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DISCLAIMER

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The following report supersedes the report dated 9/10/43 outlining a procedure for assembly of the pile shield. This report is intended to describe the pile shield assembly in sufficient detail to be used as a guide to the construction engineers in interpreting the design and planning the erection.

General Description

A general description of the pile with a suggested sequence for the construction of Building 105 is outlined in the following three paragraphs.

1. Pile footings will be poured first up to the first construction joint. Forming will then be completed for the remainder of the pile foundation. The gas inlet and outlet header assemblies will then be placed in position. The concrete will then be poured up to the second construction joint which is the level at which the 1/4" steel seal plate must be installed. This plate forms the seal against gas leakage through the concrete foundation and joins the side and end base plates to form the bottom part of a continuous envelope around the six sides of the unit. Welding must be carefully supervised and all seams must be suction tested to insure gas tightness. (Checking about possibility of using pipe instead of grout holes.)

   This second pour also brings the foundation up to the levels at which the 1-1/2" steel base plates can be set and grouted in. Upon these plates is erected the side and end shields which enclose the graphite pile.

2. The footings for the process area, work area, and fan room of the building valve pit will be poured meanwhile and this portion of the building rushed to completion in order that this area may be enclosed. The building will then be supplied with filtered air through temporary duct work so that a positive air pressure (1" water approx.) may be maintained inside while the graphite and shields are being erected. This precaution is taken to prevent infiltration of dust and sand and to exclude such foreign matter from the internal parts of the pile. A temporary assembly room, functioning as an air lock will be constructed outside the valve pit with facilities for unloading and transferring heavy equipment by tram car into the work area of the building. A 25-ton crane will be provided over this work area so that shield blocks and other component parts may be lifted from the transfer car into position on the pile structure.
3. The process unit consists of a graphite pile, 28' long, 36' wide and 36' high, assembled from accurately machined bars in a definitely specified pattern. The pile is built upon a base layer of cast iron 10" thick. This base layer is assembled from over-lapping blocks, approximately 10" thick, 2' wide and 3'6" long which are grouted into the concrete foundation.

The above assembly is completely enclosed on all sides and top by a shield consisting of 6" and 10" of cast iron and 50-1/2" of laminated steel and masonite. The sides and roof are assembled from structural steel plate and masonite, built-up and laminated in the field on the job. The two end walls, because of their more complicated design, are supplied in the form of 10-ton prefabricated blocks which lay up to form the walls. Additional structural straps are added as the walls are erected to provide required stability.

The C. I. thermal shield blocks in the base, sides and roof are cooled by means of 3/4" stainless steel water tubes extending from the front face through to the rear, forming a water wall about the graphite pile. These water tubes are laid into cast grooves in the C. I. blocks and sealed by filling in the grooves with molten lead.

The laminated shield blocks forming the front and rear of the unit are provided with round holes in a definite pattern. When assembled, there are 2004 - 1/4" diameter openings on 8-3/6" centers in both front and rear shields. These openings accommodate the tube assemblies which support and guide the aluminum tubes which extend through the graphite from the front to the rear face of the shield.

**Laminated Block Base Plates – Method of Assembly**

These base plates of 1-1/2" steel plate perform two functions:

1. The gas seal between the 1/4" seal plate in the foundation and the outside faces of the laminated shield walls.

2. A machined surface, accurately leveled and grouted in to support the side and end shield walls.

The actual elevation at which these base plates are set is the benchmark controlling all future vertical dimensions in the pile. This elevation should be established from the finished floor elevation of Building 105 as shown on M-71313. The front and two side plates are at the same elevation and should be leveled to an accuracy of 1/64" in 4 ft. The rear foundation is depressed one block height below the other 3 walls and its base plate should be set with reference to the front plate to an accuracy of 1/64".
The above work should be done after the second foundation pour.

Side Walls - Construction and Erection

The side wall structural frame should be erected next since both side wall frames must be in place before any internal parts are assembled. This structural framework furnishes rigidity to the wall and forms the skeleton on which the subsequent laminations are assembled. This structural frame consists of 9 T-sections, of which the flange is 2-1/2" steel plate, 4" wide and the web is 1/2" steel plate 50-1/2" deep. The stems of the tees are spaced 4" apart forming vertical bays which are subsequently filled with alternate laminations of steel plate and Masonite.

Nine such tee sections are assembled in the field by welding. Jigs should be used in the assembly of these tee sections to hold web at a 90° angle to the flange, and to prevent distortion during welding. Each section is then moved into place, beginning at the edge of side wall. The tee sections stand vertically with the flanges toward the inside of the structure forming a continuous 2-1/2" steel wall supported by the 1/2" steel web sections.

Temporary bracing will be required between the 1/2" plates to maintain alignment of the sections until flange plates are welded. The vertical seams will be welded in beads 3" long on 2" centers leaving a 1" length of joint not welded. This is a process requirement. The flange plates will be welded on the outside only.

The web sections will be welded to the flanges with a continuous bead for maximum strength.

The inside wall should be kept straight and free from wave or distortion by adequate bracing so that the surface will be flat within 1/4" in any direction.

The base of each web plate is fastened to the 1-1/2" base plate at two points by means of angles. These two angles furnish necessary rigidity to the framework during assembly of the skeleton. Subsequently, when the laminations are being installed, the outer angle support is removed, leaving the structure free to lift at its outer edge, still being firmly anchored at the inside. This movement of approximately .050" is a process requirement.

Assembly of Side Wall Laminations

Attention is called to the fact that up to this point, structural framing, strength and rigidity are the primary requirements, and, except for discontinuous welding as noted, ordinary methods of erection are adequate. The following section is devoted to the assembly of the Laminated filling of steel plates and HD125. Six layers of 3-3/4" steel plate (consisting of 2 - 1-7/8" plates) laid alternately with 4-1/2" of HD125 (consisting of 36 sheets 1/8" thick), with the outside steel layer...
made up of 2 - 1-7/8" plates, constitutes the filling of each 4' wide bay. Careful supervision must be exercised in this assembly and fine details given special attention.

All steel filler plates are being supplied as 1-7/8" plate, cut to form two vertical plates per lamination. Widths have been established such that each plate may be wedged tight against the web on either side, leaving a vertical joint at the center 1/4" wide. This joint will be filled with wedge strips and shim stock, completely filling the joint with metal. Tack welding of the wedges to the plate, and also of the plate to the web, will be required to hold it in position. A continuous weld is not permitted. The second lamination, making up the total thickness of 3-3/4" is assembled in a like manner. By using one narrow plate and one wide plate per lamination, the joints are staggered so that no two openings are at the same location in any one bay.

The HD126 will be supplied in full-sized sheets 4" wide and approximately 5' in length. This material must be ripped and cross cut to size in the field in order to remove the irregular edge as received from the factory. Specifications have been forwarded to the Construction Division covering the special saws used by commercial fabricators on this material. A copy of these specifications is attached to this report as Appendix A.

In assembly, all horizontal butt joints of individual sheets must be staggered at least 1" so that there will be no continuous cracks through any 4-1-2" layer. The width of the sheets is adjusted so that there will be approximately 5/16" clearance vertically between the HD126 and the web plate. Each successive 4-1-2" layer is shifted alternately to the left and right, staggering the vertical joints at the web. Wedge strips of 1/8" sheet will be used to fill the 5/16" space. A pair of sanding disks set to form a wedge is recommended to bevel the strips used in "caulking."

Having filled each bay as described above, the two outside 1-7/8" steel plates are set in position and the outer lamination welded to form the outside "seal plate" of the structure. This plate is full width, cut only 1/4" narrower than the web spacing so that a full and continuous weld can be made on both sides. These joints must be gas tight. The horizontal opening along the base plate is not welded, but is sealed with a flexible joint welded to both the base plate and side walls.

Control Holes Through Side Walls

Nine control holes are required in a definite pattern through the laminated side walls on the control room side of the pile. The finished holes accommodate 6" steel tubes containing the control rod assemblies. To provide these holes, stepped openings are first made in the steel plates and HD126 by burning the steel and boring the HD126 before erection. These steps are 2", 3", 10" and 11" in diameter for 1/8", 1/4", 1/3 and 1/6 of the bore respectively. Accuracy within ± 1/8" is adequate at this point. Steel and masonite rings, prefabricated, will be supplied to bush this opening down to accommodate the 6" diameter tube assembly.
be assembled on the top of the floor plate. The top of the floor plate should be at the bottom of the floor plate. The floor plate should be at the bottom of the floor plate. The floor plate should be at the bottom of the floor plate.

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Diagram:

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Reference: [Image]
The 3/4" layer is then mounted and plug welded to the first in vertical staggered lines. On the outside of the blocks, the plates are set in position and similarly plug welded.

The sub-assemblies are next slipped over the protruding tube ends on the pile side of both front and rear blocks. These assemblies are designed with a large hole to facilitate adjustment. After the sub-assembly is in its approximate position, steel sleeves are inserted over the tubes, fitting snugly over them, thereby locating the sub-assembly with reference to the main block.

The inside "end doughnuts" or sleeves must then be inserted in the counterbored tubes of the laminated blocks. These are slipped in with a push fit and require no fastening.

The stainless steel cooling tubes are next slipped through the row of holes in each block, guided into the cast grooves in the base and pushed through the rear blocks. The correct series of "doughnuts" or C.I. sleeves is then slipped over the ends of the tubes at both the front and rear and pushed into position in the hole, thereby supporting the tubes in their approximately position in the block. Molten lead is then poured into the grooves, sealing the tubes into the C. I. No particular pains need be taken to smooth off the lead so long as it does not extend above the top of the groove.

Welder requirements:

Steel - 1-15 start
Butt ready - 2/15
Start base plate 3/8 complete 7/8
Start end block 3/8 complete 7/8
3/3 poor 3rd lift
1/1 side shoes ready
1/1 C. I. base 1/4
2 tubs per 1/2 lift.

Impact wrenches

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