it will aquire new dimensions, but when we ask for its

specification, formsheet will give us the original group. We now can modify this group to correspond to the new dimensions of the whole, or in any other way. There is no convention for automatic correspondence between specification and abstraction.

specification of an abstraction

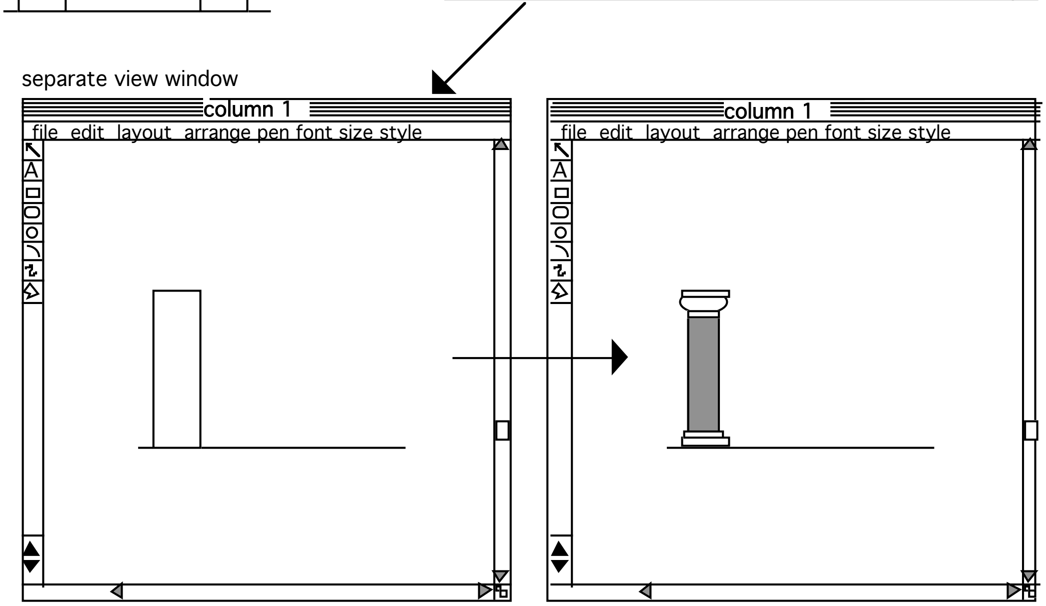


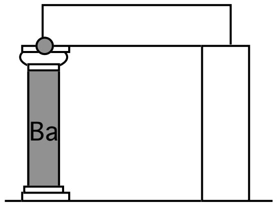

Formsheet

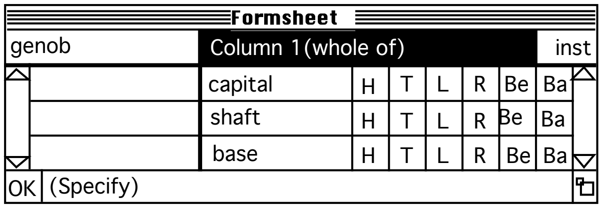
genob							inst
	Column 1	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (Specify)

separate view window


column 1
file edit layout arrange pen font size style
column 1
file edit layout arrange pen font size style

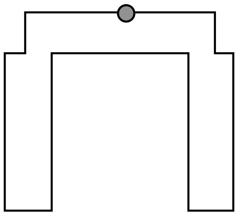


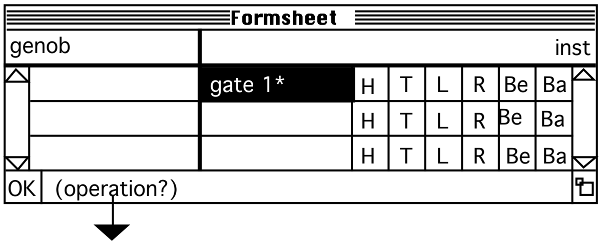

Formsheet

genob	Column 1(whole of)						inst
	capital	H	T	L	R	Be	Ba
	shaft	H	T	L	R	Be	Ba
	base	H	T	L	R	Be	Ba

OK (Specify)

Where a group can be abstracted into a single volume, a single volume can be specified as a group of several parts.
Select column 1 from the gate design and choose 'specify' from the (operation?) menu. Formsheet gives the name of the initial object a asterix (*) and a new window appears, called 'column 1' being the specification of column 1*. We now can change the design by replacing the single volume with a combination of three objects called 'capital', 'shaft' and 'base'. Formsheet will understand that 'column 1' now is a group of three objects. In fact it automaticall groups all objects in the new view window.
When we close the window, formsheet will show the specified group in the initial view window. This group will now assume all relations already connected to what is now 'column 1*'. When we call for its abstraction we may choose 'box' and get the original volume of that name'. Or we may choose shrinkwrap or custom.



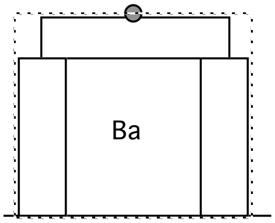


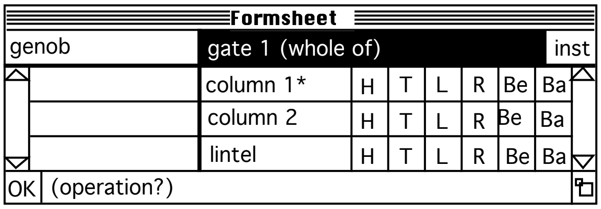
Formsheet

genob	inst						
	gate 1*	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?)

specify

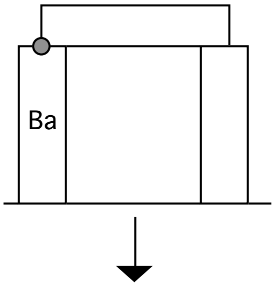


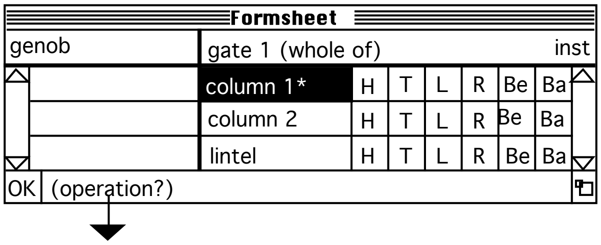


Formsheet

genob	gate 1 (whole of)						inst
	column 1*	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba

OK (operation?)



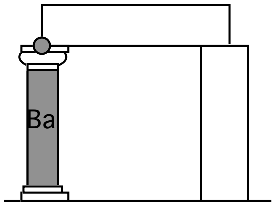


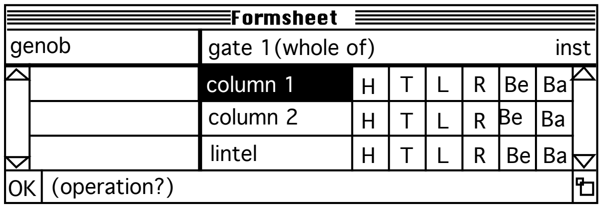
Formsheet

genob	gate 1 (whole of)						inst
	column 1*	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba

OK (operation?)

specify





Formsheet

genob	gate 1(whole of)						inst
	column 1	H	T	L	R	Be	Ba
	column 2	H	T	L	R	Be	Ba
	lintel	H	T	L	R	Be	Ba

OK (operation?)

Now, if we select gate 1* the abstraction shown in our view window, and ask for its specification in the (operarion?) menu, we will get a list called 'gate 1'. And in the drawing the abstraction will be replaced by the parts in the list.

the abstraction Column 1* will be in that list. Thus we find another abstraction as part of the specification of the first one.

We now can select column 1* and again choose 'specify' in the (operation?) menu. Formsheet will then show the group 'column 1' and in the list this group is named 'column 1' without an asterix.

If we now ask, in the (relation?) menu, what is included in column 1, we will get the list called 'column 1' listing capital, shaft, and base. (see sheet 11)

GENERIC OBJECTS

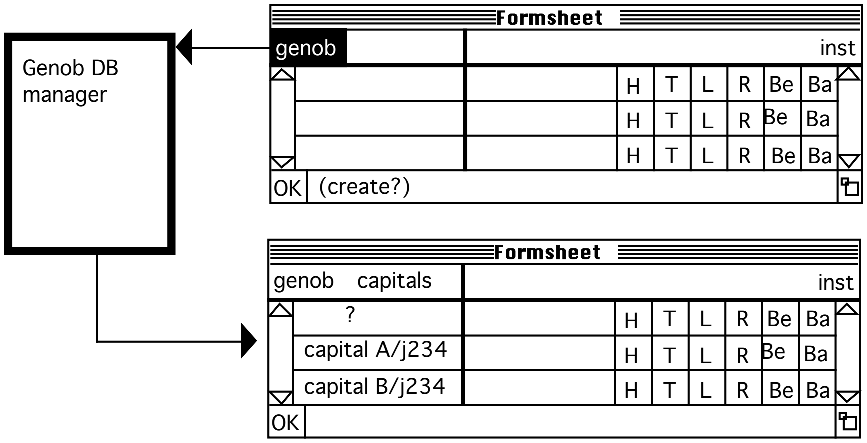
Most designing is using already known types and elements to be modified and combined into a new whole.
For that reason architects offices use libraries of standard details and already executed designs. Sub-cntractors offering technical systems use pre-designed and often already manufactured parts to be combined in specific systems serving specific buildings. Consultants use generic parts that can be viewed as abstractions of of-the-shelve systems or serve as bases for customized designs.

Formsheet therefore makes a clear distinction between the objects that figure in a specific design, called 'instances' and objects already designed, serving to be copied and modified, called 'generic objects' or 'genobs' for short.

A design process starts with the selection and composition of a genob database (library) deemed useful for the particular design task. This specific genob DB may be culled from a variety of extant libraries or may be the comprehensive basic library for an ongoing office. In all cases the genob DB presents a list of genobs or a list of lists each list containing genobs for a particular part of the design task.

Designers select genobs from these lists and import copies into the design. Such a copy makes an 'instance'. Instances can be modified and changed, often substantially, other times not at all. The transfer from a genob to an instance means that the information standing for the genob is copied from the genob DB into the Instance DB which stands for the design.

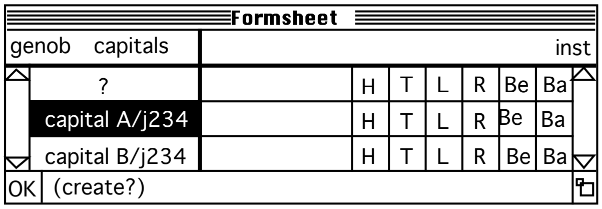
Producing an object from scratch, defined in three dimensions and sufficiently specified, is a time consuming undertaking. Therefore using genobs saves time and effort even if the instance will be considerably modified.
Formsheet is built in such a way that it encourages the use of genobs. To that purpose it contains a number of basic genobs, that will be part of any library, standing for very generic forms with particular transformational properties out of which most other objects can be made by modification and additional specification. These basic 'kinds' of objects will be clarified in subsequent sheets under the heading 'creating objects' (section F). No doubt this set of basic objects can be extended, but what is offered here is already able to cover a very large percentage of the forms used in architectural design, including its technical systems.



Generic Objects, or Genobs, are objects available in a library. Being generic they do not belong to any design but can deliver instances for a design.
Formsheet may contain any number of lists of genobs organized in any way we prefer.

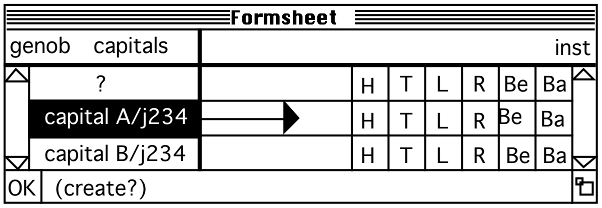
Pressing the 'genob' button brings you to the genob DB manager with the help of which the desired genob lists can be culled or composed from extant databases and arranged in the best way to support the design at hand. (See for the genob DB manager sheet 59)

The lists of the genob DB thus composed can be viewed in the left hand side of Formsheet



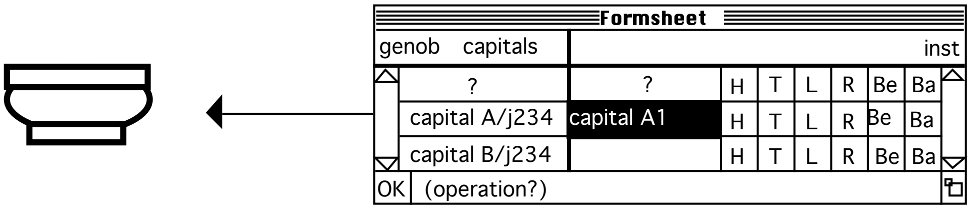
Formsheet knows objects by their names. Therefore names must be unique. The name of a generic object consists of two parts separated by a /. The first part is the 'short name' by which we will know the object in terms of daily language. (e.g. 'capital A') The second part is a code which can be up to (?) digits and/or characters long. This code will identify the library the object is in and follow any other classification deemed of use to organize object lists and libraries.

In this way the name 'capital A' may be found in several libraries. But two genobs, each named 'capital A', can always be distinguished by their unique second names.



Formsheet

genob capitals	inst						
?		H	T	L	R	Be	Ba
capital A/j234		H	T	L	R	Be	Ba
capital B/j234		H	T	L	R	Be	Ba
OK (create?)							

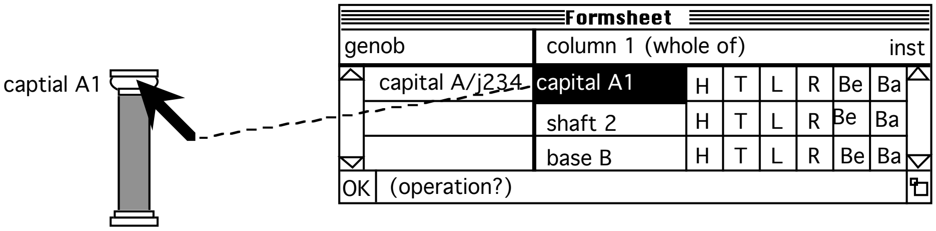


Formsheet

genob capitals	inst						
?	?	H	T	L	R	Be	Ba
capital A/j234	capital A1	H	T	L	R	Be	Ba
capital B/j234		H	T	L	R	Be	Ba
OK (operation?)							

To make an instance of a genob there are two ways:
1.
Select the object in the genob list and drag it to an empty cell in the instance list.
The instance will appear in the view window in the lower left hand corner to be dragged to its correct location. Its short name will appear in the instance list where it will get a number to distiguish it from any other instance of the same name in the ongoing project. It will not inherit the longer name of the genob.

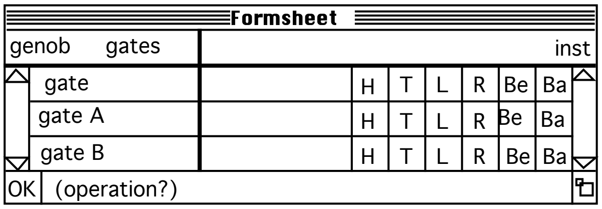
2.
Select the object in the genob list and move the cursor to the view window,
Click the cursor where the instance must be and it will appear in that spot. Its short name will appear in the instance list.



Formsheet

genob	column 1 (whole of) inst						
capital A/j234	capital A1	H	T	L	R	Be	Ba
	shaft 2	H	T	L	R	Be	Ba
	base B	H	T	L	R	Be	Ba
OK (operation?)							

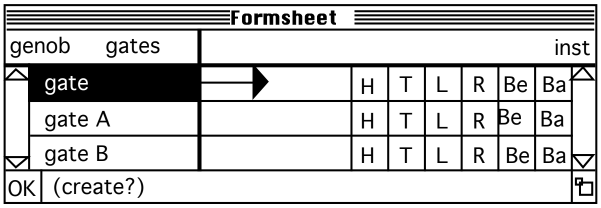
By preference the short name of the objects in the drawing may appear next to them in the drawing.



Formsheet

genob gates	inst						
gate		H	T	L	R	Be	Ba
gate A		H	T	L	R	Be	Ba
gate B		H	T	L	R	Be	Ba

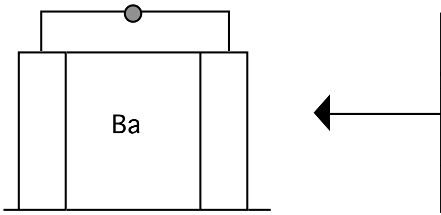
OK (operation?)

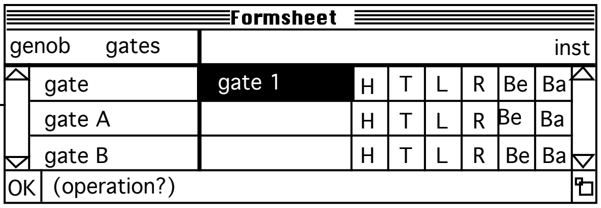


Formsheet

genob gates	inst						
gate		H	T	L	R	Be	Ba
gate A		H	T	L	R	Be	Ba
gate B		H	T	L	R	Be	Ba

OK (create?)





Formsheet

genob gates	inst						
gate	gate 1	H	T	L	R	Be	Ba
gate A		H	T	L	R	Be	Ba
gate B		H	T	L	R	Be	Ba

OK (operation?)

groups of objects can be genobs as well. This makes a 'composite genob' as opposed to a 'primitive genob' like the capital previously shown. (which is drawn with the basic volumes available in the view window when we design a genob without use of library elements. (see section F, sheet 36))
For instance, gate 1 may be an instance taken from a composite genob. It can be taken from the genob list 'gates' containing it.

A genob is a design by itself incorporated in the genob library.
The instance obtained from a composite genob is a group of objects which inherits all the internal relations and sub-groupings that the genob design has. But the newly created instance has no external relations yet.
Of course, once we have an instance, we can modify it. This modification remains unique for the instance (unless we copy it). The genob where it comes from will not change, neither will other instances derived from the same genob.

The genob library, composed for a particular project (see sheet 59) may be a single list of genobs, the sequence of which may be alphabetical, or may be reflecting an expected sequence of design decisions.
With extended libraries, it may be best to have several lists - for instance one for each subsystem to be incorporated in the design. Thus the library becomes a list of lists, or even a hierachy of lists.

We can view such a hierarchy of genob lists in the genob list column.

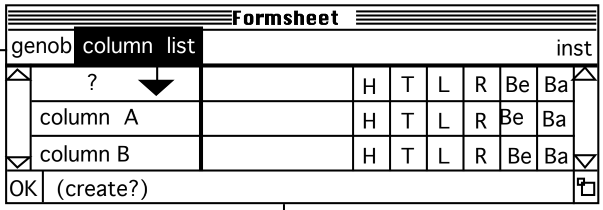
Coming from inside a genob list, take the list's heading and drag it to an empty genob cell. (1)
This will produce the list that genob list is part of. Thus we see the column list as part of the gate lists list. (2)
To go higher up the hierarchy, bring again the header down into an empty cell. (3, 4)

To go down the hierarchy of lists, bring a list name up into the header. (3,5)

Once a list of genobs is displayed, we can make one into an instance by dragging its name to an instance cell.

Lists (plural)contain other lists. A list (singular) contains genobs. Note that in the example as given, the gate lists list (3) has three items: the lintel list contains primitive genobs. The gate list contains composite genobs of complete gates. (5) The column lists list can be opened to give lists of columns and parts of columns (lists of composite column genobs, and of primitive genobs of shafts. capitals, bases, for instance).

1

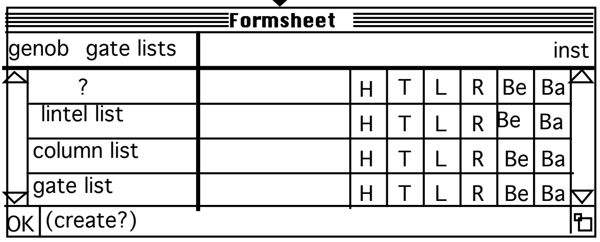


Formsheet

genob column list	inst						
?		H	T	L	R	Be	Ba
column A		H	T	L	R	Be	Ba
column B		H	T	L	R	Be	Ba

OK (create?)

2

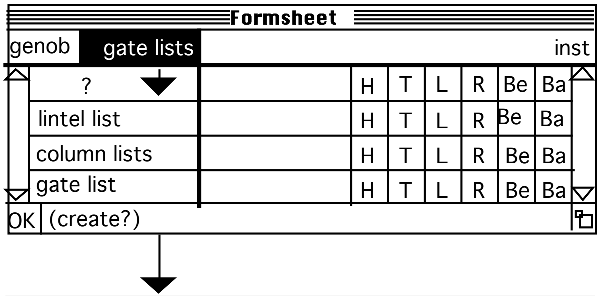


Formsheet

genob gate lists	inst						
?		H	T	L	R	Be	Ba
lintel list		H	T	L	R	Be	Ba
column list		H	T	L	R	Be	Ba
gate list		H	T	L	R	Be	Ba

OK (create?)

3

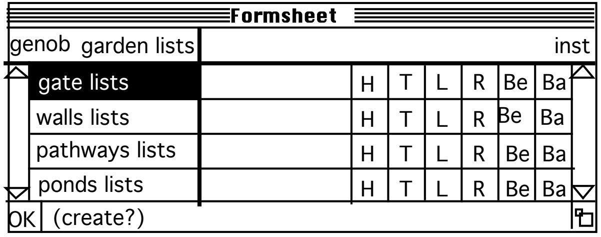


Formsheet

genob gate lists	inst						
?		H	T	L	R	Be	Ba
lintel list		H	T	L	R	Be	Ba
column lists		H	T	L	R	Be	Ba
gate list		H	T	L	R	Be	Ba

OK (create?)

4

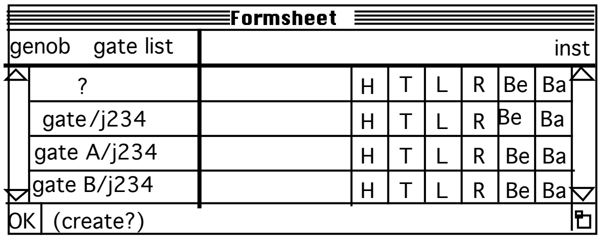


Formsheet

genob garden lists	inst						
gate lists		H	T	L	R	Be	Ba
walls lists		H	T	L	R	Be	Ba
pathways lists		H	T	L	R	Be	Ba
ponds lists		H	T	L	R	Be	Ba

OK (create?)

5

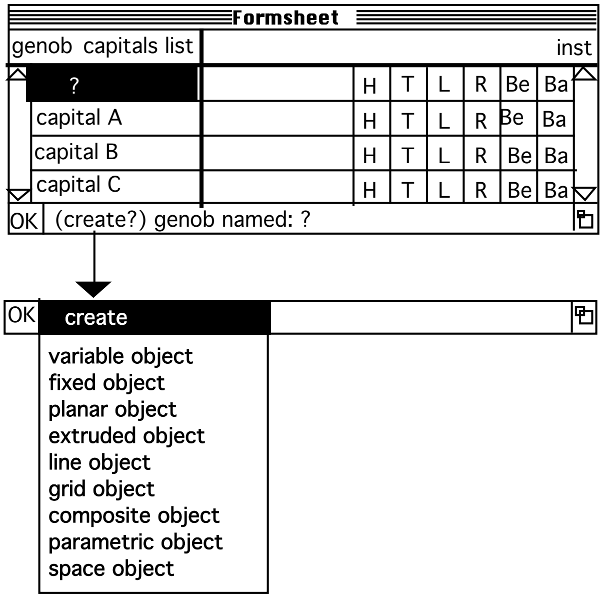


Formsheet

genob gate list	inst						
?		H	T	L	R	Be	Ba
gate/j234		H	T	L	R	Be	Ba
gate A/j234		H	T	L	R	Be	Ba
gate B/j234		H	T	L	R	Be	Ba

OK (create?)

Selecting the empty genob cell (?) will bring the (create) menu in the dialogue bar and Formsheet will ask for the name of the new genob.
Opening the menu allows us to choose the kind of object we want to create.
see the following sheets.

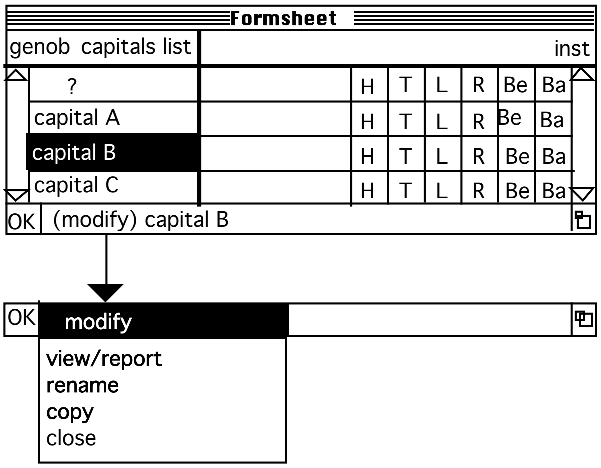


Formsheet

genob capitals list	inst						
?		H	T	L	R	Be	Ba
capital A		H	T	L	R	Be	Ba
capital B		H	T	L	R	Be	Ba
capital C		H	T	L	R	Be	Ba

OK (create?) genob named: ?

selecting a genob name will bring a (modify) menu, allowing us to change the selected genob.

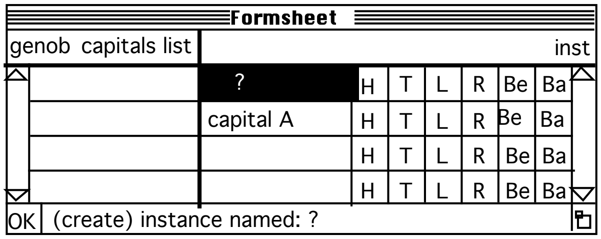


Formsheet

genob capitals list	inst						
?		H	T	L	R	Be	Ba
capital A		H	T	L	R	Be	Ba
capital B		H	T	L	R	Be	Ba
capital C		H	T	L	R	Be	Ba

OK (modify) capital B

The create menu appears also when we select the empty instance cell (?).
In that case Formsheet understands we want to create an instance.

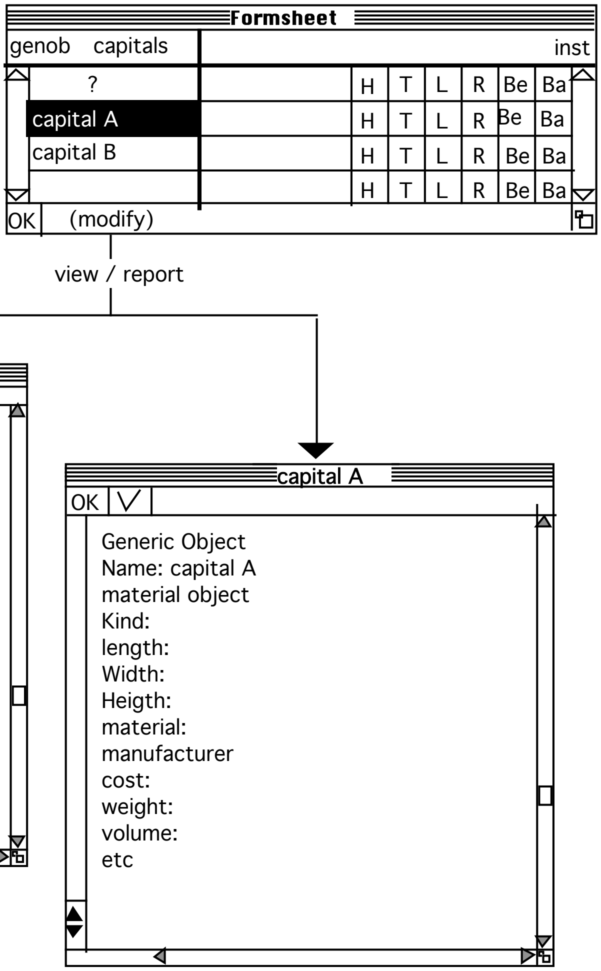


Formsheet

genob capitals list	inst						
	?	H	T	L	R	Be	Ba
	capital A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (create) instance named: ?

change a genob design



Formsheet

genob capitals							inst
?		H	T	L	R	Be	Ba
capital A		H	T	L	R	Be	Ba
capital B		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (modify)

view / report

capital A

capital A

Generic Object
Name: capital A
material object
Kind:
length:
Width:
Heigth:
material:
manufacturer
cost:
weight:
volume:
etc

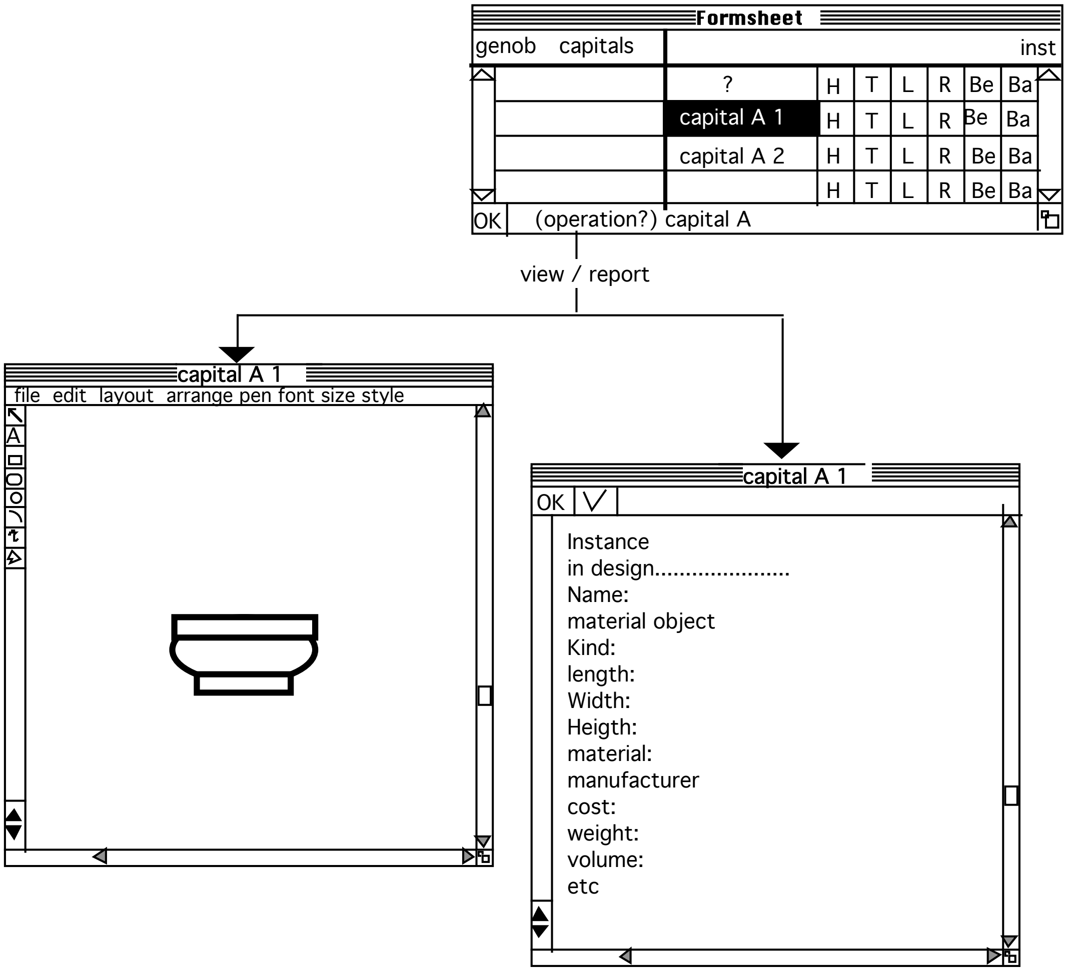
To change the design of an exisisting genob, select the genob name and choose view/report from the (modify) menu which appears when we select a genob.

two windows will appear simultaneosly. A view window containing the genob and a report window displaying its properties as available in the database.

We now can change the physical form of the object, using Fornsheet for a composite object and the volume tool box in the view window for a primitive object, like we do in any other design. We also can change whatever information needs to be put in text or numbers in the report window.

Note that some information, like the dimensions of the object, now can be modified in three reciprocal ways: in the drawing, in the report, or by means of Formsheet using orientation handles.

change an instance design



Formsheet

genob capitals							inst
	?	H	T	L	R	Be	Ba
	capital A 1	H	T	L	R	Be	Ba
	capital A 2	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (operation?) capital A

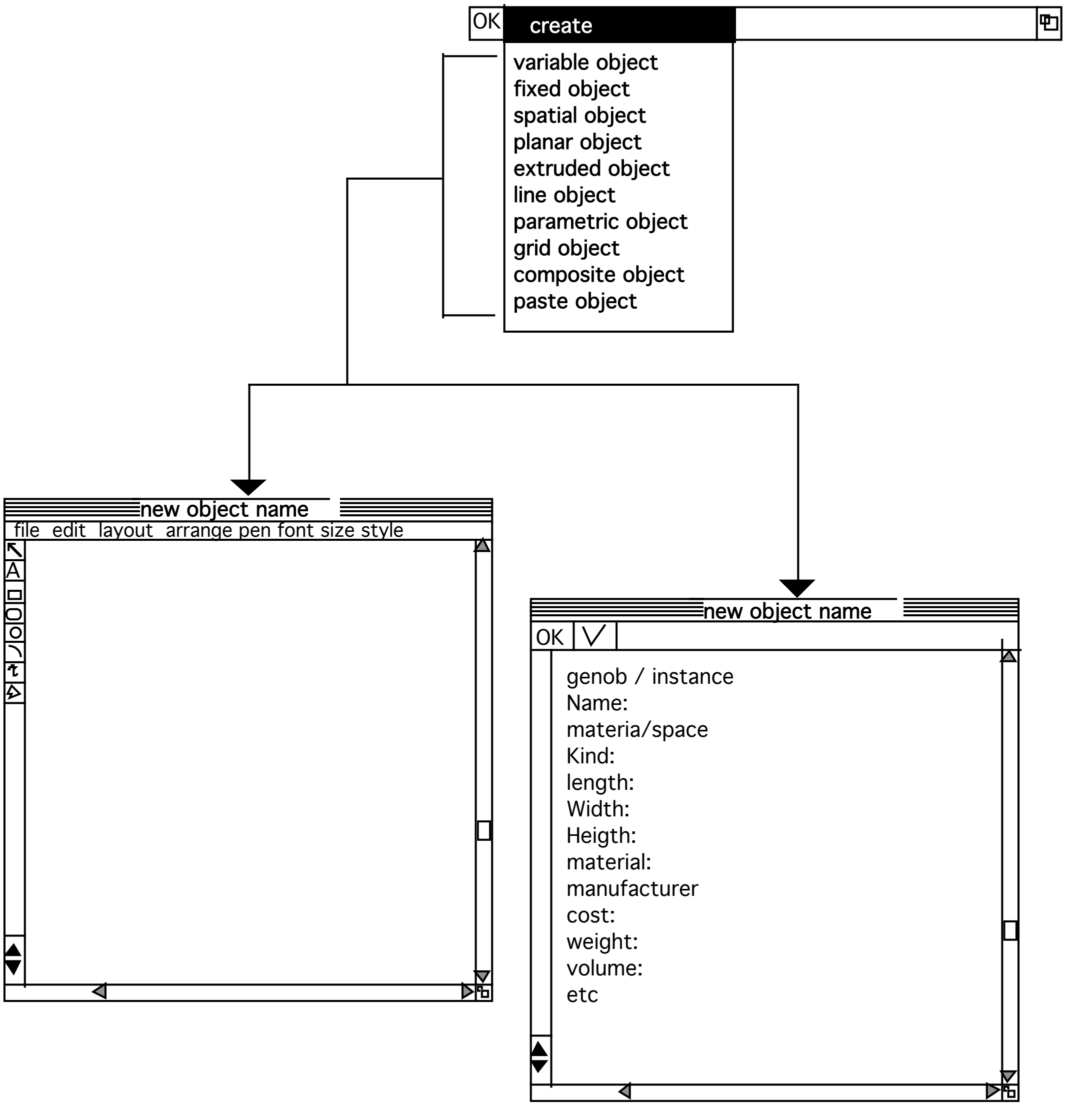
capital A 1

OK ✓

Instance
in design.....................
Name:
material object
Kind:
length:
Width:
Heigth:
material:
manufacturer
cost:
weight:
volume:
etc

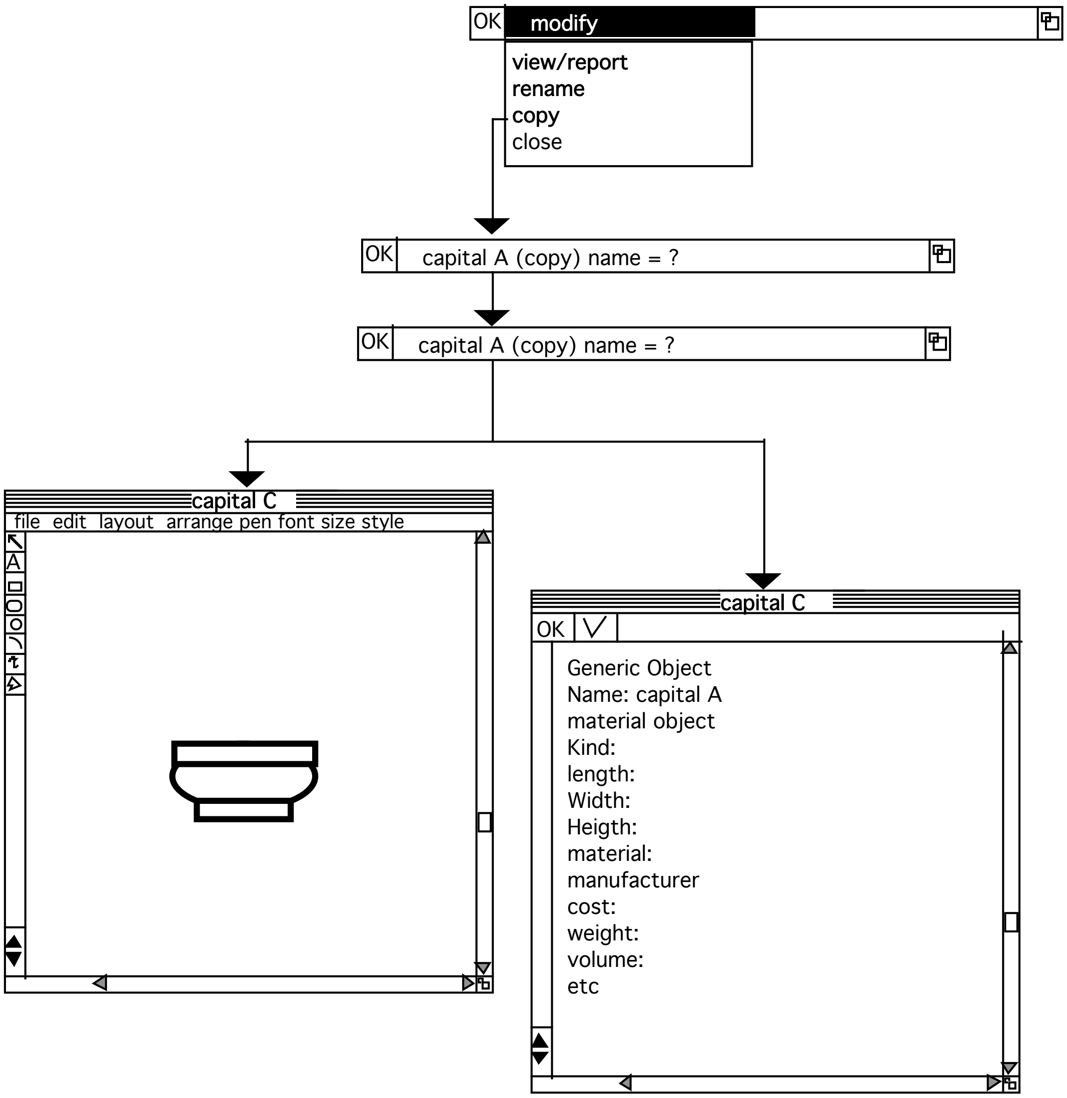
Instances of any kind, grouped or single, can be transformed in the design in which they perform, as is shown in section B 'handling objects'.
However, it may be easier sometimes, to isolate an object to work on it before viewing it in context again. In that case, select the 'view / report' option in the (operation?) menu which becomes available when the object is selected and highlighted.

two windows will appear simultaneosly. A view window containing the isolated instance and a report window displaying its properties as available in the database.
We now can change the physical form of the object, using Fornsheet as a tool like in any other design. We also can change whatever information needs to be put in text or numbers in the report window. Note that some information, like the dimensions of the object, now can be modified in three reciprocal ways: in the drawing, in the report, or by means of Formsheet using orientation handles.
While these windows are open and activated, but no items are activated, the (operation?) menu remains available



When an empty cell is activated (?) the create menu becomes available and we are asked to give the name of the new object. (sheet 31) Formsheet knows from the position of the empty cell wether we want to create an new genob or an instance.
When we choose any of the options offered in this menu two windows will appear bearing the name of the new genob or instance: one is an empty view window and the other an empty object report window.
In the view window we can design the kind of object we have selected and the tools to do so will be available in Formsheet and in the view window toolbox. In the report window the constraints and other properties relative to the chosen kind of object will already be in place and may be modified or added to.

When the windows are closed, the new object will appear in the list - genob or instance - in which we selected the empty cell.

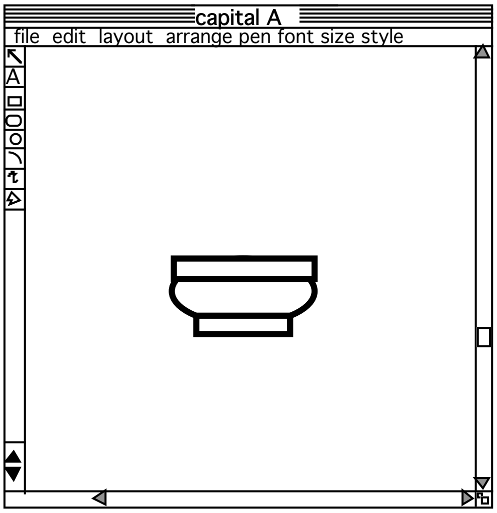


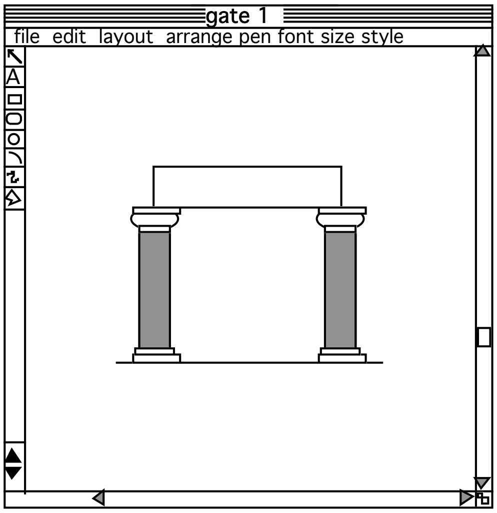
capital A (copy) name = ?

capital A (copy) name = ?

Generic Object
Name: capital A
material object
Kind:
length:
Width:
Heigth:
material:
manufacturer
cost:
weight:
volume:
etc

A genob need only to be copied to make another, different, genob,
To copy a genob, choose 'copy' from the (modify) menu. Formsheet will ask for the name of the copy and then open a view window and a report window bearing the new name but showing the view and the information about the object to be copied, ready for modification.





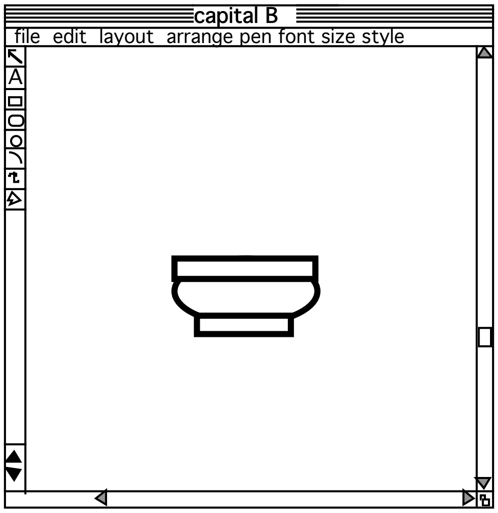
A primitive object is not a group but composed of primitve volumes available in the view window toolbox,.

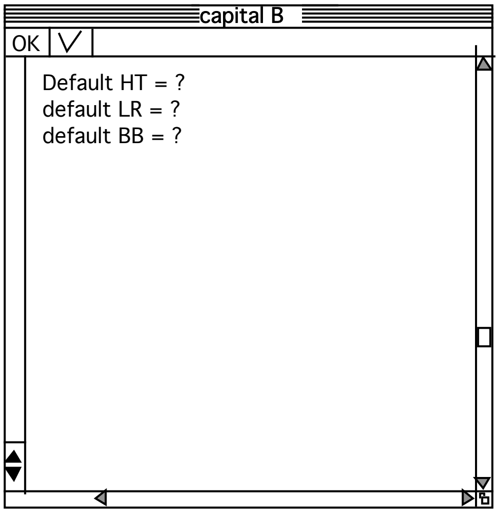
A composite object is a group composed of primitive objects and or other groups.

genobs and instances can be either primitive or composite objects.
A composite genob, being created as any other design, can be composed of newly made primitive objects, but will, most likely, be designed by making instances (in the genob create view window,) of other genobs.

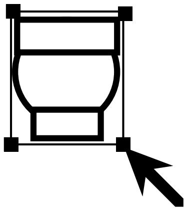
Some of the kinds of objects that can be created from the (create) menu can be either primitive of composite objects. Others can only be primitives.

sheet no. 37 variable object date: sept. 2, 1998





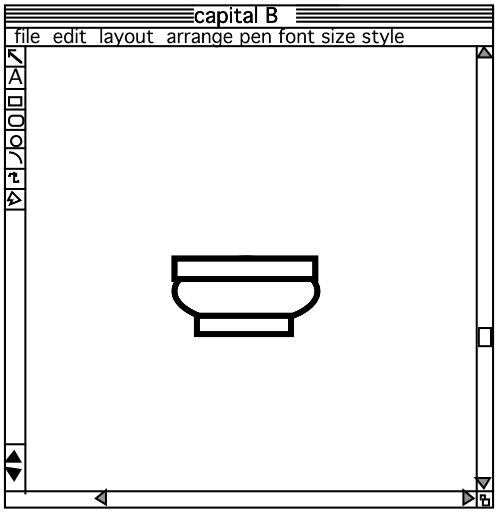
Default HT = ?
default LR = ?
default BB = ?

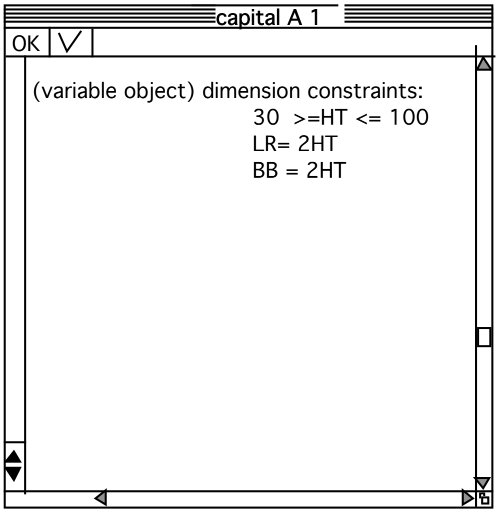


When no default dimensions are given, the instance is introduced by the cursor in the design view window:
drawing the cursor diagonally determines the size of the variable instance.

In many cases it may be advantageous to leave it to the designer to determine the dimensions of an instance. In that case the genob is a 'variable object' which is basically an object without fixed dimensions.
In the new object view windown, draw the representation of the object with the tools of the design window. Formsheet will assume the dimensions of the object as drawn to be default dimensions. When the window is closed the new name will appear in the genob cell as selected. Type in alternative default dimensions if desired. If no default dimensions are desired, type in a question mark.
 In the latter case, instance creation is by means of the cursor in the design view window: draw a diagonal to indicate opposite corners of the object.

sheet no. 38 dimensional constraints date: sept. 2, 1998

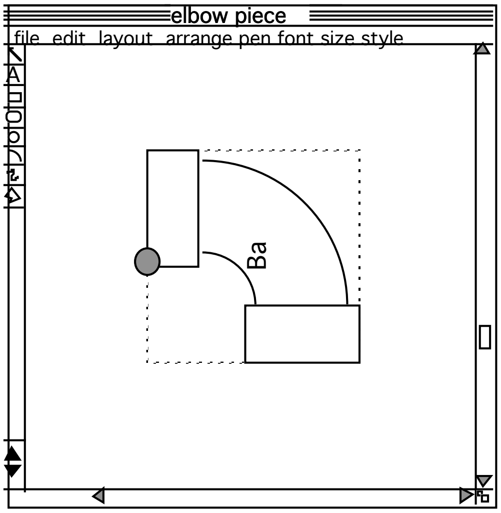


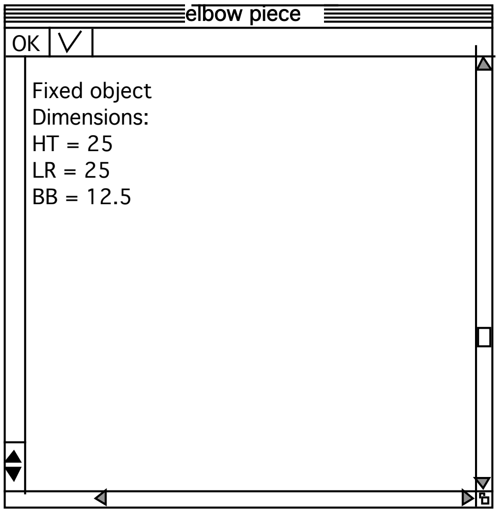


(variable object) dimension constraints:
30 >=HT <= 100
LR= 2HT
BB = 2HT

A variable object can be bound to dimensional constraints. These can be formulated in the report window. In the example the constant proportions of the object are given and the height is limited to a maximum and a minimum.

When the cursor draws te diagonal for the instance in the view window, Formsheet will observe the constraints and adjust to the dimensions closes to what the cursor suggests.



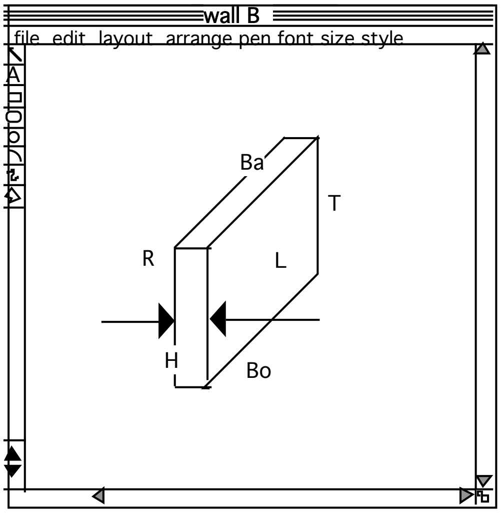


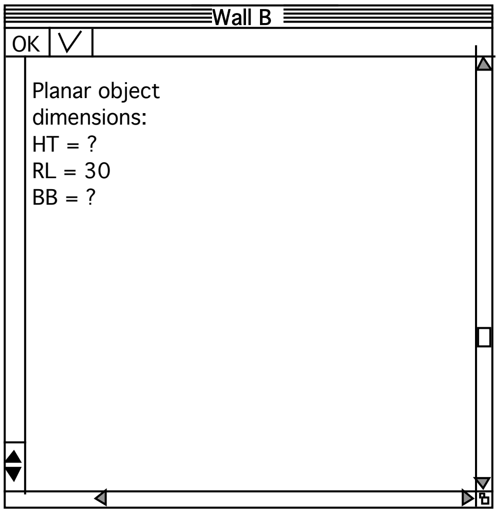
Fixed object
Dimensions:
HT = 25
LR = 25
BB = 12.5

A fixed object is an object the dimensions of which cannot be changed in the instance mode. This object status is appropriate for objects that cannot be cut, stretched, or otherwise modified in their dimensions. These are often products in the real world without any generic quality; taken from a catalogue or product specification.
Examples: a particular elbow piece in a drain pipe system, a refrigerator of a certain make and kind, a concrete block of a certain make or kind.

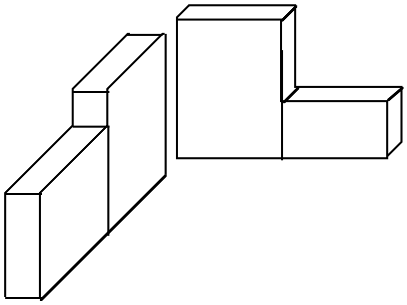
Choose 'fixed object' from the (create?) menu and you will be prompted to give the new object a name. Formsheet will then produce a view window and a report window of that name and expect you to specify the new object's dimensions in the report window. create the object in the view window with the use of the volumes in the toolbox of that window.

planar object





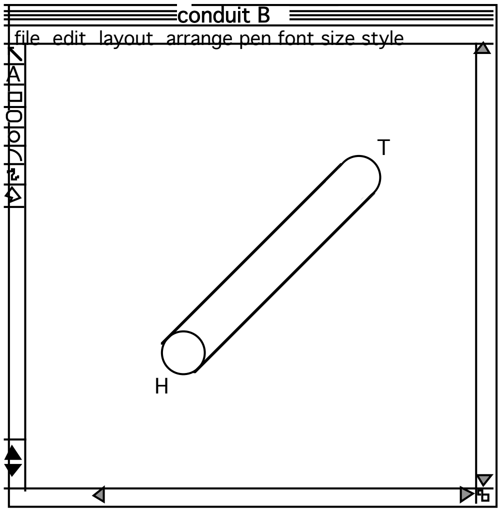
Planar object
dimensions:
HT = ?
RL = 30
BB = ?

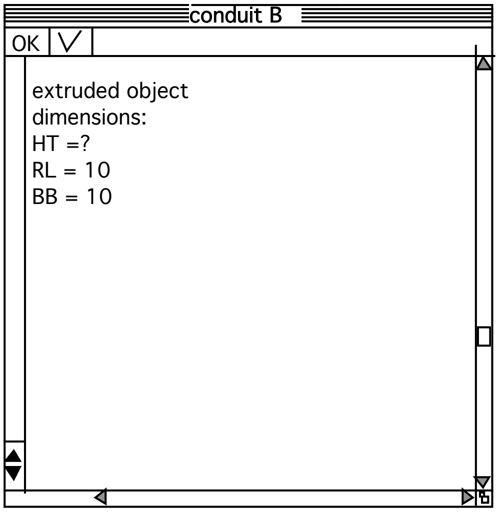


A planar object can be modified in two dimensions only, while the third is fixed.
Example: a wall of a fixed thickness. A floor slab of a certain thickness.

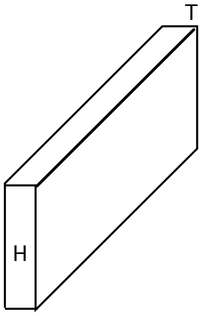
By convention , when we make a planar object, formsheet fixes the L-R (width) dimension.
To make this work well, make sure the orientation handles are distributed accordingly.
Planar objects cannot 'turn corners'

If we choose 'make planer object' in the (create?) menu we will be prompted to give it a name after which formsheet produces a view window with in it a generic drawing of a planar object with the orientation handles already determined. It wil also produce a report window of the same name and we will be asked to specify the LR dimension.
Modify the representation (orientation, color, texture, etc) with the tool box of the design window.
Enter specifications in the report window. (material, weight, etc.)





extruded object
dimensions:
HT =?
RL = 10
BB = 10

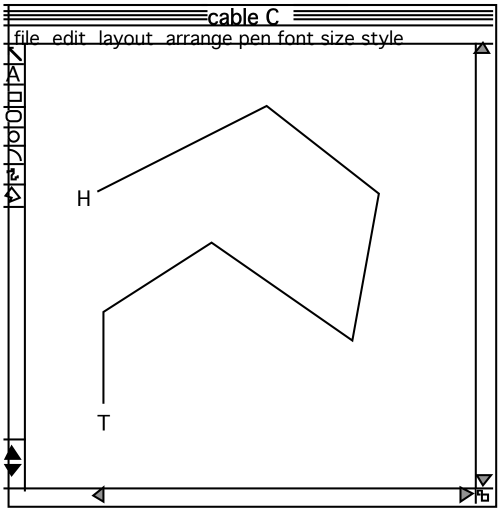


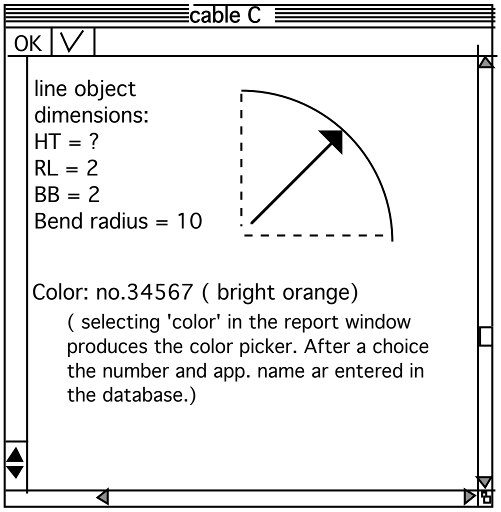
An extruded object can be modified in one dimension only while the other two are fixed.
Example: a wall of a fixed thickness and height. A pipe or other conduit. Steel profiles.
By convention , when we make a extruded object, formsheet assumes the HT dimension remains variable and the other two will be fixed.
extruded objects cannot 'turn corners'

Choose 'extruded object' from the (create?) menu and you will be prompted to give the new object a name, after which formsheet produces a view window of that name. Draw a section of the new object with the tools of the view window. Formsheet will add a default length (HT) which is variable. Formsheet also produces a report window of the same name and will expect you to specify the width and heigth of the object.

The instance of a extruded object without a default dimension can be entered in the view window by drawing the cursor along the desired HT location.

sheet no. 42 line object date: sept. 2, 1998





line object
dimensions:
HT = ?
RL = 2
BB = 2
Bend radius = 10

Color: no.34567 (bright orange)

(selecting 'color' in the report window produces the color picker. After a choice the number and app. name ar entered in the database.)

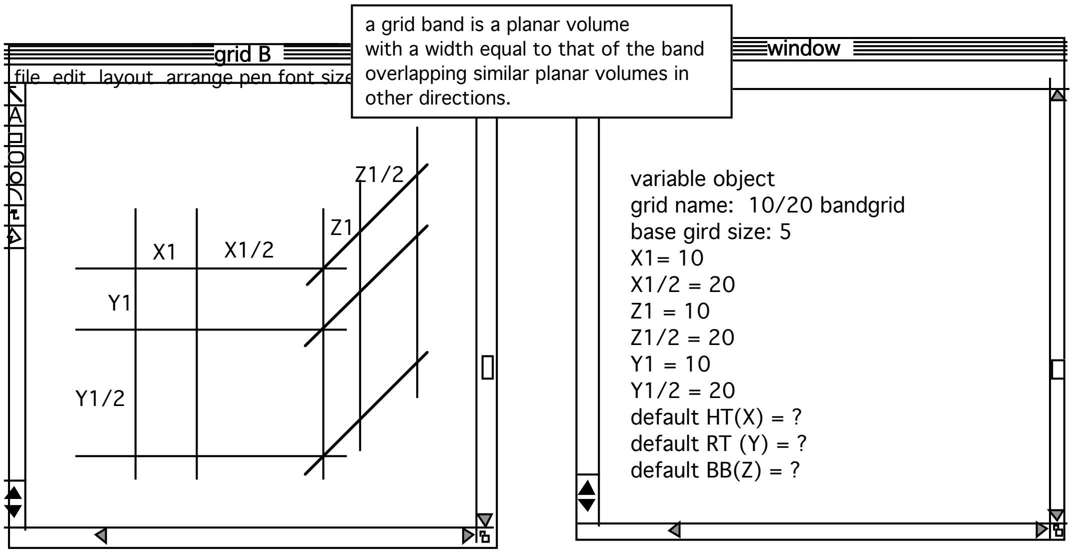
Line objects are for cables and other flexible conduits.
Line objects are polygons with curved corners and specified line thickness.

When we ask for a line object, we will be prompted to give the object a name and Formsheet will show a polygon in a view window of that name. It will also produce a report window in which we are expected to specify the radius of the bends. Determine thickness and color of the line in the report window

When a line genob is selected to create an instance, formsheet produces a cursor with which the line can be drawn in the design. Once the line is drawn formsheet converts it in an object with the correct thickness, bend radius and head and tail as specified with the genob.

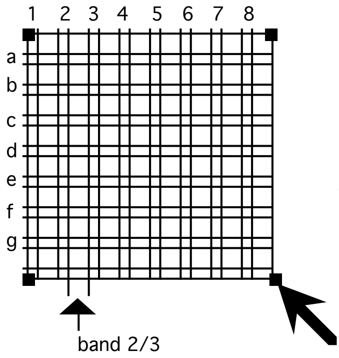
Line objects can also become abstractions of conduits composed of discrete parts like waste lines and ventilation systems. A line can be drawn to determine the run of a waste line and next be specified by a sequense of fixed parts like pipes with elbows. In the design of a fully specified system like for instance a plumbing system, such a specification operation can be automated. In that case Formsheet places the pipes and elbows along the line as drawn. Manufacturers of such systems can provide software modules capable of such specification to be inserted as a special module in the Formsheet software.

design grid object

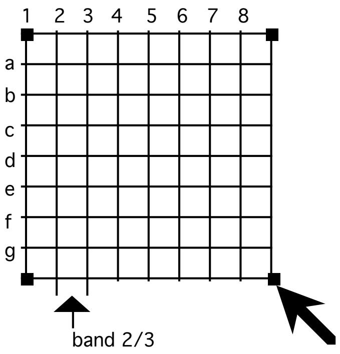


a grid band is a planar volume
with a width equal to that of the band
overlapping similar planar volumes in
other directions.

variable object
grid name: 10/20 bandgrid
base gird size: 5
X1= 10
X1/2 = 20
Z1 = 10
Z1/2 = 20
Y1 = 10
Y1/2 = 20
default HT(X) = ?
default RT (Y) = ?
default BB(Z) = ?



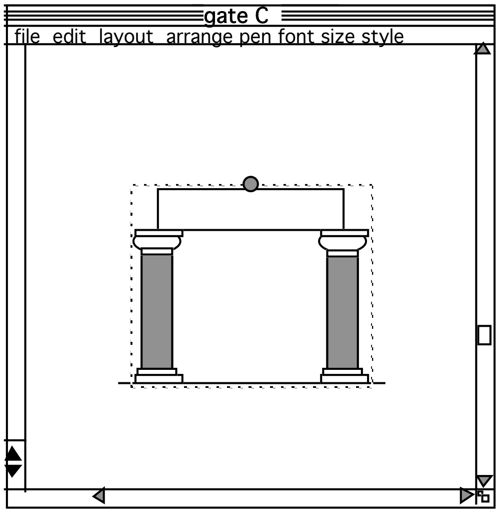
true to the principle that Formsheet knows only volumes, bands, standing for spaces, are numberd.
In a band grid, the narrow bands are numbered, the wide bands are identified by the numbers of the adjoining narrow bands.
A single band grid is one where the narrow bands are have zero dimensions. They still serve to allow statements of relation between objects and grid.



Design grids are spatial objects used to position other objects in.
to make a new grid object: Select an empty cell (?) and choose 'grid' in the (create?) menu. Formsheet asks for the name of the new object and produces a view window with the grid name displaying a matrix representing the grid,. Formsheet will also produce a report window in which we can enter the size of the base grid and the dimensions of the grid bands in the directions X,Y,and Z.
(NB the base grid is invisible and determines the minimum intervals an object can 'jump' when tied to the grid. Band widths are usually, but not necessarily, multiples of the base grid. IN case of a 10/20 bamd grid, for instance, the base grid may be 1, 5 or 10.)

In the design window you can determine the nature of the grid representation (dotted or not, thickness). You can also edit the grid numbering by changing text in the generic drawing. (e.g. to obtain the numbering given in the right hand example: eliminate X1 and change X2 in 1, eliminate Y1 and change Y2 in a.

Formsheet produces the grid as a variable object and therefore will ask for default dimensions and/or produce a cursor to size the grid object in the view window while entering it.



A composite object is a grouping of instances taken from already existing genobs or copied from other designs. As such, any design of a building is making a composite object. But we may use a dedicated view window through the (create) menu when we want to make a genob which is a composite object. Or when we first want to put together a composite part (such as a gate in the design of a whole building) before we bring it into play in the larger design.

If created as a genob, its instance will be a group (whole) with its own constituent objects and their dimensions and properties which can be modified as with all groups. (see section C)

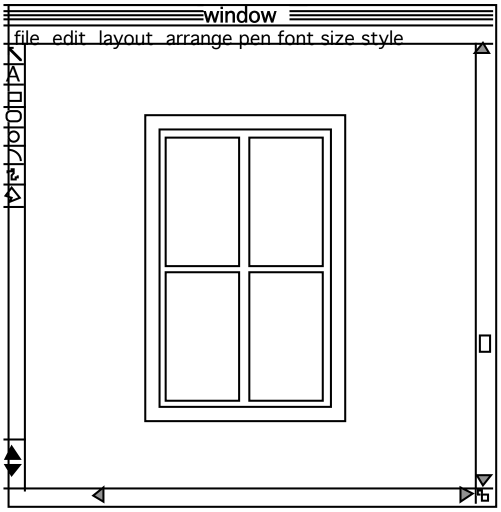
To make a composite object select an empty genob cell or instance cell and choose 'make composite object' from the (create?) menu. Formsheet will ask you to give the new object a name and produce an empty view window.

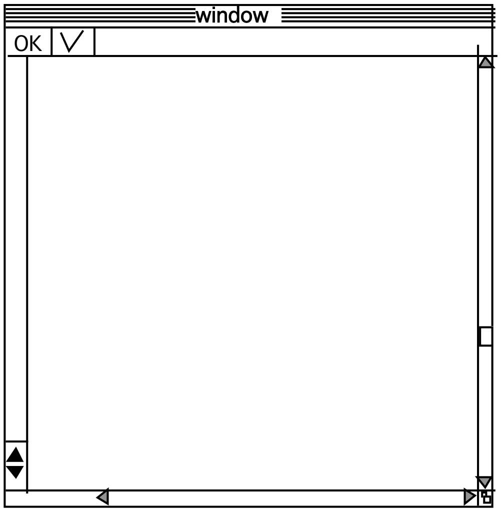
In that window design the desired composite object, using instances from already available genobs, copying and pasting instances or groups of instances from other designs, or making new primitive instances. The composite object should be designed with the dimensions the instance to be made from it must have.

When you close the window, formsheet will group the entire content of the design and assign orientation handles to the group thus created. Its name will appear in the list of which the empty cell that triggered the creation was part. Of course, you can make the group yourself, and manually assign orientation handles . If you do, make sure to include all items in the design otherwise formsheet will still group those forgotten with the group you created.

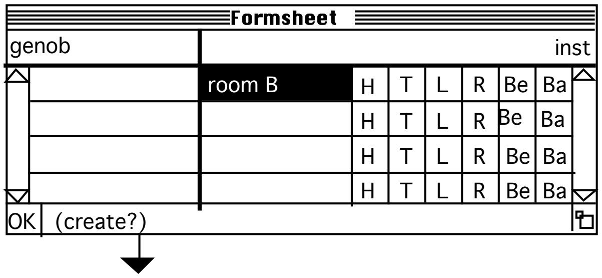
Formsheet will not produce a dedicatd report window. Reports can be called for from the reports list as with the general design at hand. (see sheet 67 report list manager.)

If you want to turn a group (whole) which is part of the design you are working at into a genob, select the empty genob cell (?) and choose 'composite object' fromthe create menu. Then copy the group in the view window made availble by Formsheet, and close. The group will appear as a genob in the list where the empty cell was selected.





The 'imported objects' option should allow importing complex variable (parametric) objects made available by third party providers.



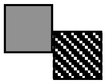
Formsheet

genob inst

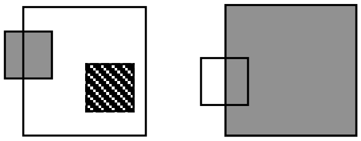
	room B	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (create?)

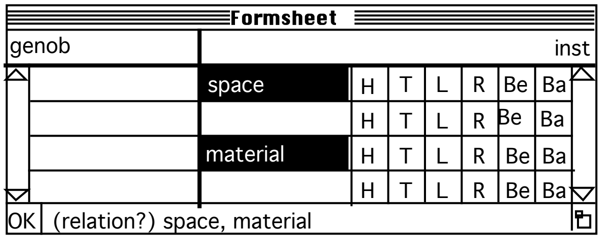
make spatial object



material objects do not overlap



spaces and material objects can overlap

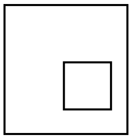


Formsheet

genob inst

	space	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
	material	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (relation?) space, material



Spaces can overlap with other spaces

By default formsheet will assume an object is material. Practically speaking our designing of buildings is a matter of material objects.

But in our design we think of spaces and want to be able to identify them, attach data to them (what furniture must be in such and such a space) and make them relate to one another or to material objects.

To create an object which is known as a space, select the empty genob and choose 'spatial object' from the(create?) menu.

Spatial objects are variable objects. Their dimensions are not fixed.

Spatial objects and material objects relate differently:

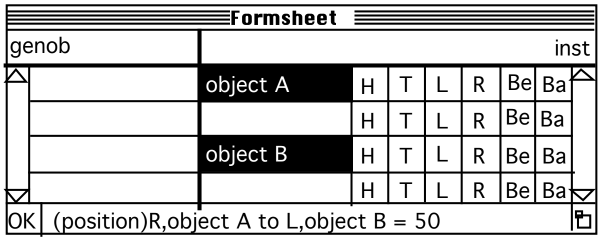
two material objects cannot occupy the same space: their distance can not be negative.
If you try to make them overlap Formsheet will refuse or warn, depending on user preference.

A spatial object can occupy the same space as a materiial object. If that happens, the volume of the spatial object is not diminished. (the volume of a room remains the same if we place furniture in it)

Two spatial objects may overlap and occupy the same space:their volumes will not diminish if that happens.

sheet no. 47 'lead' relation date: sept. 2, 1998

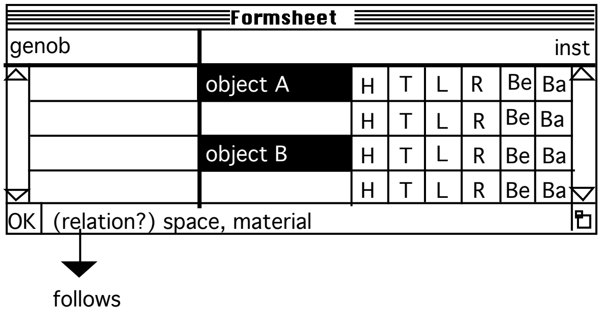
Example 1 of a 'lead' relation.
First establish spatial relation between two objects. (in this case: distance)
Next choose 'follows' from the (relation?) menu:
We have now:
object A follows object B
because A was selected before B



Formsheet

genob		inst
	object A	H T L R Be Ba
		H T L R Be Ba
	object B	H T L R Be Ba
		H T L R Be Ba

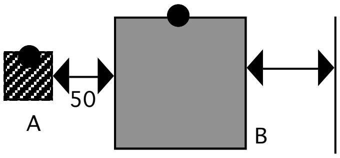
OK (position)R,object A to L,object B = 50



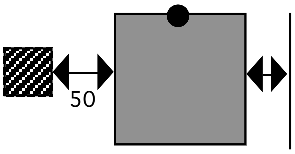
Formsheet

genob		inst
	object A	H T L R Be Ba
		H T L R Be Ba
	object B	H T L R Be Ba
		H T L R Be Ba

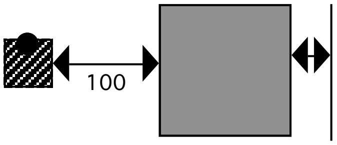
OK (relation?) space, material



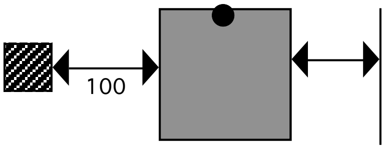
1 distance relation between A and B



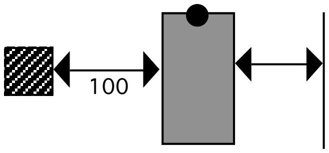
2) B moves right, A follows B



3)A moves away, B does not follow A



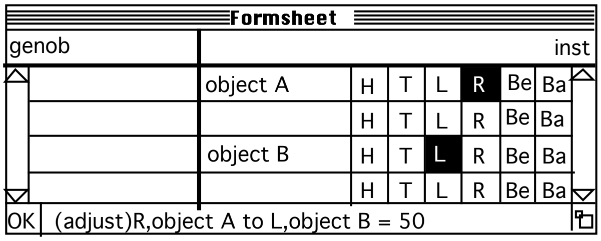
4) B moves left A maintains distance to B



4) B shrinks A maintains distance to B

A can adjust its distance to B, but B cannot. When B moves or transforms, A follows to make sure the distance relation is maintained.

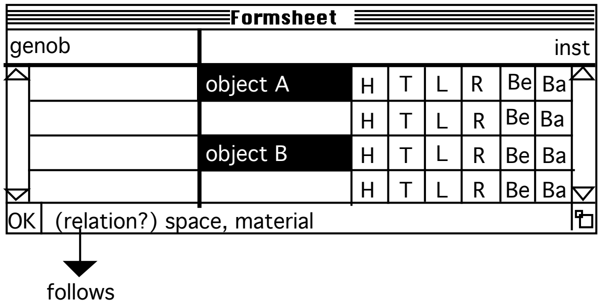
Example 2 of a 'lead' relation.
First establish spatial relation between two objects. (in this case: distance between side R of object A and side L of object B)
Next choose 'follows' from the (relation?) menu:
We have now:
object A follows object B
because A was selected before B



Formsheet

genob							inst
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
	object B	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (adjust)R,object A to L,object B = 50

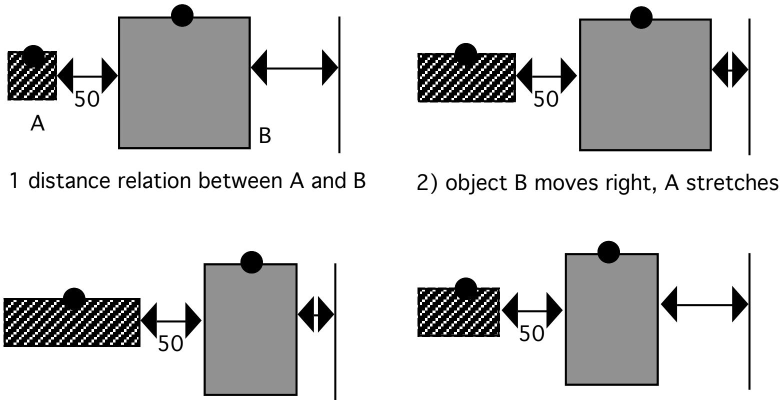


Formsheet

genob							inst
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
	object B	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (relation?) space, material

follows



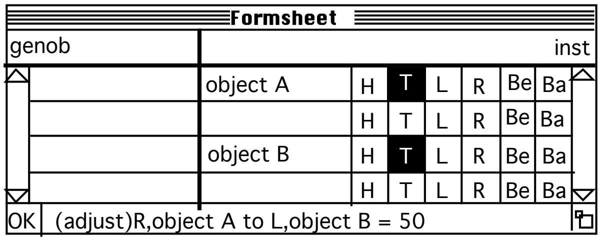
1 distance relation between A and B

2) object B moves right, A stretches

3) object B shrinks, A stretches.

4) object B moves left, A shrinks.

Example 3 of a 'lead' relation.
First establish two spatial relations between objects. (in this case: distances between the left sides of the objects and between the tails of the objects.)
If A was selected before B: choose 'follows' from the (relation?) menu:
We have now:
object A follows object B

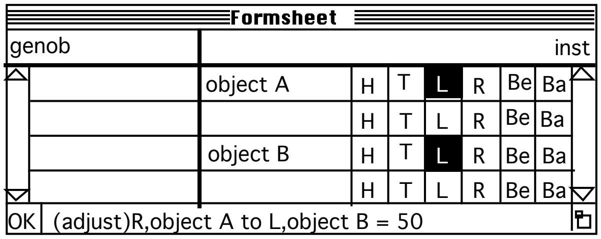


Formsheet

genob							
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
	object B	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

inst

OK (adjust)R,object A to L,object B = 50

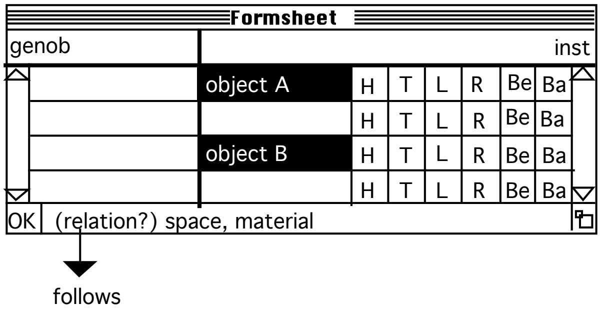


Formsheet

genob							
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
	object B	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

inst

OK (adjust)R,object A to L,object B = 50

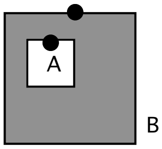


Formsheet

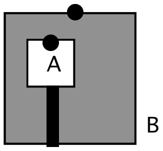
genob							
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
	object B	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

inst

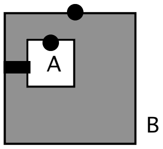
OK (relation?) space, material



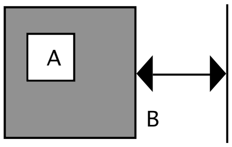
space enclosed by material
material enclosing space



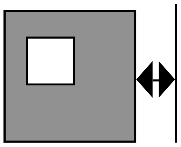
relation established
between tails



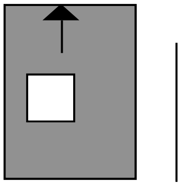
relation established
between left sides



1) A follows B,
B leads A.



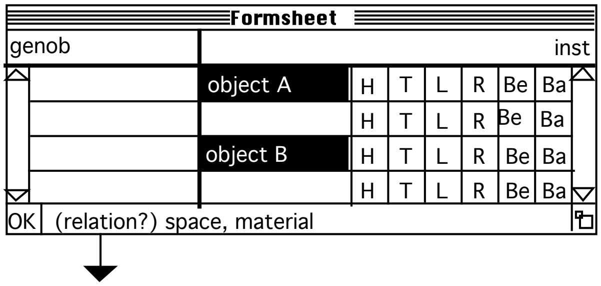
2) if B displaces, A goes
with it



3) if head of B goes up,
A remains where it is,
but......if left of B moves, A goes
with it. (not shown) etc.

sheet no. 50 enclosure date: sept. 2, 1998

select the two objects and choose the enclose relation they must have.
For each relation there are two options:
A enclosed by B = B encloses A
the sequence of selection in the formsheet ist is different.

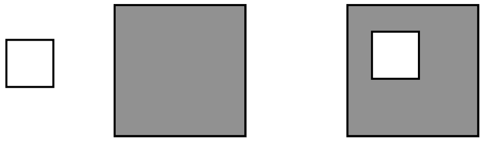


Formsheet

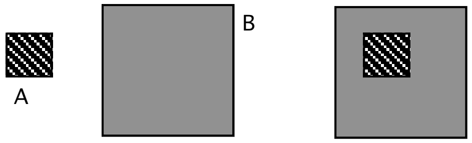
genob	inst						
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
	object B	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (relation?) space, material

encloses
enclosed by
does not enclose
is not enclosed by

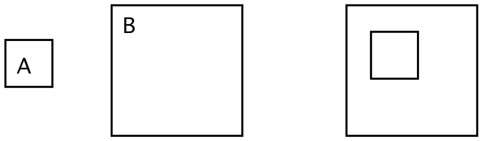


space enclosed by material
material enclosing space

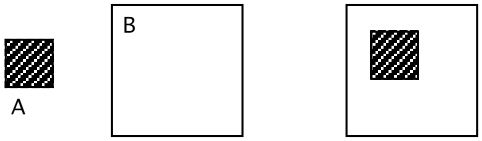


object A enclosed by object B
object B encloses object A

IF you place a material or space object in the volume of another material object , formsheet will ask if you want to create an eclosure relation. If not, it will refuse the move.



space B enclosing space A
space A enclosed by space B



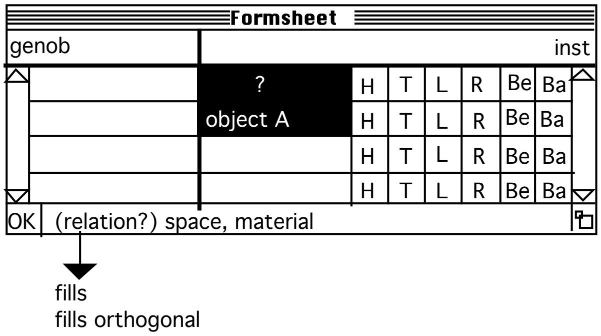
Material enclosed by space
Space enclosing material

If you place a material or space object in another space object, Formsheet assumes this is to be a 'containment' relation (see sheet53) unless instructed otherwise.

The volume of the enclosing object (material or space) diminishes with the volume of the enclosed object when the latter is put in place.
The enclosure operation does not contradict the material - space incompatibility: the enclosing object transforms and makes room to allow for the contained object. Enclosure is not a positioning relation, but a transformation operation triggered by positioning the enclosed.

sheet no. 51 fill relation date: sept. 2, 1998

To let an object enter into a 'fill' relation with surrounding material objects, select the object and an empty instance space to get the (relation?) menu, and choose ' fill' or 'orthogonal fill'

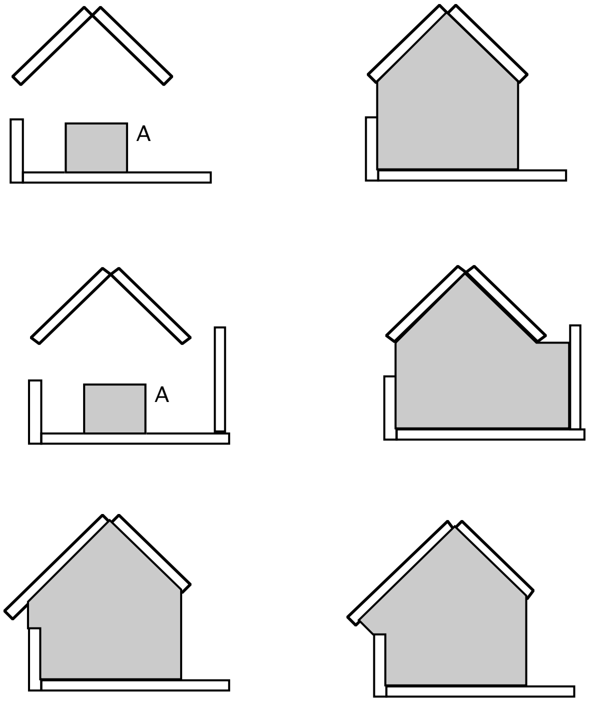


Formsheet

genob	inst					
	?	H	T	L	R	Be	Ba
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (relation?) space, material

Example:
Object A is a planar object (e.g. a wall in a cross section)
If object A assumes the fill relation it will expand to all sides in the plane that it forms, until it meets another object.
Where objects are not continuously linked it will stop at the shortest line between objects it does meet.
When boundary objects shift, A will adjust
In the example A assumes ortogonal boundaries wherever possible. When this constraint is relaxed, the last fill would be adjusted with a diagonal line.

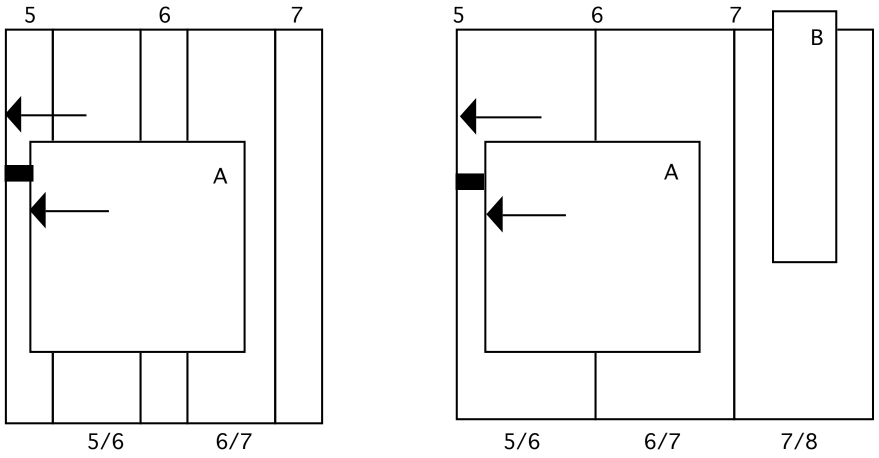


The fill relation can be assumed by material and spatial objects.

In case of a space object, the space we obtain may stand for the space formed by a material enclosure. In that case it can be used for the containment relation (sheet 53). mediating the enclosure of one material object by another (or a group of other material objects)

A material object may be variable in three dimensions as well, like, for instance, a liquid.
Or it may be a planar object like a wall or floor as shown in the example on this sheet. A linear object may also assume the fill relation in which case it stretches untill it meets another material object.

sheet no. 52 object placement in a grid date: sept. 2, 1998



Positioning an object.
Formsheet understands a grid band to be a space identified by coordinate numbers.
(see sheet 43, grid object)

We now can position an object in that grid by stating position relations to the sides of the narrow band. This is similar to relating the object to the sides of a space object.:

Select in a band and its name appears as an instance in Formsheet (for instance: 10/20 bandgrid, X5).
Select the object to be placed if it is not already visible in Formsheet.
Select object A and the left side of band X5 and make that distance 5
Formsheet will adjust the position of A accordingly.

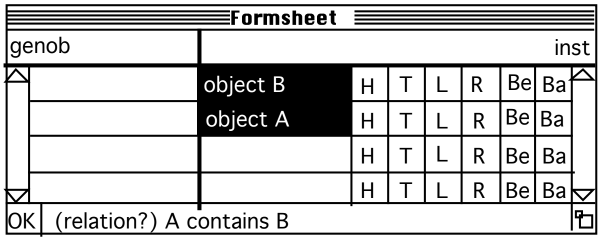
We can also make a **general placement rule** for the object:
select a grid band so that its name appears in the formsheet dialogue bar.
replace the gird band number with a question mark (?) (for instance 10/20 band grid X?)
establish the desired relation.
Formsheet will now always place this object in the 10/20 grid in the same way. This allows us to position the object more or less where it must be and Formsheet will make it assume the correct placing as close as possible to where we put it.

Genobs with grid relations.
Grid position can already be determined for the genob so that all instances inherit the position rule.
This is the one exception to the general rule that genobs do not bring external relations.
To do so:
design the genob in the (create) view window or call an existing genob tobe modified.
import the desired grid in the genob view window and establish the general placement rule as shown above.
remove the grid before closing the genob design.

In most technical systems the position rules for placement of its elements in the grid it uses are known as part of the system's design.
In that case the position rule of each of its elements in the grid can be
stated in the genobb mode for the particular object so that the designer need not bother about its position in the grid.
Involving a class of objects takes the formulation of a general rule of placement rather than a specific placement. General class rules discussed in sheet 65

sheet no. 53 containment date: sept. 2, 1998

When an object is placed in a space, formsheet will assume the containment relation as the default relation.
When we select the two objects, formsheet will state the relation:
A contains B
or:
B contained by A
depending on the sequence of selection.
In this way Formsheet will remember what objects are in a space and is able to produce a list of those objects.

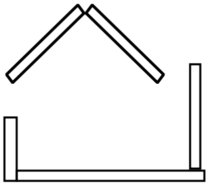


Formsheet

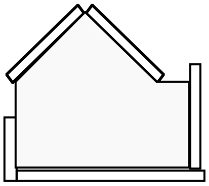
genob							inst
	object B	H	T	L	R	Be	Ba
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (relation?) A contains B

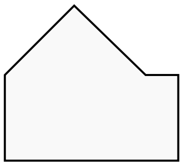
contains
is contained by



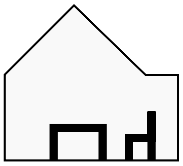
configuration
of material objects



space filling configuration

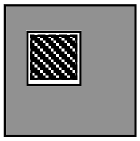


space, identified,
stands for the
space formed by
the configuration.

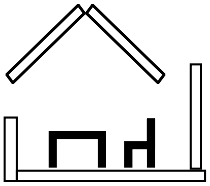


contains furniture

subsequently lead
relations can be established
between the furniture and
the space containing it.



space enclosed by material
and containing material
(opening in wall holding window)



Of course objects can be placed within the configuration without identifying a mediating space. But we cannot make statements about an unidentified space.

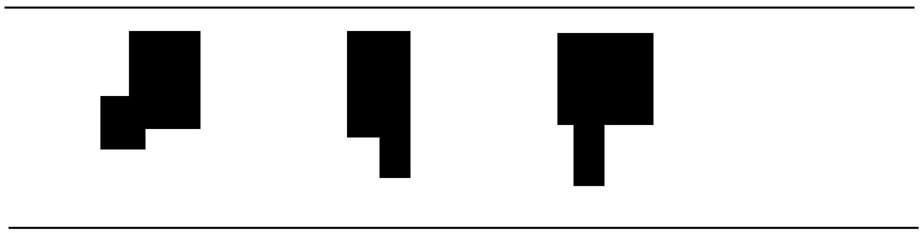
A containment relation means that the volume of the containing space is not diminished by the volume of the contained object. (space or material object)
Thus a space called 'bedroom' may contain any number of furniture without changing its volume.

Only spatial objects can contain other objects.

To make a 'room' we first must fill the material enclosure of that space with a space object.
This space object can contain other objects. It stands for the space in the material configuration it fills.

Containment relations are used when we want to identify 'rooms' or 'spaces' and give them properties and/ or make objects in them belong to them.
We may, for instance, allow only certain objects in a particular space.

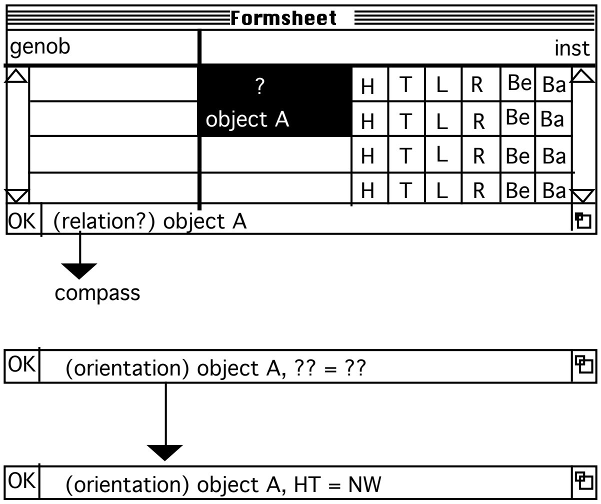
use of zones



In design, zones may be dedicated spaces in which certain objects must be positioned and others may not. For instance, in urban design the position of buildings may be ruled by a general zone in which they must be placed. Often rules are also about the exact position of the building in the dedicated zone. For instance that the distance from the street side must be uniform.

This relationship is again one between an object (the building) and a space (the zone) and can be handled in that way.
However, we can also use the containment relation and say that the building is contained by that zone. This means that the building must be placed in it and Formsheet will refuse to put it otherwise, or may warn if another position is given.

Of course, placement of houses in houselots, observing easement rules, can be stated also as a containment situation with added distance statements.



Formsheet

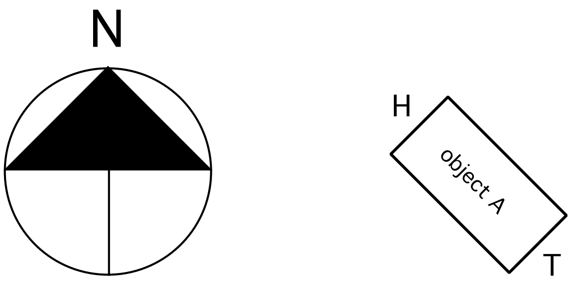
genob	inst						
	?	H	T	L	R	Be	Ba
	object A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (relation?) object A

compass

OK (orientation) object A, ?? = ??

OK (orientation) object A, HT = NW



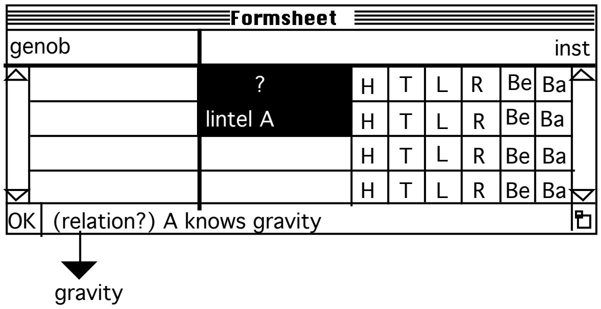
Formsheet can know the compass orientation.
Objects can be positions in relation to the compass.
The compass icon is an instance taken from a genob.
In a new design window, bring in a compass instance and establish the correct direction of North by means of the rotate tool.
This establishes North for all objects in that window.
By implication 'above' (sky) and 'down' (earth) are also known.

To orientate an object to the compass:
select the object and the empty instance cell and choose 'compass' in the (relation) menu.
Formsheet will prompt you to state the axis that must be orientated and the orientation it must have.

Or: Select the object and the compas instance in the view window or in the instance list and Formsheet will understand you seek the compass relation and prompt you to state the axis that must be orientated and the orientation it must have.

Gravity

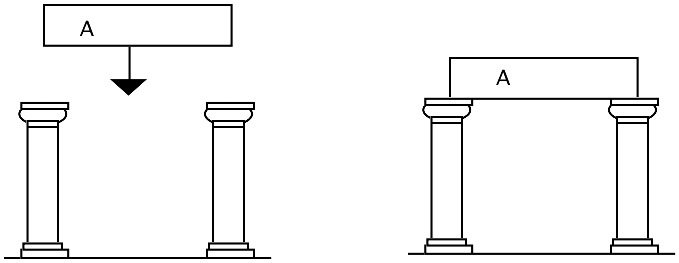
To endow a material object with gravity select the object and the empty instance and select 'gravity' from the (relation?) menu.



Formsheet

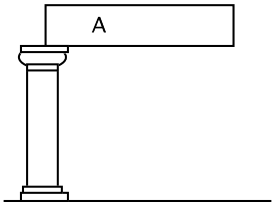
genob		inst					
	?	H	T	L	R	Be	Ba
	lintel A	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

OK (relation?) A knows gravity



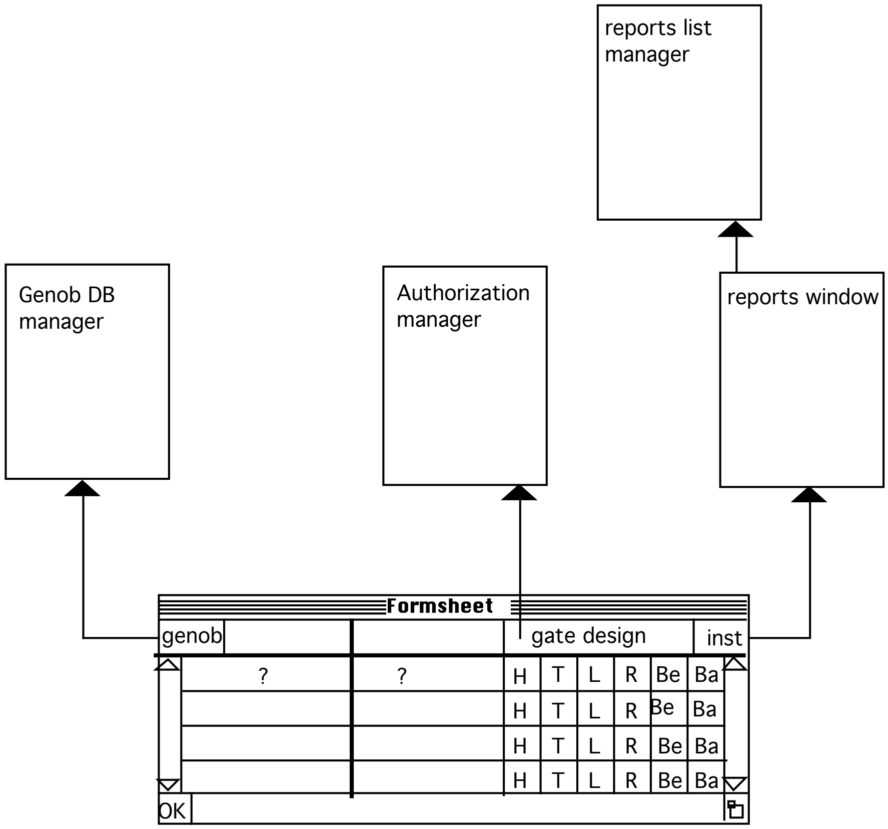
In a design, orientation can be determined defining North, South, East, West.
See sheet 55
This also defines what is 'upward' and what is 'downward'.

When the gravity relation is selected for a material object, formsheet will move this object downward untill it meets another material object.



In the above definition of the gravity relation an unbalanced situation would not be recognized.
In a more advanced version it may be possible to endow material volumes with a gravity center and have formsheet issue warning if their position is not stable.

sheet no. 57 access to managers date: sept. 2, 1998



?	?	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

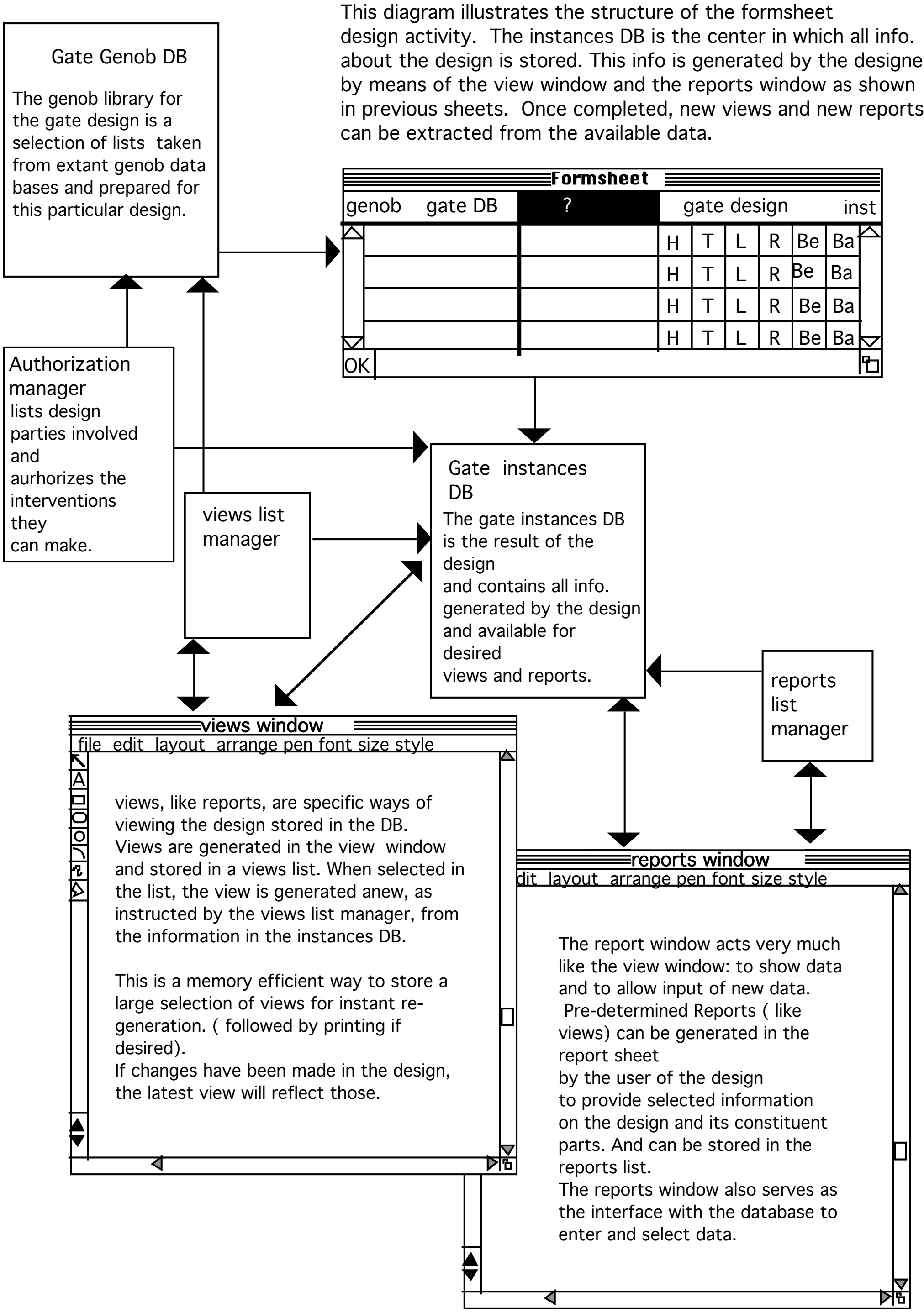
Whereas the design process is always a matter of using of the formsheet tool and the view window, other windows need to be accessed to organize the participation of Formsheet in the design process.

The Genob mamager is to be accessed by doubleclicking on " genob" text.
It is the tool by which we organize the genob list used in a particular design project.

The Authorization manager can be accessed by doubleclicking on the design name.
It needs to be entered to establish what participants in the design project have authority over what objects, and in what way.

The reports window can be called anytime by doubleclicking on " inst. "
to show textual and numerical information in tandemwith the graphic information in the view window. (standby mode)
From this window the list of reports, reporting on various aspects of the design, is available.
From the report window we can also access the reports list manager to establish the formats of the reports to be seen and to make new reports.

This diagram illustrates the structure of the formsheet design activity. The instances DB is the center in which all info. about the design is stored. This info is generated by the designer by means of the view window and the reports window as shown in previous sheets. Once completed, new views and new reports can be extracted from the available data.



Gate Genob DB

The genob library for the gate design is a selection of lists taken from extant genob data bases and prepared for this particular design.

genob	gate DB	?	gate design					inst
			H	T	L	R	Be	Ba
			H	T	L	R	Be	Ba
			H	T	L	R	Be	Ba
			H	T	L	R	Be	Ba

Authorization manager
lists design parties involved and aurhorizes the interventions they can make.

views list manager

Gate instances DB

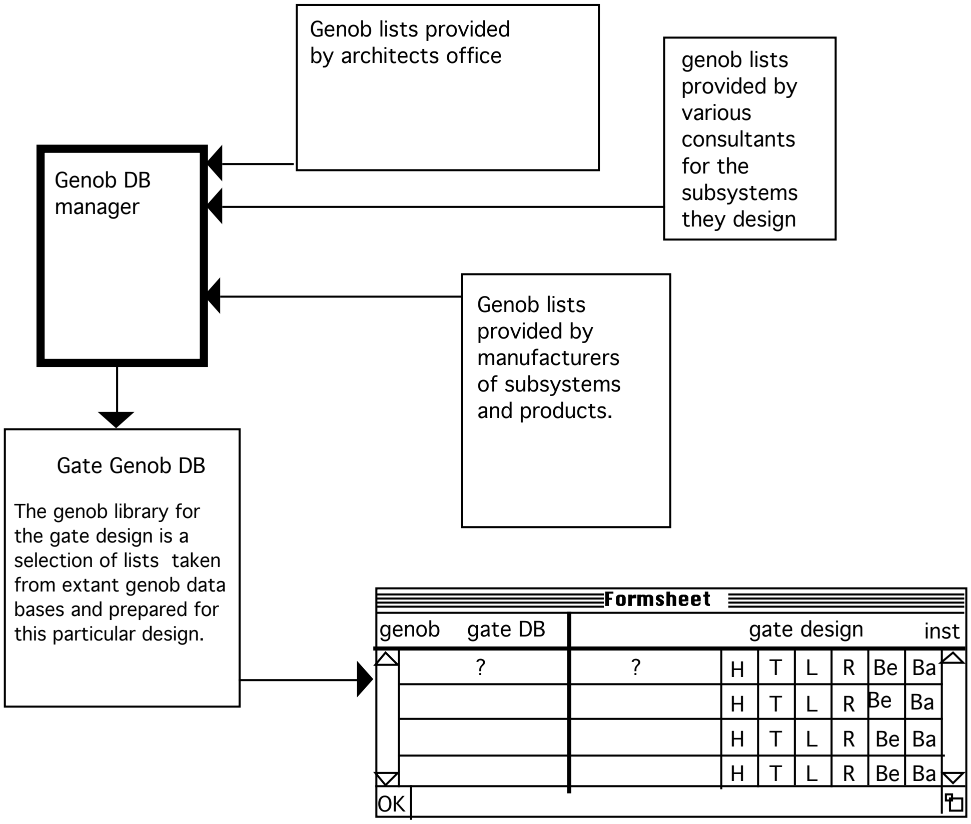
The gate instances DB is the result of the design and contains all info. generated by the design and available for desired views and reports.

reports list manager

views, like reports, are specific ways of viewing the design stored in the DB. Views are generated in the view window and stored in a views list. When selected in the list, the view is generated anew, as instructed by the views list manager, from the information in the instances DB.

This is a memory efficient way to store a large selection of views for instant re-generation. (followed by printing if desired).
If changes have been made in the design, the latest view will reflect those.

The report window acts very much like the view window: to show data and to allow input of new data.
Pre-determined Reports (like views) can be generated in the report sheet by the user of the design to provide selected information on the design and its constituent parts. And can be stored in the reports list.
The reports window also serves as the interface with the database to enter and select data.



Genob lists provided by architects office

genob lists provided by various consultants for the subsystems they design

Genob lists provided by manufacturers of subsystems and products.

Genob DB manager

Gate Genob DB

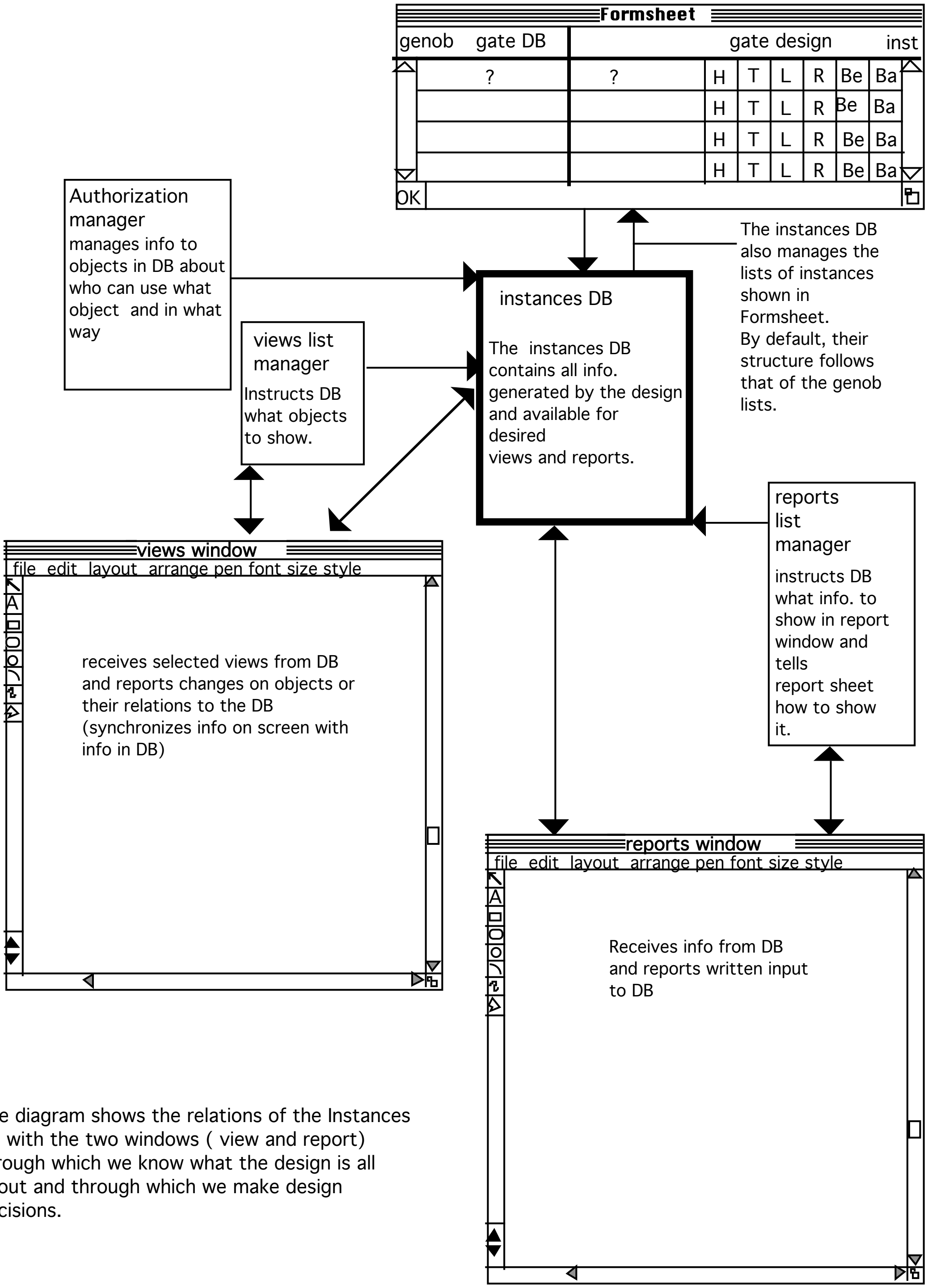
The genob library for the gate design is a selection of lists taken from extant genob data bases and prepared for this particular design.

genob gate DB		gate design					inst
?	?	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

IThe Genob DB for a specific design is culled from extant databases in posession of parties involved in the design project. Since formsheet is intended to be the design base for all parties involved, all can contribute to the specific Genob DB serving the project as a whole.
The Genob DB manager is the tool with which the design team prepares and updates the Genob DB needed for the particular project at hand.
Genobs may be culled from the larger DB of the architecture firm, they may come from manufacturers sollicited to submit material, or they may come from consultants or contractors and sub-contractors involved in the project.

The genob DB manager helps organize all this information in such a way that each actor can easily access what is needed and can organize their own part in a sequence most supportive of their design process. While there may be a central DB manager person with overall responsibility, each actor should be able to alter and update their own library part.
An important role is played by the Athorization manager where such access is codified.

instances DB



Formsheet
genob
gate DB
gate design
inst
OK
views window
file edit layout arrange pen font size style
reports window
file edit layout arrange pen font size style

genob gate DB	gate design						
?	?	H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba
		H	T	L	R	Be	Ba

Authorization manager
manages info to objects in DB about who can use what object and in what way

views list manager
Instructs DB what objects to show.

instances DB

The instances DB contains all info. generated by the design and available for desired views and reports.

The instances DB also manages the lists of instances shown in Formsheet.
By default, their structure follows that of the genob lists.

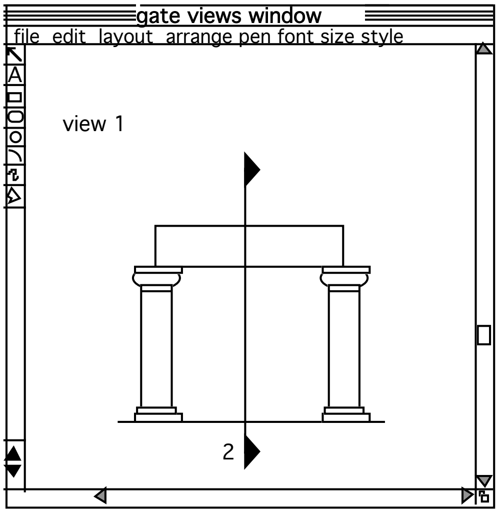
reports list manager

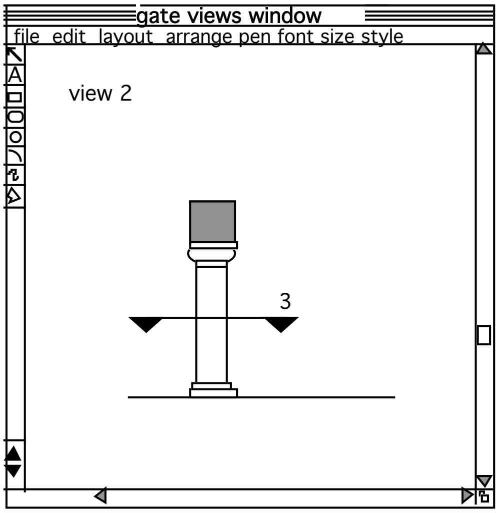
instructs DB what info. to show in report window and tells report sheet how to show it.

receives selected views from DB and reports changes on objects or their relations to the DB (synchronizes info on screen with info in DB)

Receives info from DB and reports written input to DB

The diagram shows the relations of the Instances DB with the two windows (view and report) through which we know what the design is all about and through which we make design decisions.

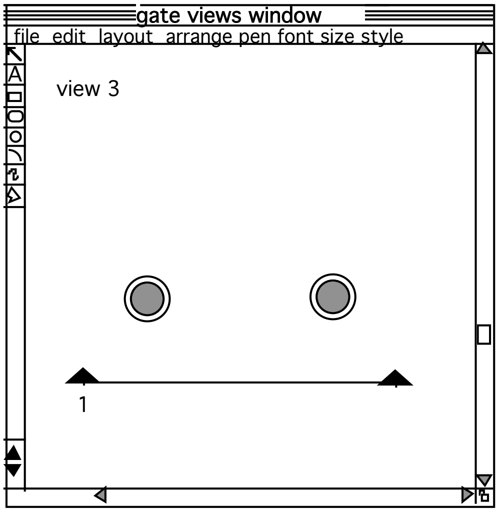




The view window serves to display the design, both in the design phase and later for the various views extracted from the Instance DB in support of the execution of the project.

The gate view as shown in view 1 may be sufficient to determine the gate design. In that case we must properly align the two columns and the lintel by relation instructions in the central formsheet whitout actually seeing the alignment.
Alternatively we could call for view 2 and do the aligning there. In either case we subsequently can call forth additional views that do not add new information to the DB but may clarify the design as made for purposes of execution, discussion, etc.

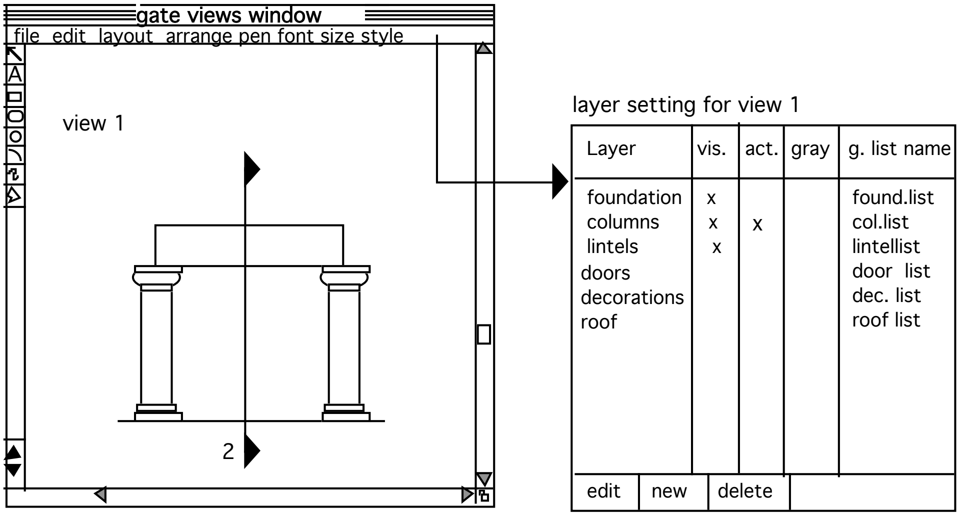
All or any views can be kept available for re-generation in a views list by the views list manager .



View windows are like the familiar design windows of traditional CAD programs. But they have a few extra tools. One is the VIEW INDICATOR as shown here. It basically is a plane that can be drawn, indicating a direction. In respons to its activation formsheet produces another window with the desired view, or. if so desired, replaces the existing view in the first window.

Obviusly, in case of 3D viewing the already familiar rotating tool should be available.

layer setting tool



layer setting for view 1

Layer	vis.	act.	gray	g. list name
foundation	x			found.list
columns	x	x		col.list
lintels	x			lintellist
doors				door list
decorations				dec. list
roof				roof list

When a view is created, it involves not only the selection of a plane of view (or in 3D apoint of view) but also the selection of the layers to be seen which determines what objects will be shown and what not, and in what way these objects will be shown.
Only when the layers have been determined can the view be given a name and be stored and incorporated in the view list kept by the views list manager.

The LAYER SETTING TOOL is used to determine the layer settings for each view. It can be accessed and used at any time during the design, but specific settings can be attached to specific views as part of such a view and stored with it.

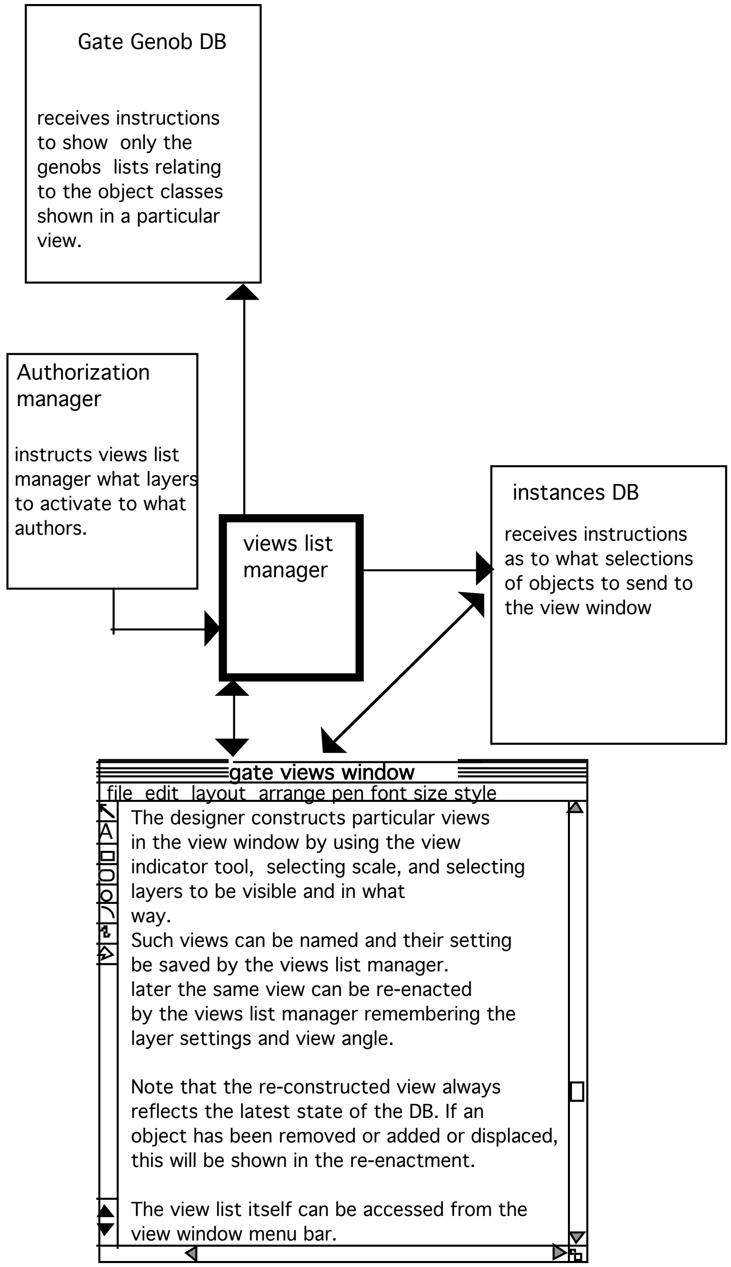
A layer holds a selection of instances for view.
Such selections may in turn correspond with subsystems or parts of subsystems, (for instance load bearing structure, roof, partitioning, plumbing, furniture, kitchen equipment, etc.)
or any other distinction the design team wants to organize their views with.

Layers can be activated or deactivated, shown or remain invisible, shown in a predetermined color or in gray, in certain levels of abstraction, etc.   For each view, the layers to be visible can be specified. When the view is stored in the view list and later called again, these settings are reproduced.

Layer setting and Genob lists.
In the layer setting form, a column allows making a link between layer and genob list. With this link, when a layer is activated so that its object can not only be viewed but also can be manipulated, Formsheet will show the corresponding genob list. By calling the view the designer will have immediate access to the genobs of object allowed in the active layer.

In many cases designers (consultants, manufacturers, subcontractors) will start a project with predetermined view lists attached to their predetermined genob libraries. They will design by calling such views and bring in the instances that go with it.

views list manager



Gate Genob DB

receives instructions to show only the genobs lists relating to the object classes shown in a particular view.

Authorization manager

instructs views list manager what layers to activate to what authors.

instances DB

receives instructions as to what selections of objects to send to the view window

gate views window

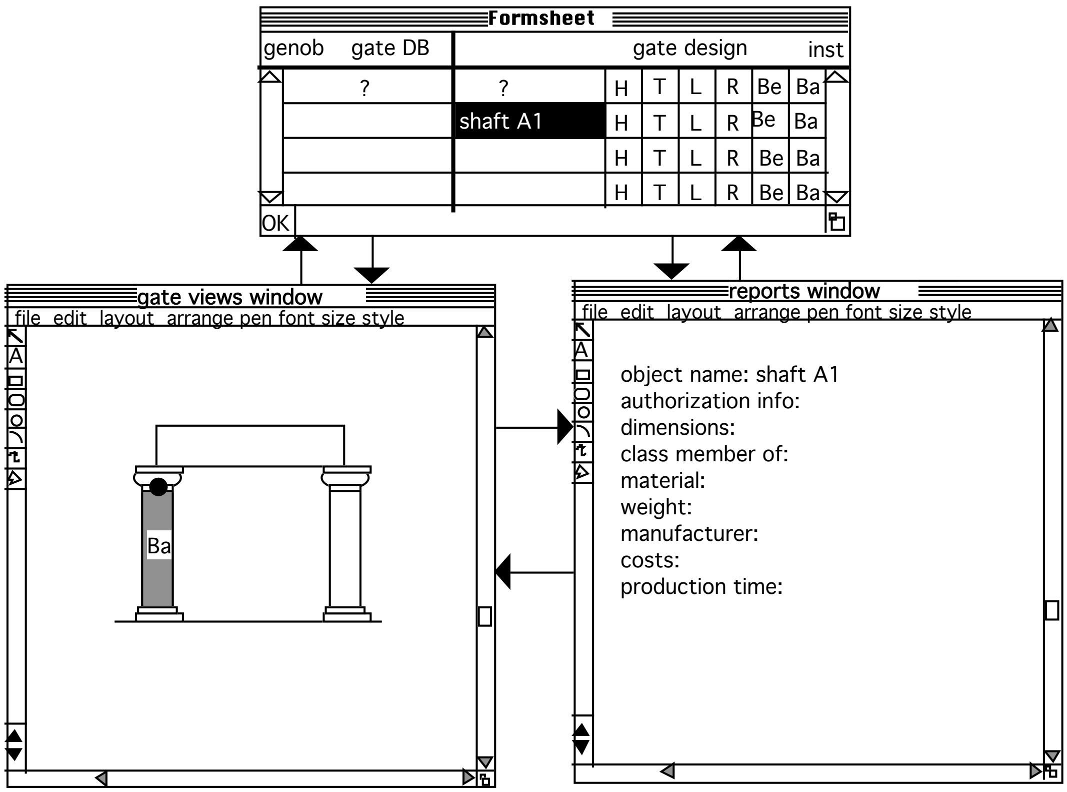
The designer constructs particular views in the view window by using the view indicator tool, selecting scale, and selecting layers to be visible and in what way.
Such views can be named and their setting be saved by the views list manager.
later the same view can be re-enacted by the views list manager remembering the layer settings and view angle.

Note that the re-constructed view always reflects the latest state of the DB. If an object has been removed or added or displaced, this will be shown in the re-enactment.

The view list itself can be accessed from the view window menu bar.

standby reports window

date: sept. 2, 1998



object name: shaft A1
authorization info:
dimensions:
class member of:
material:
weight:
manufacturer:
costs:
production time:

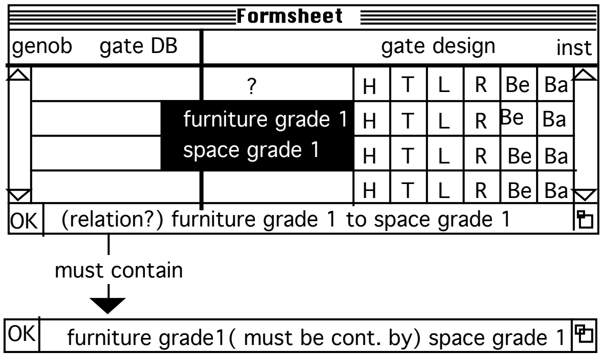
doubleclick the 'inst' button in Formsheet and the report window opens in the 'stand by' mode.
'Standby' means that it will display information on objects in tandem with what we activate in the view window or instances list in Formsheet.

In the report window we will find information additional to what can be shown graphically. The format of the standby mode can be determined and edited in the 'reports mamager'. This format will determine what information will be displayed when an object is activated in the view window.

If nothing is activated in the view window or instances cells, the report window stays blank.

IF more than one object is activated in the view window or instances list, the reoprts window will give a list of those objects.

class relations

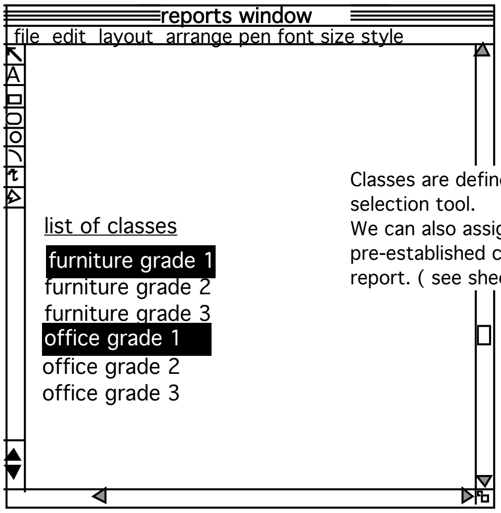


Formsheet

genob	gate DB	gate design						inst
		?	H	T	L	R	Be	Ba
		furniture grade 1	H	T	L	R	Be	Ba
		space grade 1	H	T	L	R	Be	Ba
			H	T	L	R	Be	Ba

OK (relation?) furniture grade 1 to space grade 1

OK furniture grade1(must be cont. by) space grade 1



list of classes

- furniture grade 1
- furniture grade 2
- furniture grade 3
- office grade 1
- office grade 2
- office grade 3

Classes are defined by means of the DB selection tool.
We can also assign any instance to any pre-established class via its own information report. (see sheet 64, stand by reports.)

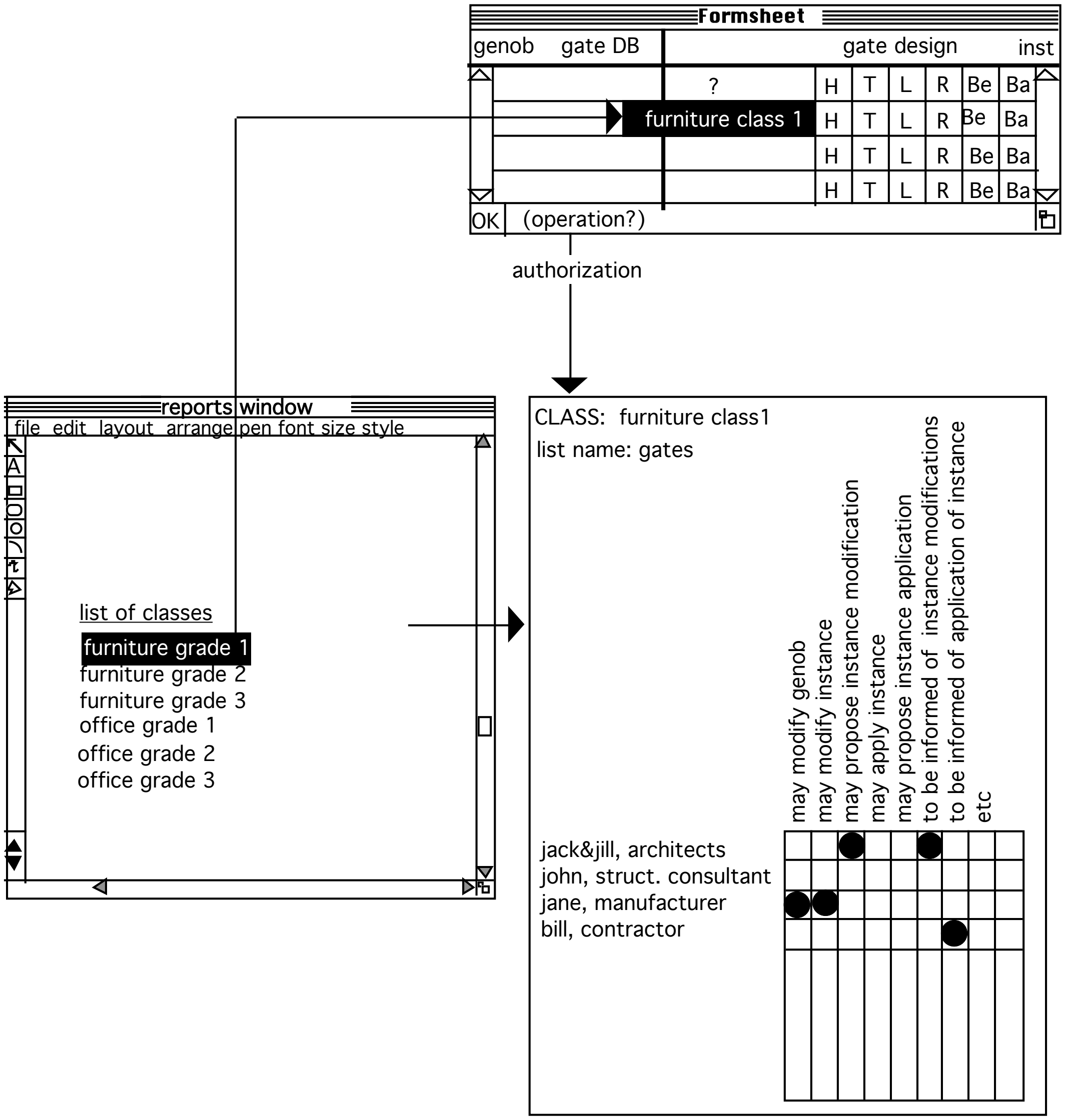
It may be advantageous to have Formsheet understand general relation statements.
For instance that, in case of a interior decoration project for a large office, certain kinds of furniture may only be placed in certain kinds of spaces.

To make such a statement:
first define classes of objects to be related. This can be done with the conventional search tool of a database. The selections thus found shouldbe declared a 'class' and given a name.

Formsheet will then be able to display lists of classes.
Select the two classes to be related .
They will appear in instance cells in Formsheet, and Formsheet will bring up the (relation?) menu
Select the relation desired and Formsheet will state the relation rule.
Click OK to confirm.

When a class 1 piece of furniture is brought into the design, Formsheet will check if it is contained by a class 1 space.
Following pre-established preferences Formsheet will, in case of violation, refuse to perform, or warn parties involved.

class authorization



list of classes

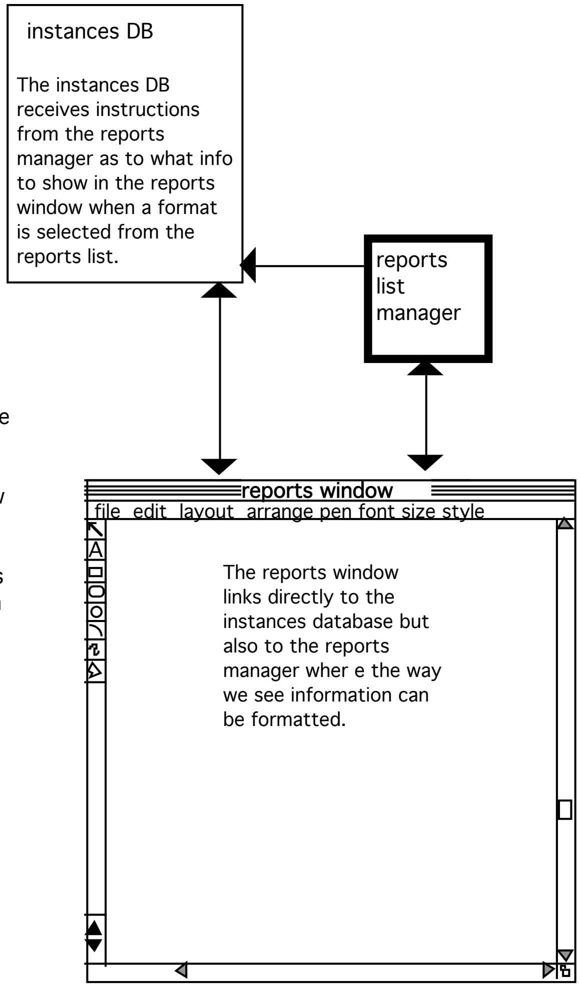
- furniture grade 1
- furniture grade 2
- furniture grade 3
- office grade 1
- office grade 2
- office grade 3

CLASS: furniture class1

list name: gates

	may modify genob	may modify instance	may propose instance modification	may apply instance	may propose instance application	to be informed of instance modifications	to be informed of application of instance	etc	
jack&jill, architects			●			●			
john, struct. consultant									
jane, manufacturer	●	●							
bill, contractor							●		

Classes of object are also used to establish authorization in the design process.
select the class of objects in the class list of the report window and transport to a instance cell of Formsheet.
Select 'authorization' in the (operation?) menu
The authorization form for this class of objects is displayed in the report window and can be filled in.



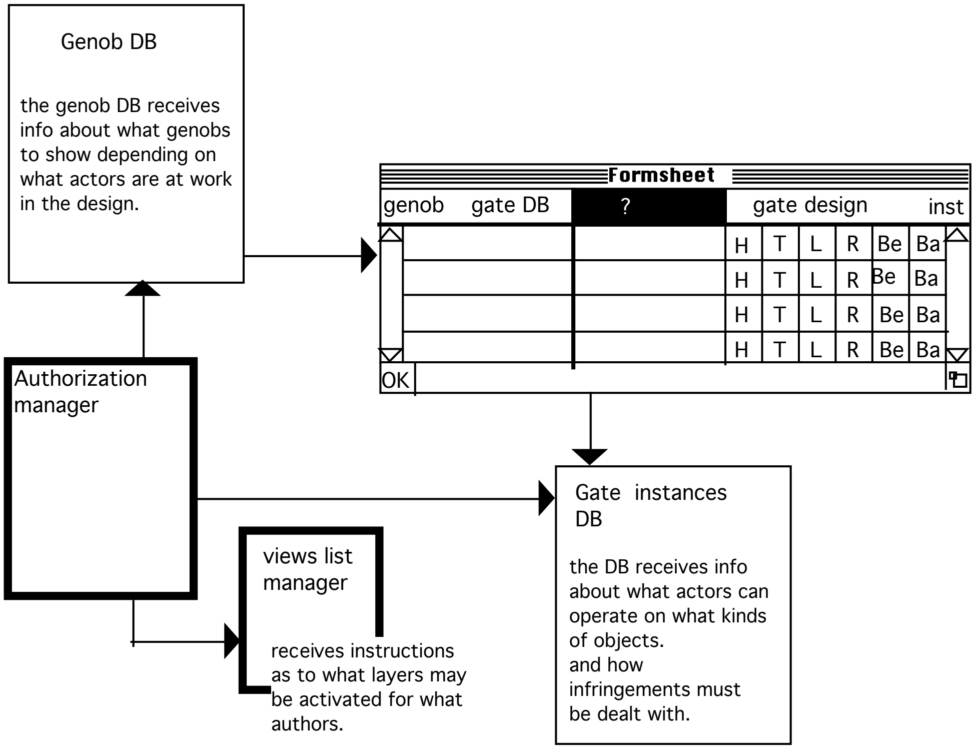
The instances DB receives instructions from the reports manager as to what info to show in the reports window when a format is selected from the reports list.

The reports window links directly to the instances database but also to the reports manager wher e the way we see information can be formatted.

The reports list manager is accessed through the report window.
The reports list mamager , when entered, will work like normal interfaces for database to allow us to view and arrange available information.

The reports manager also serves as a tool for us to format new reports and to keep a list of such reprots formats available for re-generation of data.

The default report format which appears when the reports window is opened, is the 'standby mode' report as discussed on sheet 64.



the genob DB receives info about what genobs to show depending on what actors are at work in the design.

receives instructions as to what layers may be activated for what authors.

the DB receives info about what actors can operate on what kinds of objects.
and how infringements must be dealt with.

The authorization mamager is the tool used to establish authorization agreements and the conventions by which these agreements are kept and controlled.
The authorization manager controls the log-in procedures by which authors get access to the design.
The authorizationmanager also instructs the view manager what layers may be activated depending on what authors have logged in.
It also instructs the Genob DB manager what genobs may be shown in Formsheet when what authors are at work.

Formsheet is a design environment for all parties making design decisions in a particular project. It must therefore understand what actors are authorized to work with what objects and remeber what protocol to follow to keep actors informed about the acts of other actors. (if, for instance a hole must be drilled in a beam to pass a pipe through, the plumber's design may trigger a warning to the structural consultant.)