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СООБЩЕНИЯ
ОБЪЕДИНЕННОГО
ИНСТИТУТА
ЯДЕРНЫХ
ИССЛЕДОВАНИЙ

Дубна

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ATLAS BARREL HADRON CALORIMETER:
TOOLING DESIGN DESCRIPTION
FOR MODULE ASSEMBLY

1995

The auxiliary equipment technical project for 6 meter module assembly has been presented by us on April, 1995 ATLAS-Week.

At this moment the fully completed working project is prepared. At 10-th August, 1995 the *eps* and *igs* forms shop-drawings are placed on the cadd-disk. The working project differs from the technical one by more detailed work over of all the assembly units and details of tooling.

Tooling for module assembly consists of the base, face brackets and horizontal platforms with rails (Fig.'s 1, 2, 3).

The base (Fig. 4) is welded using I-beams 240 mm in height, two structural channels 140 mm in height and stiffening ribs 6 mm thick, and support plates 20 mm thick. After welding, the base has to be annealed to remove the internal stresses. The bottom and top supporting surfaces of the plates are milled. The center top support plates have 27 mm diameter holes used to attach to the girder when the module is assembled. The outer top support plates have 18 mm diameter holes to fix the face brackets.

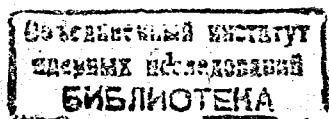
The face brackets (Fig.'s 5, 6) are manufactured from $10 \div 30$ mm thick plates welded together; they have to be annealed after welding.

The datum surfaces of the brackets are machined. The allowed nonperpendicularity of these surfaces is 0.12 mm.

The left face bracket (Fig.'s 1, 2) is installed against the girder. The right face bracket is installed with 40 mm clearance. This positioning of the bracket is suitable for installing the final, 19-th, submodule. The right face bracket (Fig. 6) uses M12 bolts (two bolts are on the top and two one's on the bottom) for adjusting the submodule along Z-axis.

Left and right face brackets have 22 holes in the middle of vertical wall to allow the possibility for inserting 8 mm diameter studs (tubes) into the module without moving the brackets.

The horizontal platforms (Fig.'s 7, 8) are attached to the side surfaces of the brackets. These platforms are welded using structural channels 120 mm in height. The surfaces of these platforms are covered with checkered steel plates. These platform edges have brackets for attaching to the face brackets.



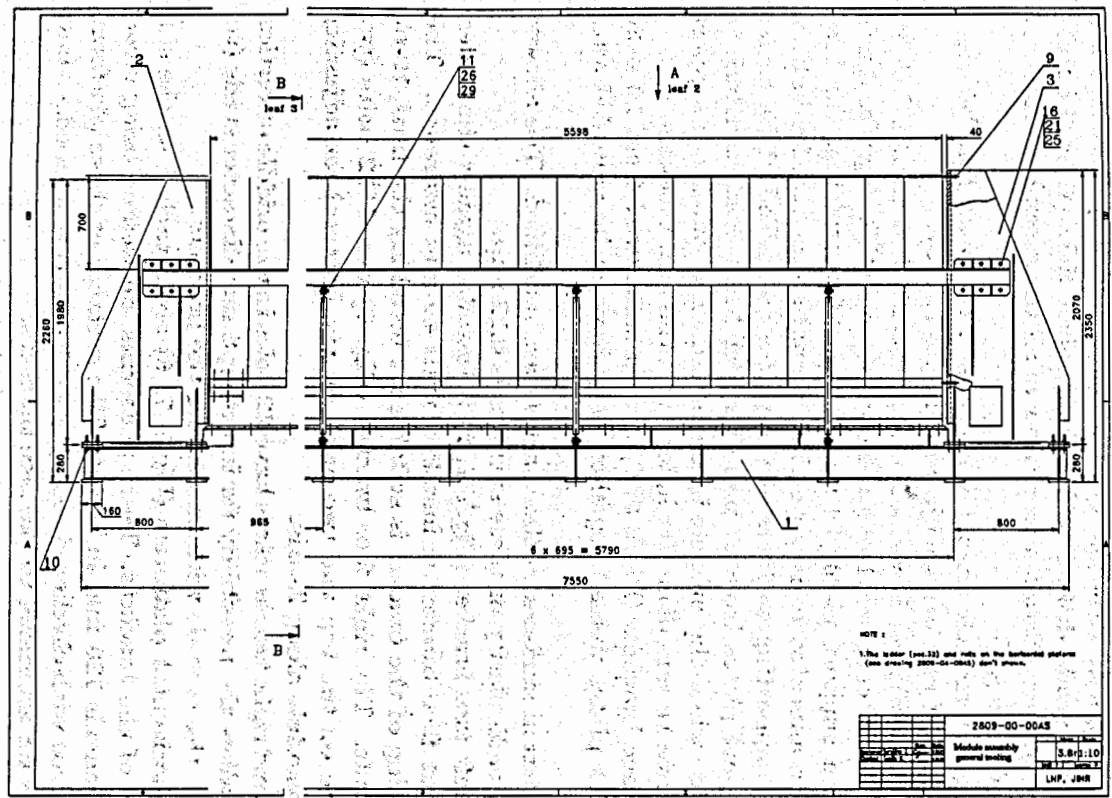


Figure 1

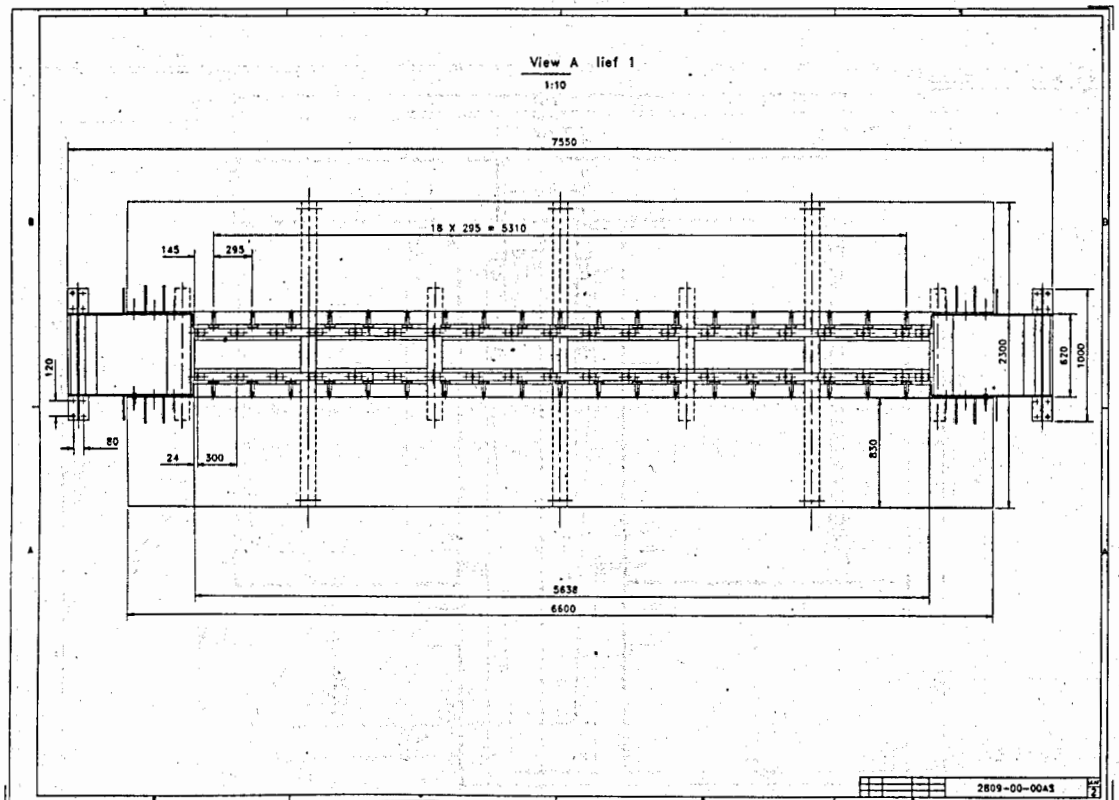


Figure 2

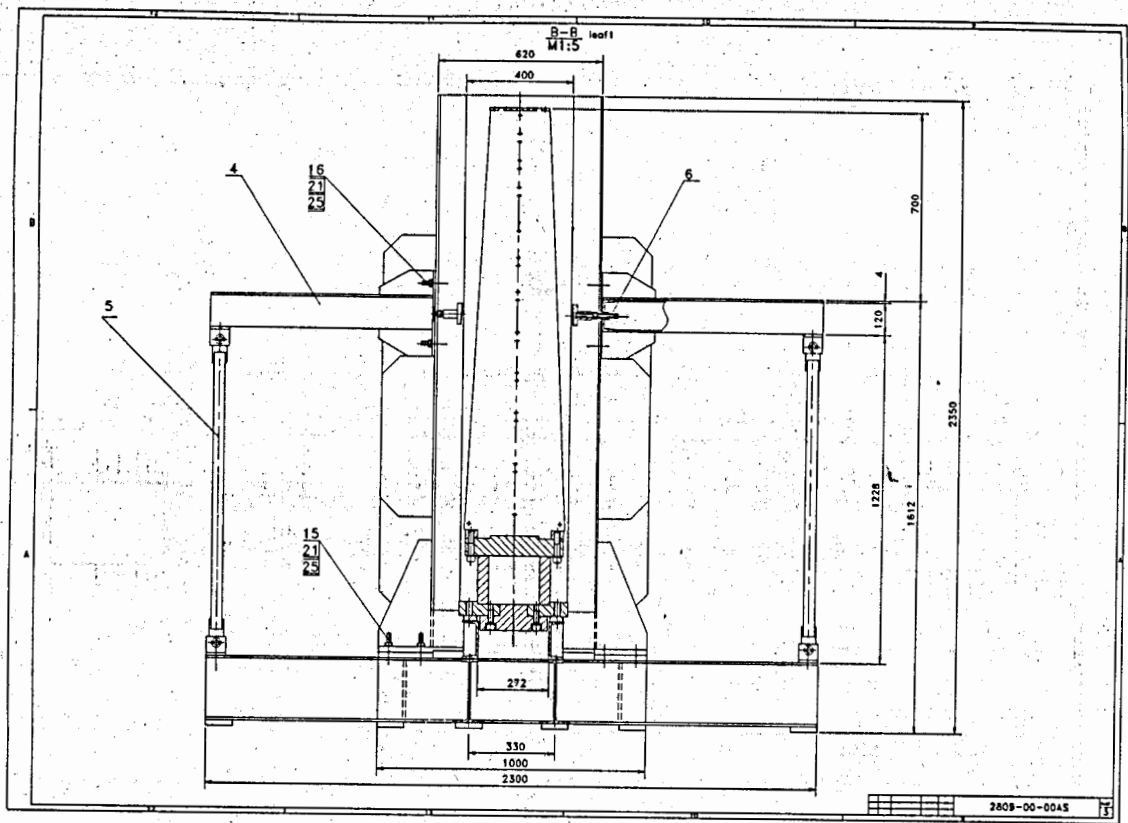


Figure 3

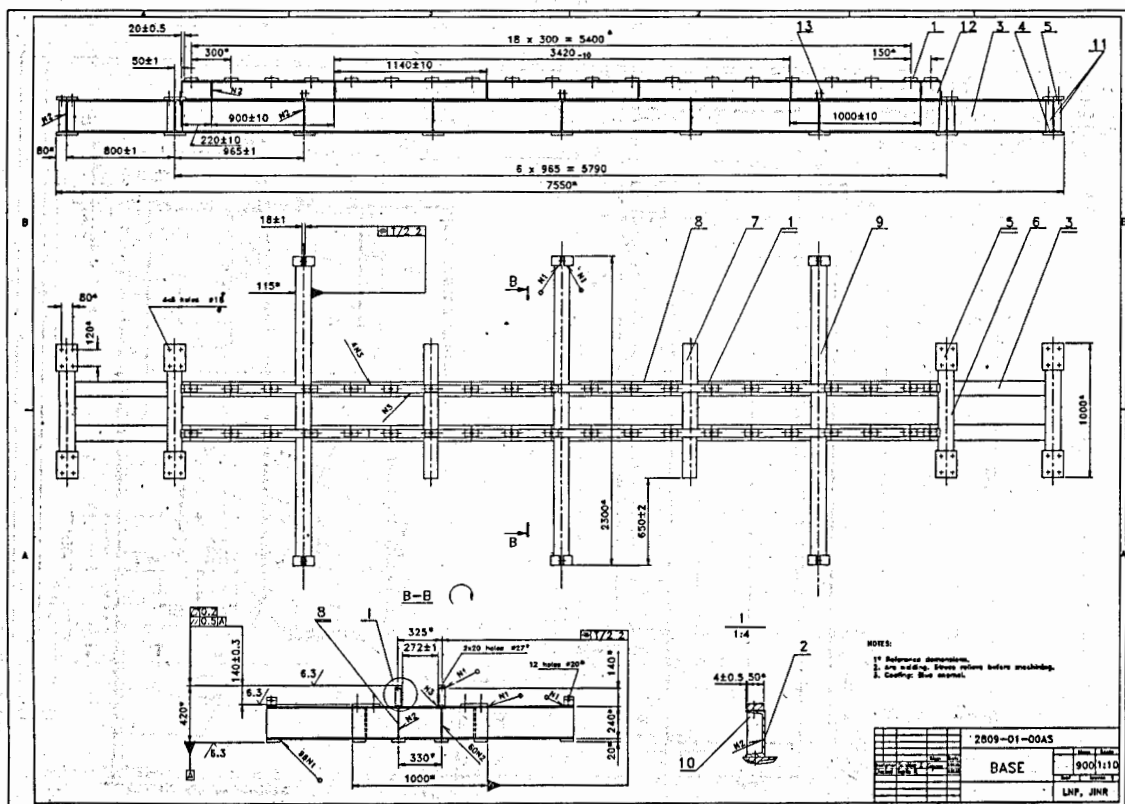


Figure 4

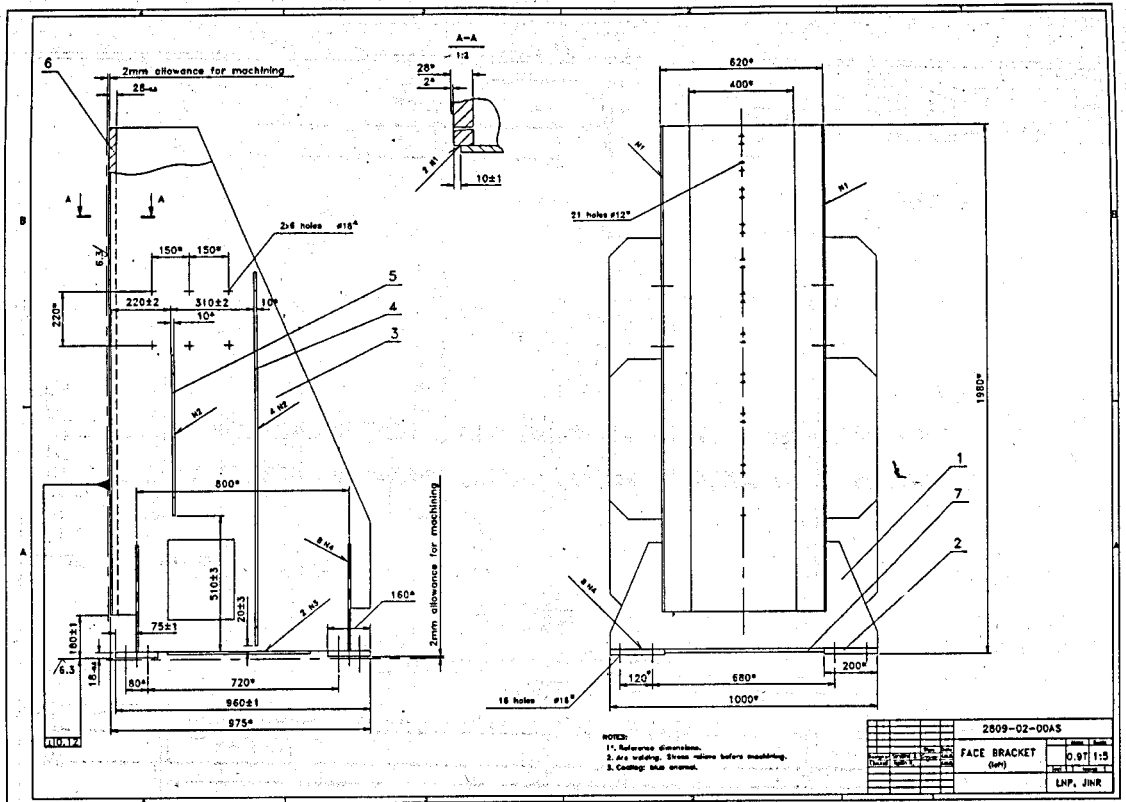


Figure 5

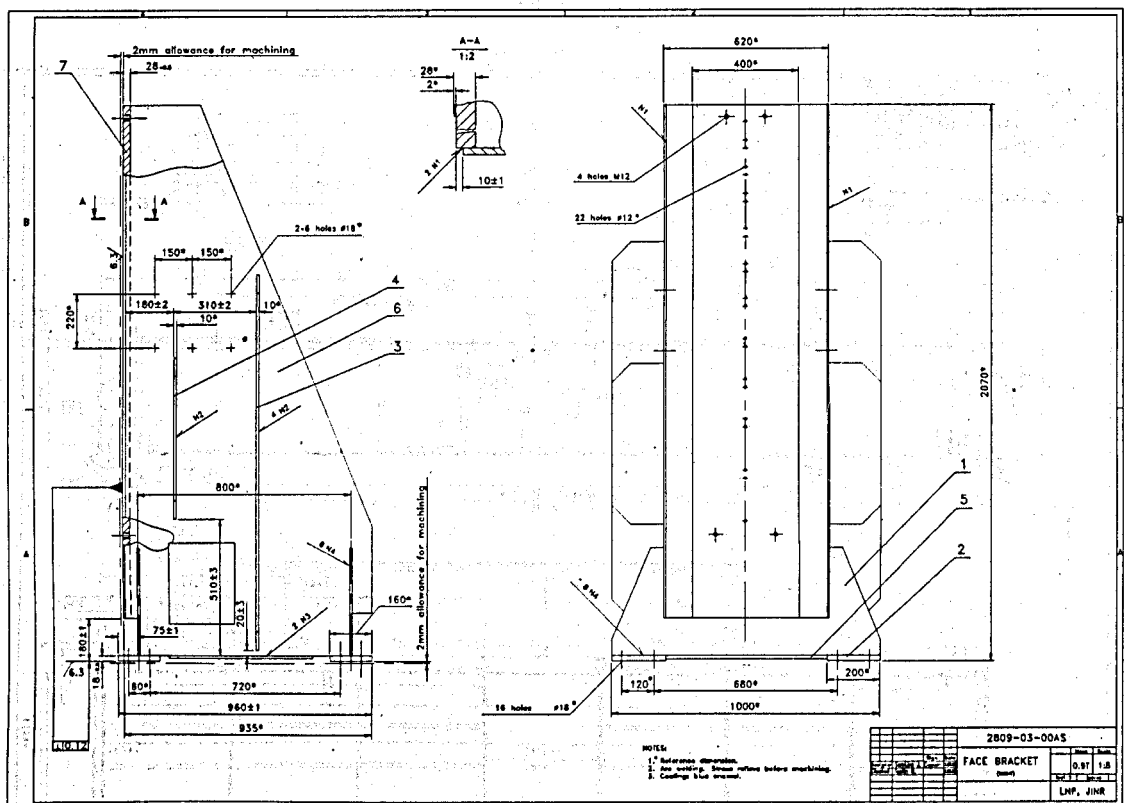


Figure 6

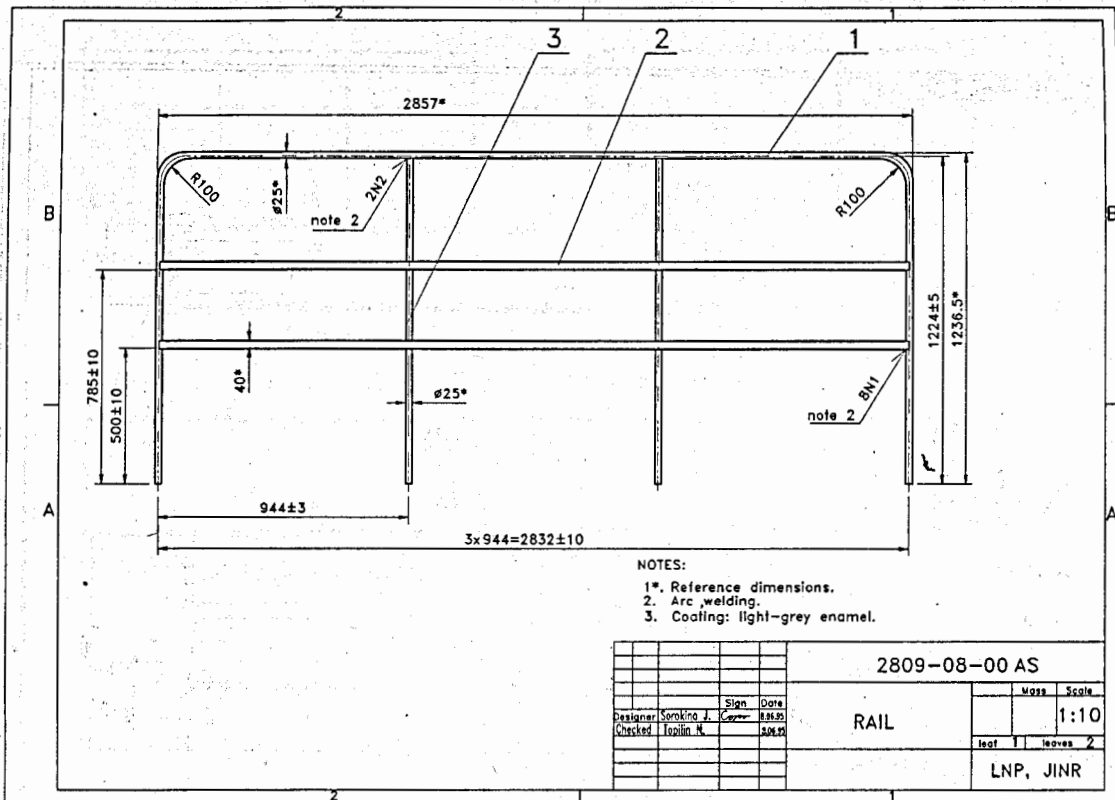


Figure 9

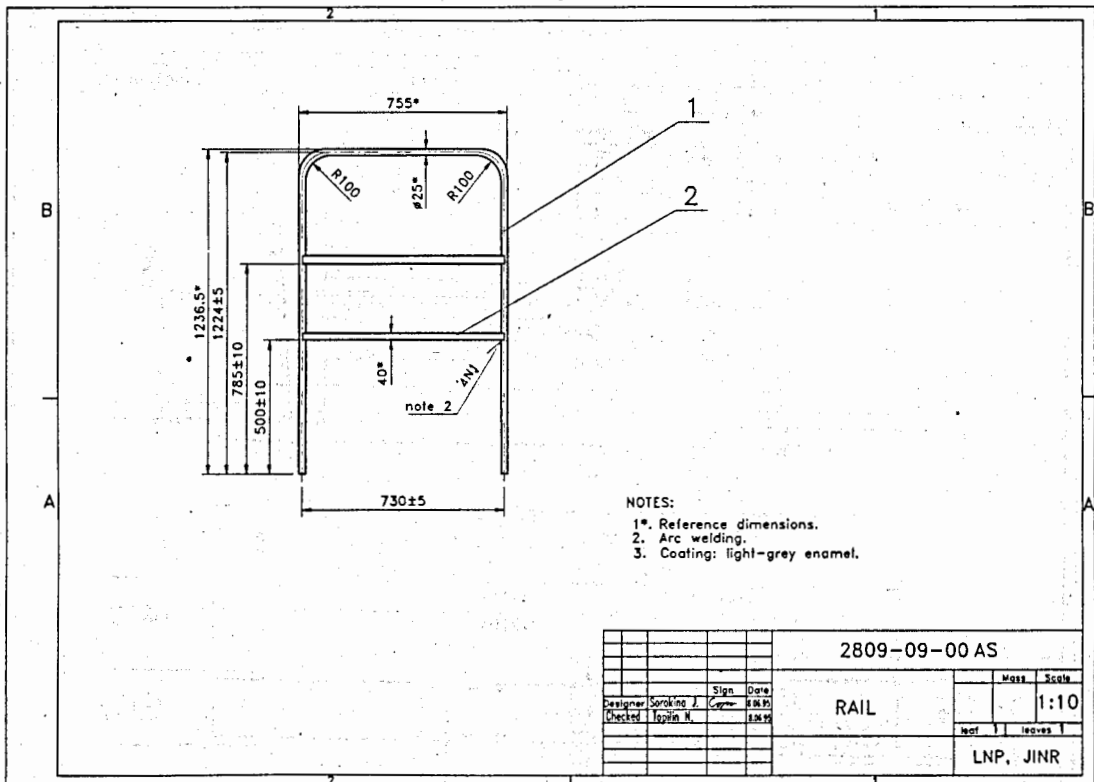


Figure 10

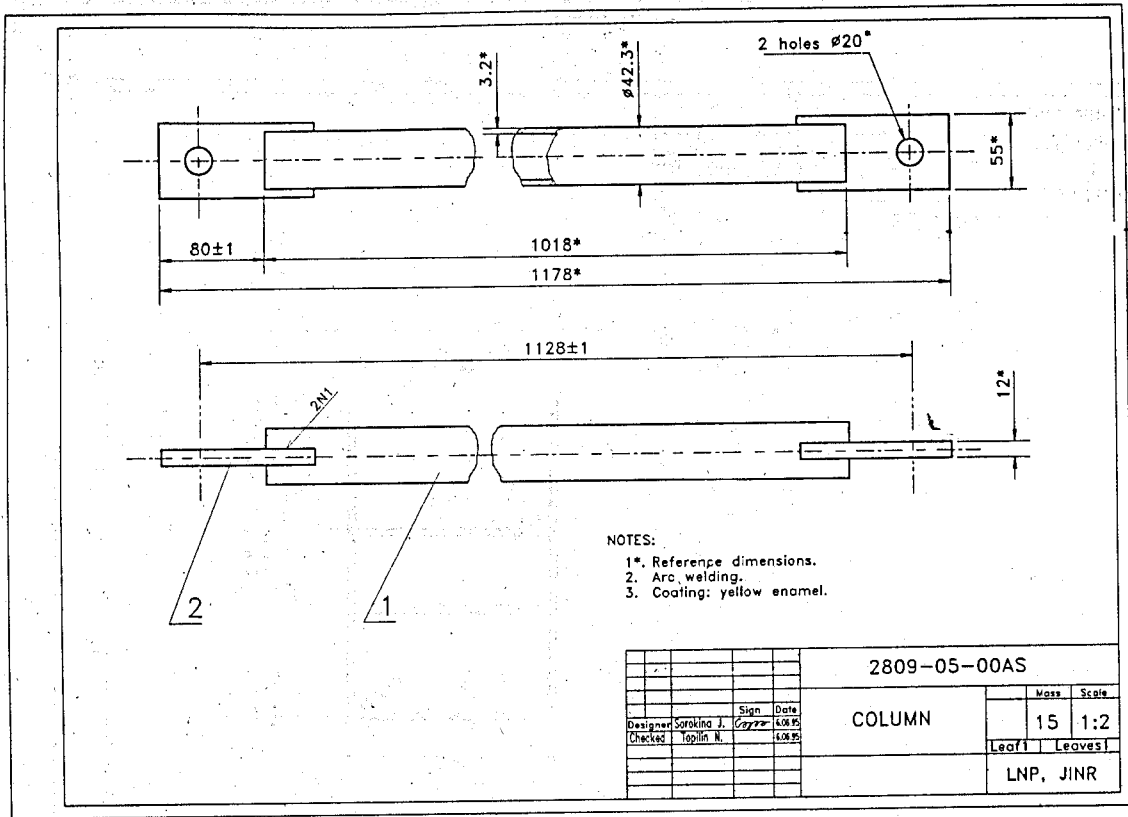


Figure 11

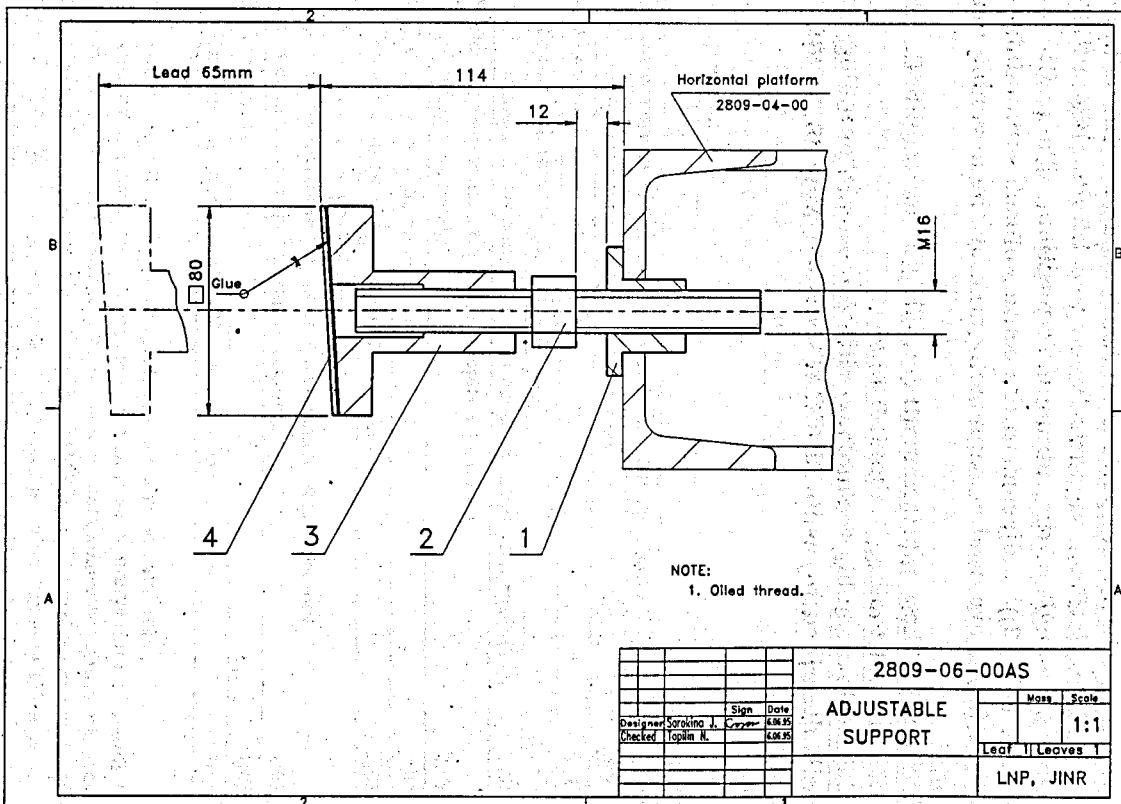


Figure 12

The platform external sides have the rails (Fig.'s 9, 10) for personal safety when module assembling.

The platforms are supported at their center with columns (Fig. 11). The platform supports have special bolts (Fig. 12) for adjusting the ϕ -angle of the submodule's position. The position of these bolts (Fig. 2) is adjacent to the center of each submodule.

The platforms are used as supporting area by the assembly personnel.

Annealing of these platforms after welding is not required.

The weight of tooling is about 4 tons.

The module assembly technology with the use of the tooling was in details described by us in TILECAL-NO-52 (May 26, 1995).

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