

**Installation and
Operation Manual
for the
VERAUTO
software suite.**

A must for Steel Tower design

SANTA MONICA SERVICES
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Installing the software

Before you start installation of your software it is convenient to make sure there is enough space on the Hard Drive to receive the programs and accompanying files. The group of files that come with the VERAUTO for Analysis and Verification of Steel Tower Structures needs about one hundred and eighty megabytes (180MB). In that way, you should not have your installation refused for lack of space.

After installing the different options provided in the VERAUTO software suite and re-starting windows (if requested by the setup program) the following software will be available :

- SMLOADER,
- XVERAUTO,
- VISUALIZ,
- BARDIM
- GENUSE (General use) which provides access to several convenient software in a single window.

For those who have purchased the software with the "HARD-LOCK" option, remember to insert the dongle in the appropriate port (USB / Parallel, etc.) before starting to use the applications. The dongle is not required to start installation, but it will be requested by the program Organisateur that will finalize installation.

The data files may be read by any application of the VERAUTO suite, provided that the application is of the same or newer version than the application that was used to generate the data file.

Data files are totally compatible with the applications using the HARD-LOCK. Therefore, all data files created by any application of the VERAUTO suite can be transferred to another computer and used on the other computer using a HARD-LOCK. For the other license options (non HARD-LOCK), this compatibility is not directly supported since the licenses are linked to the computer on which the software is installed.

Anyhow, in order to guarantee our clients with the best services, a simple option has been added. The files created using whatever computer will be read by SmLoader on any other computer and the results of SmLoader saved on proper computer will be read by all other applications on same computer.

Definition of tower and member axes

The local axes of the members that make up the bracing of the tower face are, for the major part, considered in such a way that the local axis "X", parallel to the first dimension supplied, is effectively in the tower face.

In order to better understand the logic, one can imagine that all the members that make up the face are placed in the First Face of the tower (lower part of the drawing) having their principal axes parallel to the planes of the tower axes.

See the main axes on the sketch on the right

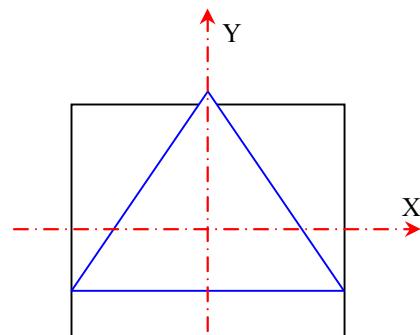
On the adjacent sketch is shown an Unequal Legs Angle having its X axis parallel to the tower's X axis and its smaller side (leg) within the tower face whereas the major side (leg) is perpendicular to the tower face. As such, its dimensions will be supplied as:

$X \times Y \times \text{Thickness}$

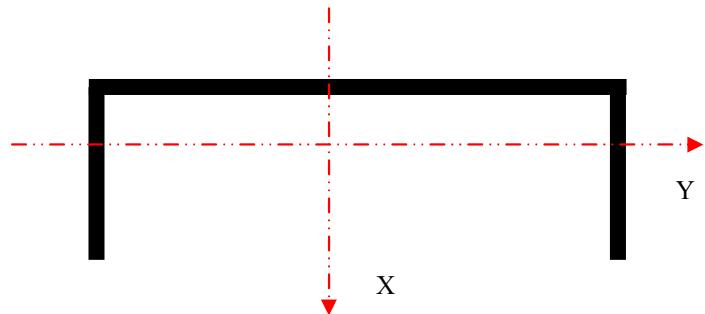
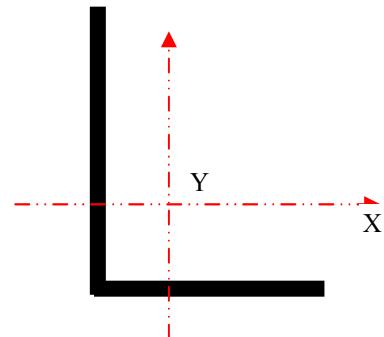
X being the side of the angle parallel to the principal axis.

Inverting the values X & Y in the name of the member will force the major value (leg) to be considered in the face and the minor (leg) perpendicular to it.

Exception to this rule are the members type "C", "I" and "U" that actually are considered with the larger dimension parallel to their local axis Y which in turn is considered in the tower face. This condition corresponds to the most frequent cases encountered in existing towers, reason why we adopted it until a more interesting solution appears for such cases.



First face



In the specific case of leg members for triangular towers, the axes X and Y are automatically computed to be parallel to the principal axes of the tower, taking into account that tower verification occurs with the most stressed leg member being at the vertex of coordinate X=0.

Terminology & other terms

Antennas - The names given to antennas are not important all through the applications. What are significant and have influence are the *equivalent area* and eventually the *moment of torsion* produced and the *proper weight* of each antenna.

Let us make it clear that if in some cases the name of the antenna is requested, this has the only scope of getting things easier. Quite often, in supplier's catalogs, the equivalent area and weight of the antenna is tied to a name. This name that will appear in the Antenna tables is provided with the idea that it may help in an easy choice of the antenna characteristics reducing the need to research in antenna providers' tables. Thus, if an antenna name is missing in the antenna Table, another name may be used whenever its equivalent area and weight are similar to the required antenna placed on the Tower.

Jummelé - Name given to the couple of angles assembled to work as one member, having their legs  placed side by side and bolted at least twice in the unsupported length. According to DIN Norms the connection must be with at least two bolts. Verauto applications always consider this option. There are cases where this option is overridden, these are when the user indicates specifically one bolt (NBR 8800 for example), then the application will consider only one bolt.

Oppose - Name given to the file automatically created by the application to allow for the check of major traction in the triangular tower's legs. The major compression is always computed in the first run of a triangular tower. Actually, the user has not to be preoccupied with this file, since its creation and use are internal to the application.

Reforço - Also **Reinforcement**, represents the complementary angle added to strengthen an existing one. Usually combined members are made up of two angles, the first one that is the one being strengthened and is already part of the structure and will bear the name corresponding to its location (Diagonal, Leg, etc.) and the other angle is named Reforço or Reinforcement

Flange - Flanges for connecting extremities of tubes are generally defined and presented in the various applications under the label DE x EP x NN, where DE indicates the external diameter, EP the thickness and NN the number of ribs connecting the tube to the flange.

NOTE: THE LATTICE OR FRAMEWORK MEMBERS RECOGNIZED IN THE PROCESSOR BY A NUMERICAL CODE THAT APPEARS ON THE SCREEN IN CERTAIN CIRCUMSTANCES, SO WE LIST THEM BELOW:

Structural element	Code	Structural element	Code	Structural element	Code	Structural element	Code
Leg Member	1	Diagonal Reinf.	6	Bracer 1	11	Diaphragma (cvt1)	31
Diagonal	2	Horizontal Bar Reinf.	7	Bracer 2	12	Diaphragma (cvt2)	32
Horizontal Bar	3	Sur-Bar	8	Bracer 3	13	Diaphragma (cvt3)	33
Sur-Diag	4	Sur-Diag Reinf.	9	Bracer 4	14		
Leg Reinf.	5	Sur-Bar Reinf.	10	Bracer etc.	Etc.		

* Reinf. = Reinforcement

Bay Type and Numbering

Lattice Types.

The framework or lattice types are identified, in the applications, by a group of 3 characters. An example of which may be this group “K 1A.”

The “K” represents the basic type of the truss which is tied to the generic shape formed by the diagonals in respect to the leg members.

Thus we actually have the following types named “A K N S V W X” which are generally sufficient to represent all types of bracing found in the latticed towers. Some bracing shapes may be increased or added if necessary when completely different from those already developed in the applications.

In the second position we always have a number that will correspond to the number of leg divisions, thus a K 5 will have the leg member divided in 5 parts.

The third position is always a letter whose scope is to define the type of bracing that will make up the framework connecting the principal members in the tower face.

In the sketches annexed to this document you will find most of the frames already developed.

Numbering of members and nodes of the tower.

The numbering of nodes for each frame in the tower always starts with number 1, summing up with the actual numeration of previous ones. This organization makes it easy to find the position of any node in the structure using the localization tables given by the computer. Looking into the tables written in the File CONTROLE.TMP can be found the beginning and end of any member, in whatever frame in the tower.

In order to make it easy to find out any member in the mathematical model created by our applications, we created a specific program, named VISUALIZ. This application shows on the screen, one face at a time, the complete tower. Just click on the desired member and its number and other relative information will pop up. Typing a number in the adequate Box will change the color of the member that corresponds to the inserted number. Most other relative characteristics will also be shown on the screen.

The eventual use of knowing the member numeration may be required if ever someone wants to find out the loading conditions of a determined member reading it from the results of the frame processing data. These results are listed and ordered in the file TowerName.EFF. For the final results, what is important is the worse situation for each type of member and this is automatically chosen by the application.

The results that appear in the file TowerName.LIR are shown in form of tables where are listed, bay by bay, all the necessary information to make sure the user can check the situation of his structure and pinpoint the elements that are insufficient to support the expected loads.

Standards used in calculations to define the shapes without ambiguity

The shapes actually covered in the applications.

A = Bent plate Angle with equal legs

B = Bent plate Unequal legs Angle

C = Bent plate U shape

U = Commercial U shape

D = Unequal legs commercial Angle

L = Equal legs commercial Angle

O = Omega shape (also named open U) at 60° \ /

S = Equal legs angle with an aperture of 60° named (Shifflerized in USA)

T = Tube

X = Conical Tube (Tapered)

V = Bent plate angle at 60° (looks like a V with rounded base)

The dimensions of shapes are given as described in [DEFINITION OF TOWER AND MEMBER AXES](#).

THE FOLLOWING SHAPES ESCAPE FROM THIS RULE :

Omega indicated 444 x 111 x 12.7 where 444 corresponds to the total width of the plate to be bent, 111 is the distance between the two lines where the blades for bending will act & 12.7 the thickness

Shifflerized indicated 152 x 33 x 12.7 where 152 is the width of the angle's leg, 33 the distance between the heel and the bent in the leg and 12.7 the leg thickness.

Tapered Tube indicated 100 x 110 x 4.8 where 100 is the minor external diameter, 110 the major external diameter and 4.8 the thickness of the tube.

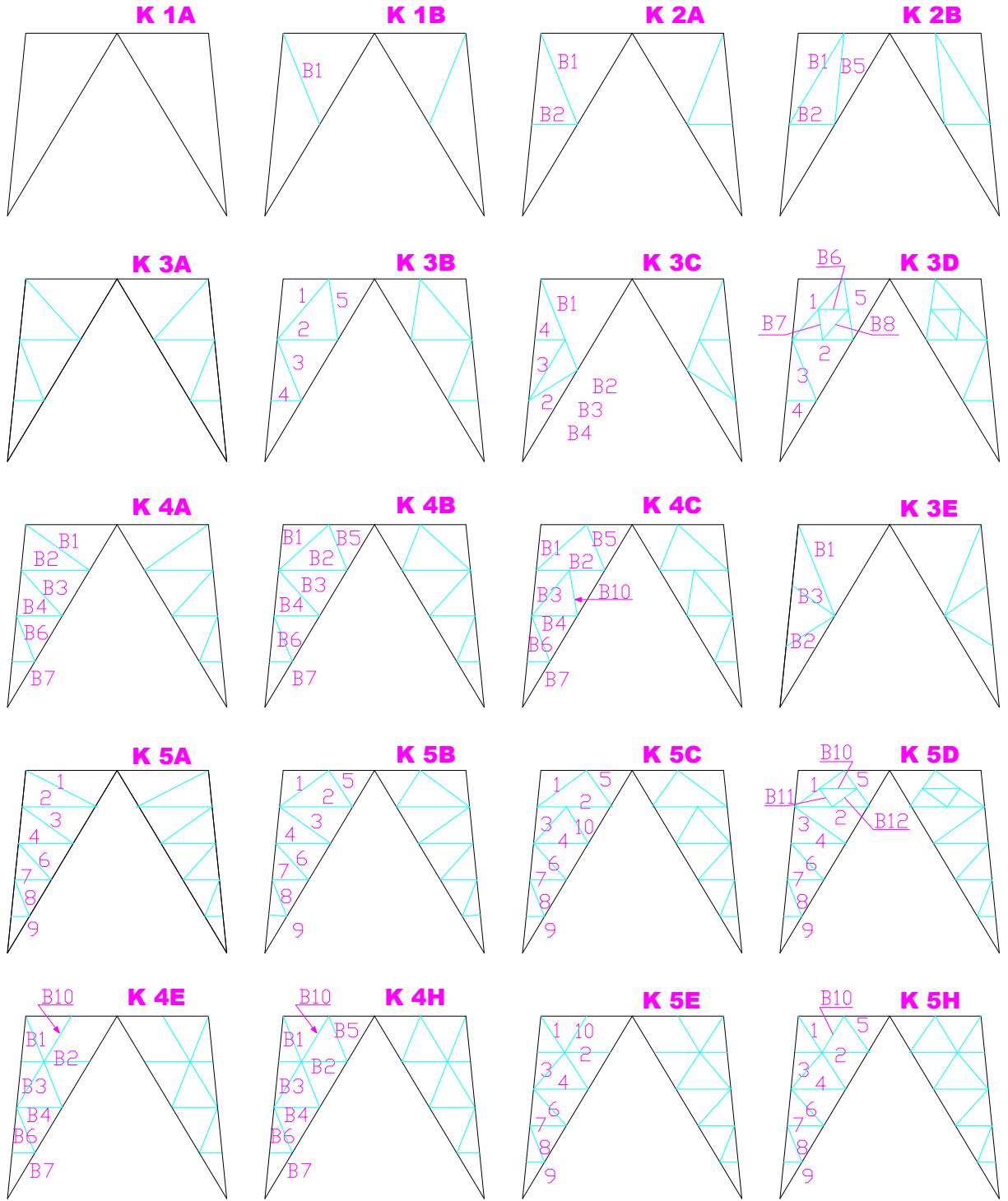
Note : If you are still uncertain about any of the above, please submit your question directly on the site ("Support" page)

In the next pages, you will be shown most of the lattices that are already supported in the VERAUTO application. This will facilitate your choice when required.

You will find interesting information that will prove very handy for starters.

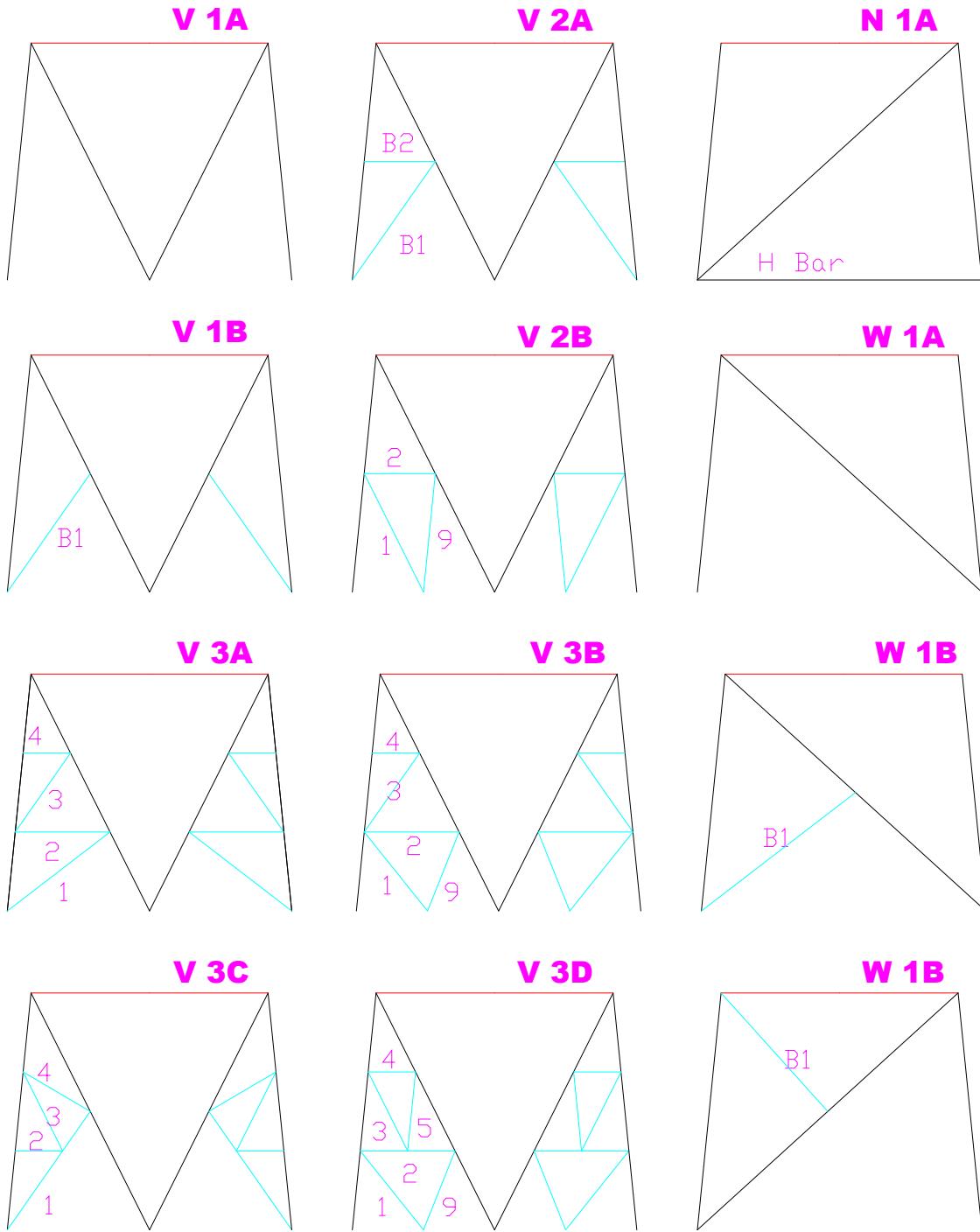
Latest Update : We have recently added the X1R lattice which is similar to the X1A lattice except that the diagonals are made up of small diameter round bars that are only subject to pulling forces. It is therefore necessary to have a horizontal bar (Sur-Bar) at the top and bottom of the bay.

Most usual Bays of Type K



On this page, the Bracers (Redundant) are shown in pale blue accompanied of their standard numbering.

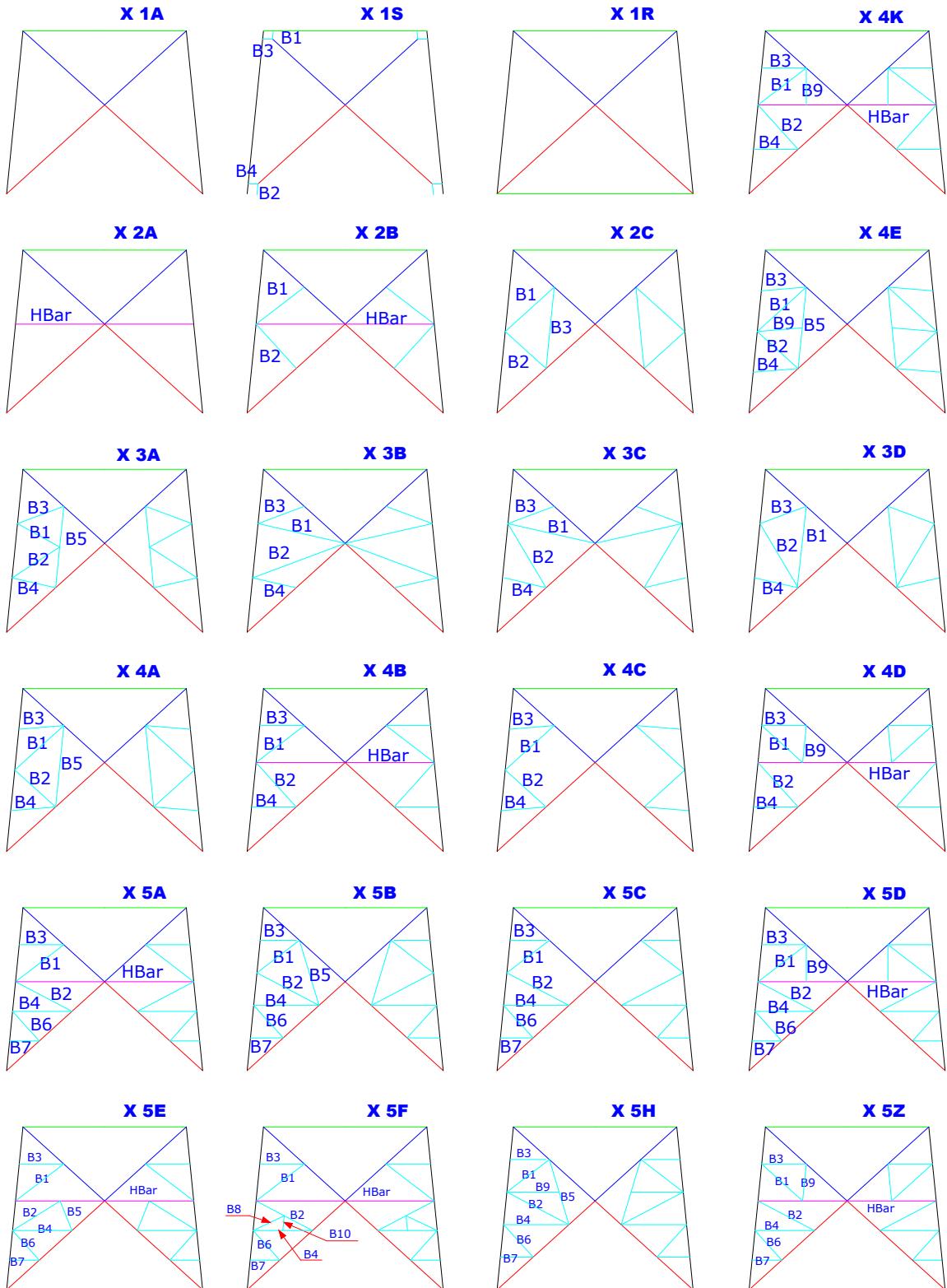
Typical lattice Bays of class N, V and W



Redundant (or Bracers as they are called in the calculations) which lay in the tower face are shown here in pale blue and are numbered according to the numeration used in the report.

Note that the red horizontal bar in the latticed bays is not always present. It is called SurBar in the report when it appears in the structure.

Typical lattice for Bays of class X and S



Redundant (or Bracers as they are called in the calculations) which lay in the tower face are shown here in pale blue and are numbered according to the numeration used in the report.

Note that the green horizontal bar on top of the latticed bays is not always present. It is called SurBar and shown in the report when it appears in the structure.