



Exploration & Production

GENERAL SPECIFICATION

PIPING VALVES VESSELS

GS PVV 114

Design models

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1. Scope

This specification covers the fabrication and utilisation of the design models.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

The model shall be built according to the plans and drawings issued by the Engineering Company and especially the following documents:

- Plot-plan
- P and ID's
- List of the lines
- Piping material class
- Piping standards
- Preliminary layouts for the main components of the structures, piping, cable ways, etc.
- Vendor drawings and equipment data sheets
- Civil work and metal framework guide-plans for the slabbing, under-ground pipes, structures, platforms, buildings, etc.
- Layout drawings for fixed fire fighting equipment
- Layout drawings for escape ways and rescue equipment
- Fire-proof bulkheads and fire-proofing drawings.

Standards

Reference	Title
Not applicable	

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	



Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
Not applicable	

3. Definition of a design model

A design model is a three-dimension tool used by the Engineering Company to build an installation that is economical, easy to operate and maintain. It is studied in detail by all the experts involved, specialised in piping, vessels, structures, rotating machinery, etc., so as to make sure that all requirements are met.

Upon approval by the COMPANY, the model is used as the reference for the construction drawings. The model is then used on the construction site as an aid for the erection, and then by the operators for training.

Design models are built in the following cases:

- Onshore installations
 - Production units, prefabricated skids
- Offshore installations
 - Production Platforms
 - Utilities Platforms
 - Living Quarters Platforms.

4. Development phases

The model shall be built up over two phases corresponding to two periods of the engineering design.

4.1 Phase 1: Basic layout study

During this phase all the major components are modelled (large structures, large pipes, main equipment, main lifting equipment, etc.). The detailed material (valves, instruments, piping system, local panels, analyser cabinets, electrical sub-station, etc.) is not modelled at this stage.



The COMPANY and all concerned parties shall examine the general arrangement in function of safety, erection, operation and maintenance rules.

The examination shall mainly concentrate on:

- The layout of equipment structures, platforms, and main accesses
- The installation of critical piping (transfer lines, centrifugal compressor suction and discharge, etc.)
- The main nozzles orientation on the equipment
- Escape ways and gathering points on platform for boarding
- Accesses and different service areas (e.g. areas reserved for exchanger bundle removal service areas for the compressors or heaters, etc.)
- The work areas covered by the lifting equipment installed on the platforms
- Possibility of modularising the different equipment sets (compressors, turbines, separators, manifolds, etc.)
- Hook-ups to be made on the platforms after installation of the modules.

All modifications requested and approved during the first phase shall be put on the model and then re-examined for final approval by the COMPANY and all parties concerned before commencement of the detailed studies.

4.2 Phase 2: Detailed study

At this stage all the components detailed in chapter 6 must be represented on the model before it is examined by the COMPANY and the concerned parties. The approval procedure is described in chapter 7.

5. General configuration

5.1 Scale

The design model shall be built to a scale of 1/33 1/3. Use of another scale is subject to previous approval by the COMPANY. At least three movable figurines to scale shall be furnished with the model to be used as a working reference. A scale ruler shall be furnished for each board.

5.2 Division into plot boards (See figure E)

An installation plot board division plan, giving the number and location of the plot board tables shall be marked on a reproduced tracing of the plot-plan as per the following criteria:

- The dimensions of a plot board table shall not exceed 750 x 1500 mm to facilitate handling
- The various units grouped in a single set shall whenever possible be on the same board
- The plot board edges should never pass under any equipment or under the centreline of a structural column.



5.3 Plot board tables

5.3.1 Fabrication

The plot boards shall be made of 16 mm thick fibreboard and covered with a smooth layer in matte white.

A frame 80 mm high and 19 mm thick and made out of the same material as the plot boards shall be provided under each board to prevent warping. This frame shall be mounted 18 mm from the edges to provide the necessary "finger room" for handling. Spacers shall be added under the boards if necessary.

Each plot board shall be equipped with four metal adjustable and removable legs so that their upper face can be raised approximately 800 mm from the floor. The legs shall be made of steel tubing 25 mm in diameter and painted black. They may have a square section of equivalent dimensions, and be chrome plated and/or in stainless steel instead of being painted.

5.3.2 Identification and markings (See figure A)

5.3.2.1 On at least one corner plot board

- The model scale
- A legend of the main colours used
- An inset with the project's main references: COMPANY name, Engineering Company(ies) name, the type of unit or installation, the installation site.

5.3.2.2 On each plot board

- The plot board identification number
- Direction North (upper right of each plot board)
- The elevation
- Each side boundary coordinates.

6. Model contents

6.1 Equipment (pressure vessels, columns, rotating machines, etc.)

6.1.1 Fabrication principles

The equipment shall be modelled in wood or opaque plastic. The cylindrical shapes shall be made from plastic tubing of standard dimensions, which best approximate the actual dimensions sought (without heat-proofing). Special shapes (pumps, compressors, etc.) shall be made from blocks showing the external configuration and characteristic details.

All pipes, platforms and handling appliances shall be shown in simplified form.

The heat and fire-proofing shall be shown with a crown in white plastic fixed onto the equipment.



6.1.2 Mounting

Large equipment models shall be solidly attached on the plot boards by screws or bolts. The medium or small sized equipment models can be glued directly on plot board.

6.1.3 Identification

6.1.3.1 Alpha-numeric identification (See figure B)

Equipment identification numbers shall be marked in 6 m high letters and figures on stick-on labels. The labels shall be affixed on the top of the unit for exchangers and on the most easily readable side for other equipment items.

6.1.3.2 Colours

The fixed safety equipment shall be red. The other equipment models shall be dark gray. The heaters shall be light blue.

6.1.3.3 Other markings (See figure C)

The equipment location coordinates shall be marked as well as the elevation of their corresponding platforms.

Tables giving the characteristics of each equipment piping shall be affixed on each board receiving the equipment (identification, diameter, series, coordinates and orientation, elevation, etc.).

6.2 Civil works

6.2.1 Buildings

Buildings sheltering equipment (compressors, water treatment, pump stations, etc.) shall be shown in exploded view. Other buildings (control rooms, analysers, electrical sub-stations, etc.) shall be made of blocks and only the doors and windows shall be shown.

The building steel parts shall be dark gray and the concrete parts in light gray.

Ventilation air intakes shall be shown in red.

6.2.2 Foundation blocks

The foundation blocks of the equipment, structures, platforms, etc., shall be made of PVC or Plexiglas. The ladder and stairway bases or small pipe supports shall not be shown.

6.2.3 Access roads and ways

Access roads shall be indicated on the plot boards by black adhesive strips.

Escape ways shall be shown by means of adhesive strip in black and yellow.

6.2.4 Underground systems

All underground systems (piping, electrical and instrumentation cables, etc.) and obstacles at the slabbing level, the drains and gutters shall be shown by strips of coloured adhesive tape.

6.3 Structures

6.3.1 Fabrication principles

The structures shall be modelled with wood or plastic parts. The fire-proofed metal framework shall be considered as concrete beams or columns. To facilitate pipe laying or photography, some structures shall be removable (preferably at the flooring level) (See figure F).

All platforms, slabs and flooring shall be shown and modelled in transparent Plexiglas. The slabs and flooring shall be at least 3 mm thick and the platforms at least 2 mm thick. The grating and slab and floor concrete shall be partially represented by appropriate adhesive stripping.

All the columns, beams, struts (spacers) shall be shown so as to gain an appreciation of the space available for the pipe-runs.

The ladders and stairways shall be represented in simplified form; handrails and safety ladders shall be shown.

The pipe supports shall be shown in simplified form (beams, columns and struts).

All handling facilities shall be shown (cranes, monorails, gantries, etc.).

6.3.2 Mounting

All the structures shall be solidly fixed on the plot boards with screws or bolts. The small sized platforms shall be glued directly on the plot boards.

6.3.3 Identification

6.3.3.1 Colour codes

The following colours shall be used:

- Light gray: Concrete parts (or fire-proofed)
- Dark Gray: Metal parts
- Black: Piping supports
- Brown: Temporary supports
- Transparent: Platforms, slabs and flooring

6.3.3.2 Other indications

Identification and coordinates shall be as per figure D.

6.4 Piping, valves and fittings

6.4.1 Fabrication principles

All pipes having a diameter greater or equal to 2" are shown to scale. All pipes having a diameter of less than 2" shall be shown by plastic cord 1.5 mm in diameter and shall only be shown on the model if they are part of the following:

- Process piping
- Passages provided on the pipeways
- Reduced part of a welded pipe section whose diameter is greater or equal to 2"

- Instrument connections
- Vessel or process line vents or drains
- Skid lines.

Repetitive pipe systems (e.g. heater burner equipment) are entirely installed once and in detail only, the other equipment of the same being shown symbolically.

The heat-resistant lines shall carry outside sleeves (rings or bushings) to show the heat-proofing's outside diameter (dimensions). The tracing manifolds shall be shown and the tracing pipes shall be symbolised by a plastic cord glued on the ring representing the heat-proofing.

All fittings (unions, flanges, etc.) and the valves shall be modelled. The wheels, the chain or extension wheels shall also be shown. Commercially available standard components shall be used; scaled models shall be built when standard material cannot be used.

The utility facilities, sampling taps, the safety sprinklers shall be shown and marked.

6.4.2 Mounting

All the piping elements shall be assembled with glue. When gluing on painted surfaces, the paint shall be scratched off before gluing.

If the piping is cut off because of the plot board division, transparent plastic braces shall be used to support the lines. Fictional supports for bracing the lines on the model shall be in transparent plastic whenever deemed necessary.

6.4.3 Tagging

6.4.3.1 Identification

All lines shall be identified with their number, which shall be printed on stick-on labels affixed to the relevant piping. Horizontal labels shall be grouped and affixed so as to be read perpendicularly from the plot board edges. Vertical labels shall be grouped and affixed so as to be read from bottom to top. Material class change on the same line shall be marked by a stick-on label. Arrows on the labels shall show the fluid flow direction.

6.4.3.2 Colour code

The following colours shall be used:

- Red Fire-fighting piping
- Green Alloyed or stainless steel piping
- Yellow Process piping in carbon steel
- Blue Utility piping in carbon steel
- Black Existing piping
- Orange Piping in special material or having an internal lining
- Silver Future piping
- Gray All the valves and fittings (except instrumentation)
- White Connecting pipes between the modules to be built on the platform



- Blue Cylinders Cooled sampling taps
- Blue Blocks Utility stations, safety sprinklers

Note: The unions (elbows, flanges, reductions) may be white.

6.4.3.3 Other indications

All the lines shall be sized using a system of coordinates and their elevation shall be given (pipe centrelines or lower plan in the lines which are supported by pipe racks).

6.5 Electricity

Electrical equipment shall be modelled in plastic blocks showing their external shape. Running of electric cable bundles above the ground shall be shown by in-depth coloured Plexiglas; individual cables are not shown.

The following material must be shown:

- Transformers
- Electrical boards (outside)
- Individual power supply boxes
- Lighting boards
- Welding outlets
- Local control boards
- Lighting fixtures.

The colour used shall be: **green**.

6.6 Instrumentation

All the line instruments (control valves, orifice flanges, safety valves, pressure and temperature pick-off, etc.) and the equipment instruments (levels, safety valves, etc.) shall be shown and identified.

The transformers, local controllers, etc., the buildings, (analysers or other), the instrumentation boards or cabinets, the distribution boxes shall be represented by scaled plastic blocks.

Instrumentation cable bundles run above the ground shall be shown by in-depth coloured Plexiglas; individual cables shall not be shown.

The air-instrument connections and instrument process connections shall not be shown.

The colour used shall be: **pink**.

6.7 Fire-fighting and safety equipment

The following equipment shall be shown in red:

- Fire water monitors
- Fire hydrants
- Pillar type fire hydrants



- Fire-proof partitions
- Rescue equipment on platforms.

7. Approval and updating

Before the model is approved by the COMPANY and the other parties involved, the Engineering Company shall make sure that the model conforms to the latest revised issues of the contractual reference documents.

The following shall be subject to approval (this list is not exhaustive):

- Accesses (roads, catwalks, stairways, ladders, etc.)
- Safety equipment
- Fixed lifting and handling facilities
- Operations and maintenance facilities
- Access to certain types of equipment
- Surfaces or spaces necessary for disassembly and maintenance of certain equipment and instruments.

After the last comments, the model shall be entirely updated as per changes approved by the COMPANY.

Colour photographs of each plot board and overall views of the assembled plates shall be taken after each review (phase 1 or 2).

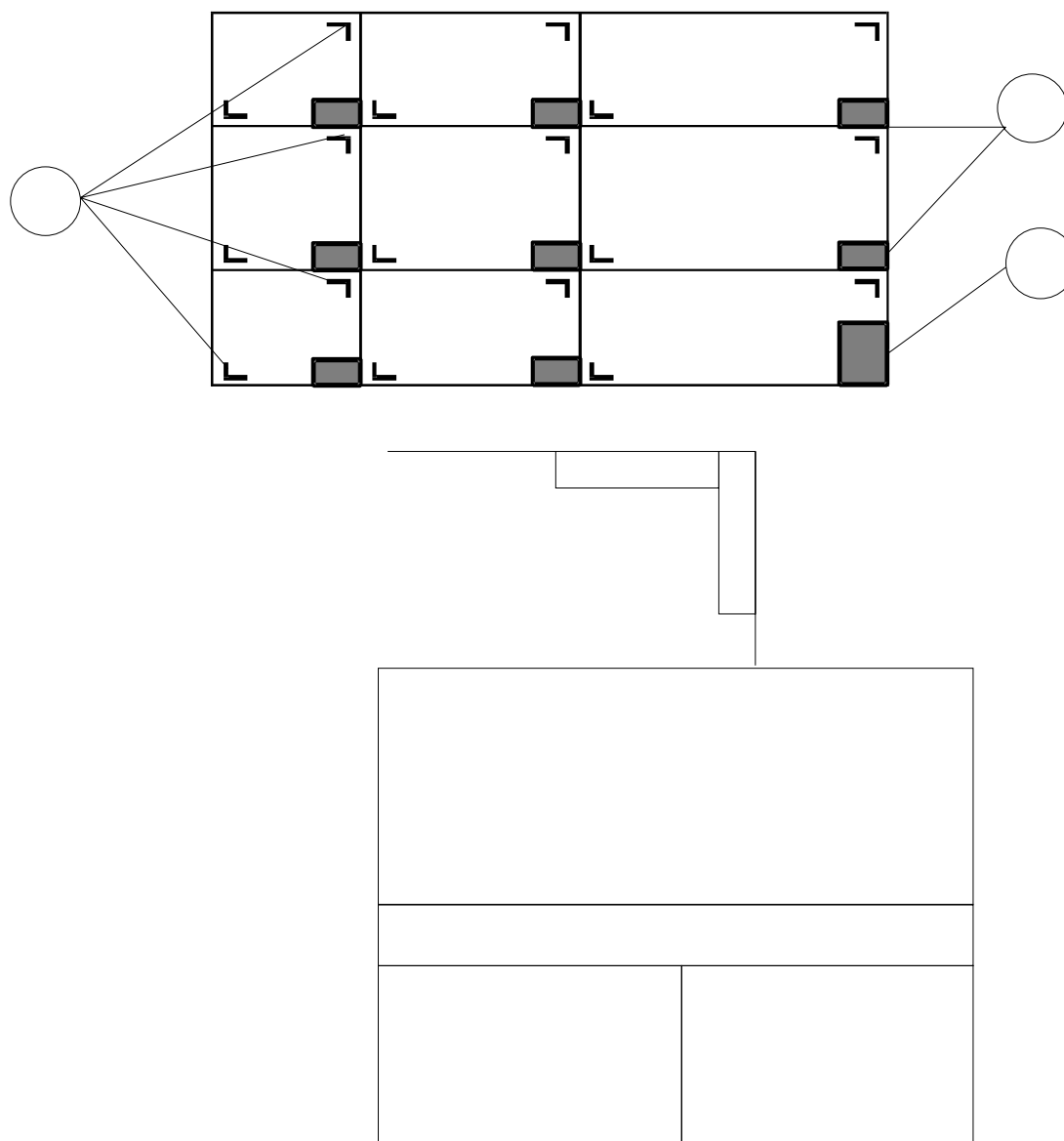


Figure A - Example of identification on plot boards
Overall view of all the plot boards of a single model

- Equipment identification example

12 C . 01

- Piping identification example

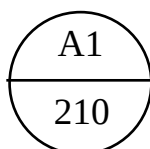
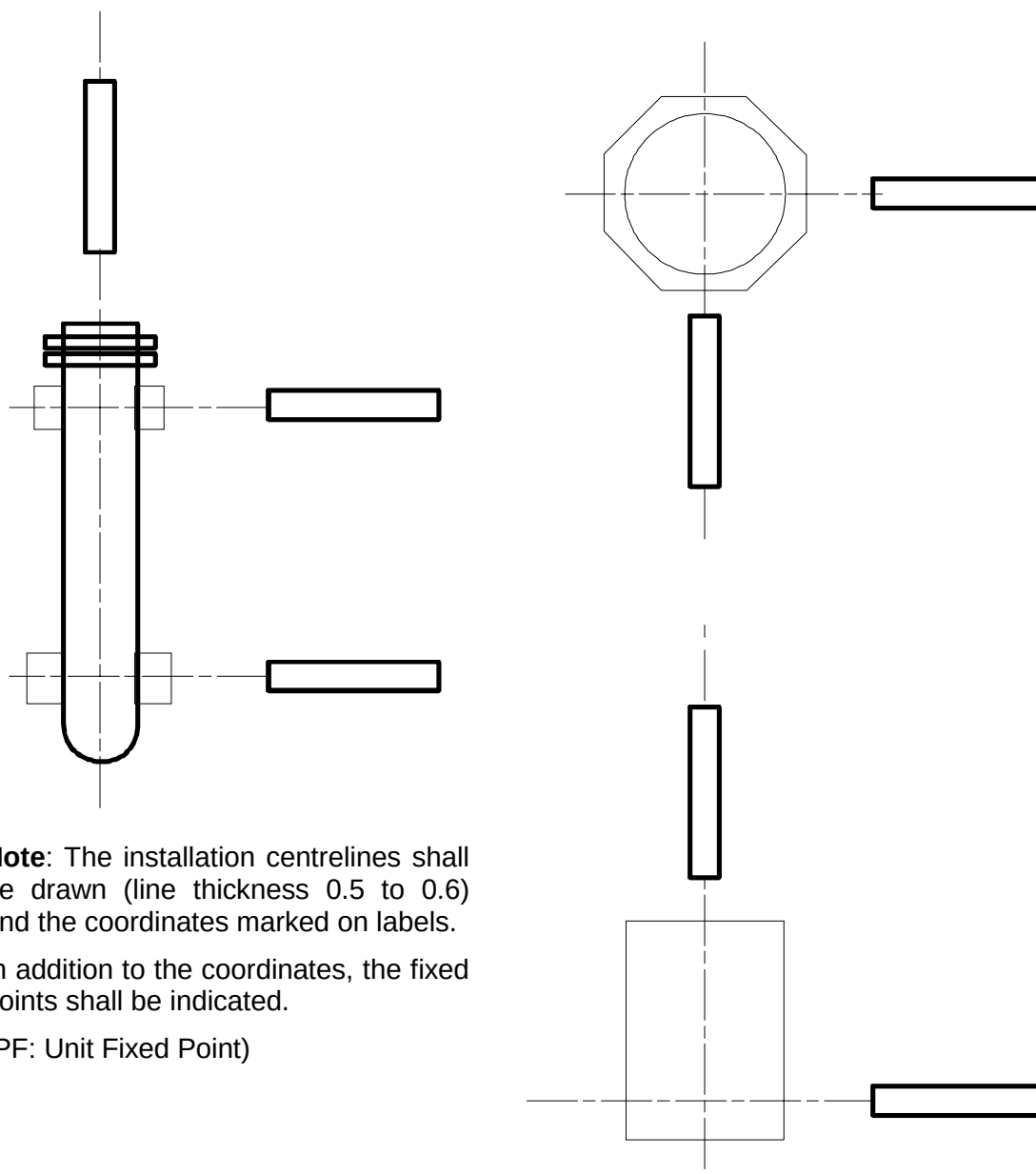


Figure B

Note: The piping shall be identified by a circle 9 mm in diameter. Only the pipe number and orientation shall be indicated. This circle shall be as near the pipe as possible and placed directly on the top pipe (slanted letters and figures 3 mm high).

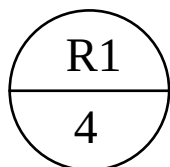


Note: The installation centrelines shall be drawn (line thickness 0.5 to 0.6) and the coordinates marked on labels.

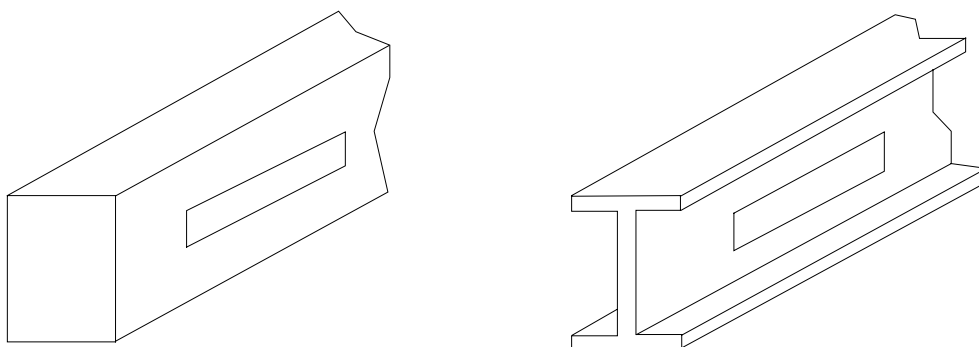
In addition to the coordinates, the fixed points shall be indicated.

(PF: Unit Fixed Point)

**Figure C - Equipment location coordinate
Marking example**



Note: Building column row and rack structure markings shall be indicated on stick-on circles 19 mm in diameter (slanted letters and figures 5 mm high).



Note: The support iron or **girder level** shall be marked with labels.

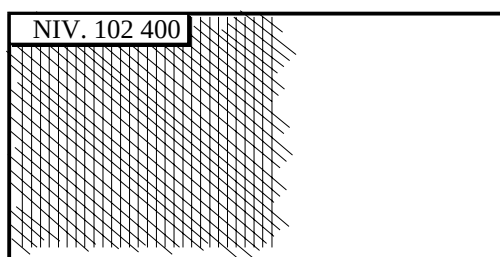


Figure D - Example of steel level and column row identification

Note: The metal platform level (top of iron) shall be marked on the site with stick-on labels.

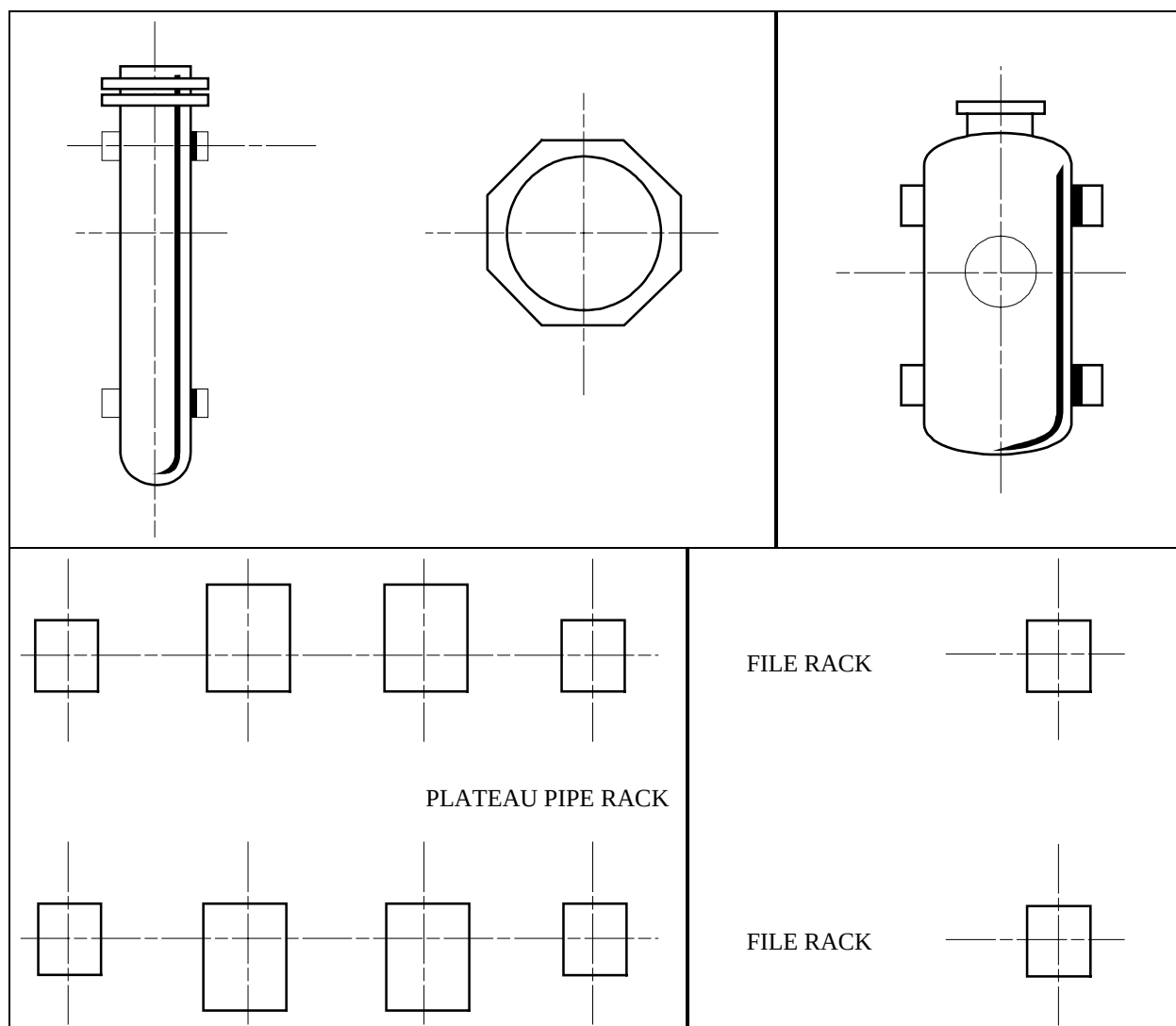


Figure E - Example of plot board division

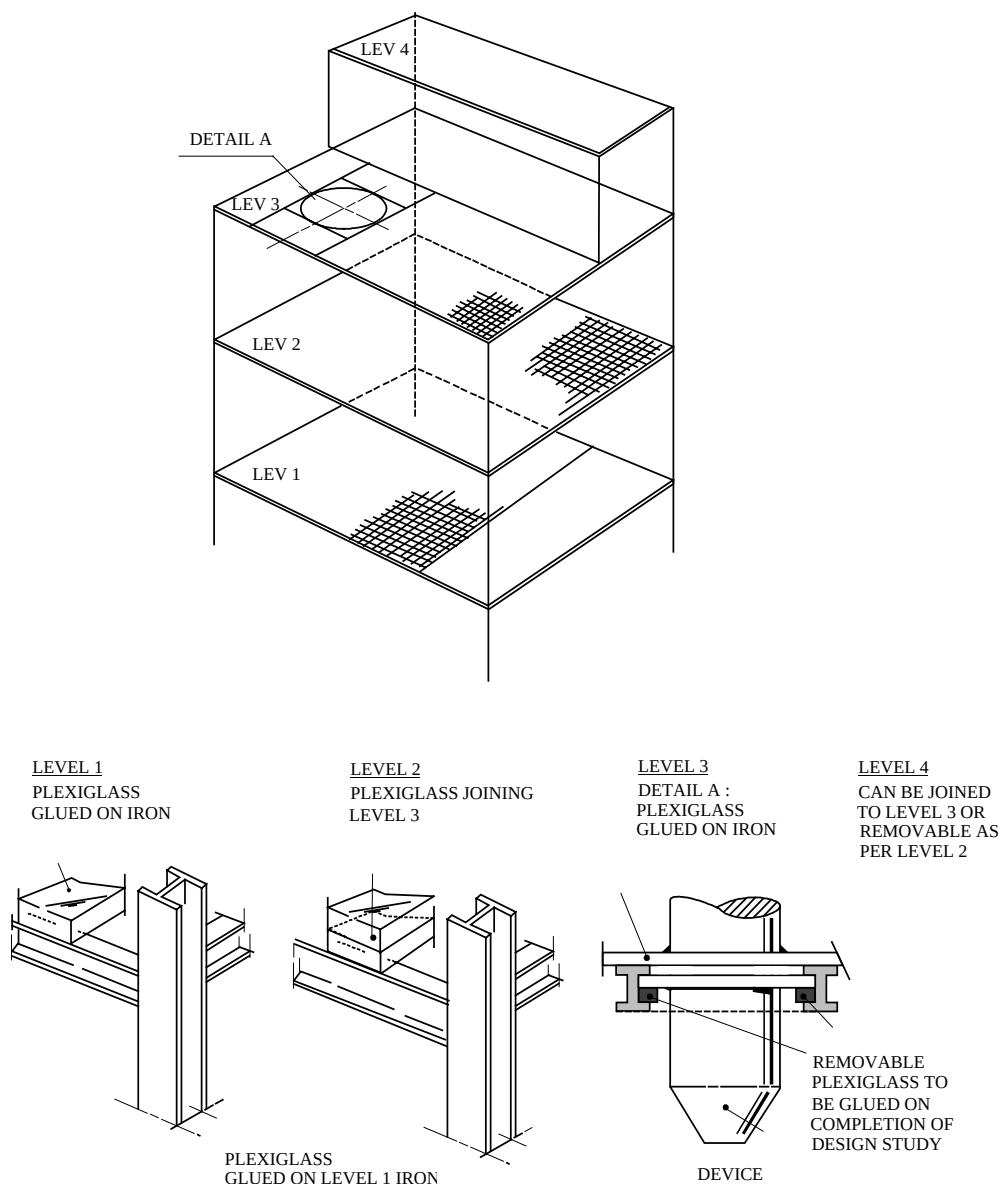


Figure F - Fabrication principle of removable structures