STANDARD TANK CONSTRUCTION WITH SULFUR CEMENTS

DESCRIPTION

A basic principle of corrosion resistant masonry construction requires that an impervious membrane must first be applied to protect the supporting structure from attack. The function of masonry sheathing is to keep excessive heat, abrasion and physical abuse from damaging this membrane. The method and thickness of the construction depends upon physical factors, such as the dimension and shape of the area to be protected, the maximum operating temperature of the vessel and other such conditions. The selection of the corrosion resistant cements depends upon the corrosives involved. In Standard Construction one cement, either a sulfur or resin-based material, is used throughout the entire masonry sheathing regardless of the number of tiers of brick required.

Steel tanks which are to receive this masonry sheathing must be constructed in accordance with ATLAS "Specifications for Welded Steel Tanks, Stacks, Ducts or Other Welded Parts for Lining and Covering" (2-12DN). Concrete tanks must be constructed in accordance with ATLAS "Specifications for Concrete Tanks" (2-11DN). Impervious membranes must always be used and be properly applied before construction begins. Prior to the application of chemical resistant masonry sheathing, a release agent must be applied to the surface of all resin based and sheet linings. The use of a release agent allows the masonry sheathing to move independent of the lining system, preventing a potential tear in the lining. In the case of sheet linings installed with a welded or overlap seam, foam strips must be used on each side of the seam to prevent the sulfur cement or mortar from locking into the seam. Duct tape is usually placed over the foam strips on the floor seams to hold in proper position until the brick are laid. Refer to ATLAS Drawing 2-370DG, "Rubber Lining Lap Joint Detail".

The sulfur cement should be melted and handled in accordance with the information given in the appropriate Data Sheets. Brick must be clean and dry and at a moderate temperature before being laid. In construction with sulfur cements, all joints must be at least 1/4" wide so that the molten cement will completely fill all voids and will not freeze before the joint is full. To assure joints of proper width and facilitate the laying of the brick, 1/4" thick spacer chips, made from the sulfur cement are furnished when requested. Each brick is set on three chips when the horizontal joints are spaced and the chips can also be used to gauge the width of the vertical and back joints. Sulfur cements freeze within five minutes and vessels with masonry sheathing bonded with sulfur cements can be placed in service immediately upon completion.

SINGLE TIER CONSTRUCTION

A tier is composed of a number of courses of brick laid one on top of the other in a broken bond pattern. It is usually 2-1/4" or 3-3/4" wide, depending upon whether a single brick, 8" x 3-3/4" x 2-1/4", or a double brick, 8" x 3-3/4" x 4-1/2", is used. In most rectangular or square tanks a thickness of 3-3/4" is required. If different sizes than the red shale brick described above are used, the thickness will, of course, vary.

Before the brick is laid, the floor membrane is protected by applying a flood coat of sulfur cement over the area. The hot material is quickly spread on the bottom with a straight edge, such as a piece of masonite. This thin coat (1/8" [3 mm.]) protects the membrane from damage by the spacer chips and must always be used when working with asphaltic membranes.

Construction of the side is started at one corner and the bond course is set, on spacer chips, around the perimeter with the smooth surface of the brick facing into the tank. After the bond course has been set, about 10 square feet of the bottom, starting at one corner, is also set on chips. The molten sulfur cement is then poured between the brick until the bed joint in the area has been filled and the material begins to rise in the vertical joints. As the cement hardens it locks this section of the bond course and the bottom in place. The rest of the bottom is installed in the same manner, in approximately 10 square foot sections. The workmen can stand on the courses that have been laid while they are setting the brick and making the new pour. The sulfur cement should be poured in one spot as long as the material will flow away quickly. The new pour is always made from the point to which the cement has run and the pouring proceeds in this manner so that no air pockets are formed.

When the bottom has been completed according to this procedure the area is flooded with molten cement, which is worked into the vertical joints with a straight edge. This leaves a very thin coat of cement on the face of the brick. The entire installation should be completed as quickly as possible so that all new pours are made while the cement from the previous pour is

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still warm. This condition will assure a good bond between pours and is desirable in all installations made with sulfur cement.

The sides are then completed following the pattern set by the bond course and interlocking the corners. One course at a time is placed around the perimeter, setting the brick on chips to form a 1/4" horizontal joint. The vertical and back joints must also be 1/4" wide. After this single course has been set, forming paper must be put in place so the sulfur cement can be poured. Kraft paper may be purchased locally and usually is available in 6" wide rolls. Convenient sized strips, three to four feet long, are cut and coated on one side with sodium silicate solution (water glass). The paper is then applied to the face of the course of the brick just set and is smoothed out so that all open joints are covered. About five minutes must be allowed for the adhesive to harden. The sulfur cement is then poured, starting in the corner and working toward the center until the joints are filled to within 1/2" of the top of the course. The pouring is again done in sections, as described, to prevent the formation of air pockets. The remaining courses are laid in the same manner. Splits 1-1/8" and singles 2-1/4" should always be on hand during an installation to be used to course out at the top. Sometimes doubles laid as 8" soldiers can also be used for this purpose. After the masonry sheathing has been installed, the forming paper is removed by covering the tank with a tarp and piping steam into the tank. After about 10 hours, or overnight, most of the paper will have peeled from the brick. The more difficult spots can be removed by soaking them with water. Steam should never be applied directly upon the brick work. When steam is unavailable, the paper can be removed by soaking and then scraping although this is somewhat troublesome.

MULTIPLE TIER CONSTRUCTION

Many times, dimensional or structural stability or service conditions require the use of multiple tier construction. In this case, construction starts in the same manner as single tier work. However, the rough surface of the brick in the back tier and the bottom layer is turned into the tank and the next tiers are then laid with the smooth surface facing into the tank. The rough surfaces of the adjoining tiers then face each other and provide maximum bond between tiers.

After initial bond course has been set, the bottom is completed with the vertical joints being filled to within 1/2" of the face of the brick. This locks the bottom and the bond course in place. To make the pouring of the bottom easier, the corner of the brick where the pour is to be made is chipped off. This allows the sulfur cement to flow more rapidly into the joints. It does not affect the performance of the brick since another layer will be set on top and the oversize void which was created is completely filled with cement. A flood coat of cement, however, is <u>not</u> applied. Instead, the bond course for the second tier is set on chips around the perimeter, with a 1/4" joint being maintained between this tier and the initial bond course. The second layer of brick for the bottom is then laid in sections following the same procedures. The pours made in laying this layer fill the remainder of the joint in the first layer, the horizontal joint between the layers and rise in the vertical joints of the second layer. This again locks the layers together. When all the brick have been laid, the area is flooded, as previously described, to give a final thin coat of sulfur cement on the bottom.

The sides are then completed following the patterns of both bond courses. One course of brick is set on each tier around the perimeter with 1/4" joints being maintained throughout. The forming paper is smoothed in place on the interior tier and the joints of both courses are filled with sulfur cement. The remaining courses in each tier are then laid and coursed out in the same manner. This order of construction keys the side tiers into the bottom and provides grated stability. If more than two tiers of brick are required, installation still proceeds as outlined above.

OTHER CONSTRUCTIONS

When speed of installation is a vital factor but the corrosives involved require the use of a resin mortar in contact with the solution, ATLAS Dual Construction and Modified Dual Construction should be considered. These economical constructions, described in other ATLAS Data Sheets, utilize a sulfur cement in the back and a resin mortar toward the interior of the tank.

Cylindrical vessels usually do not require expansion joints, but long rectangular tanks, subjected to elevated temperatures, do use such joints as well as end pads. ATLAS' Engineering Department will be pleased to give specific recommendations and instruction for their use.

OTHER PERTINENT INFORMATION

Consult ATLAS' Sales Department for detailed literature for membranes, mortars and brick used in corrosion resistant masonry construction.

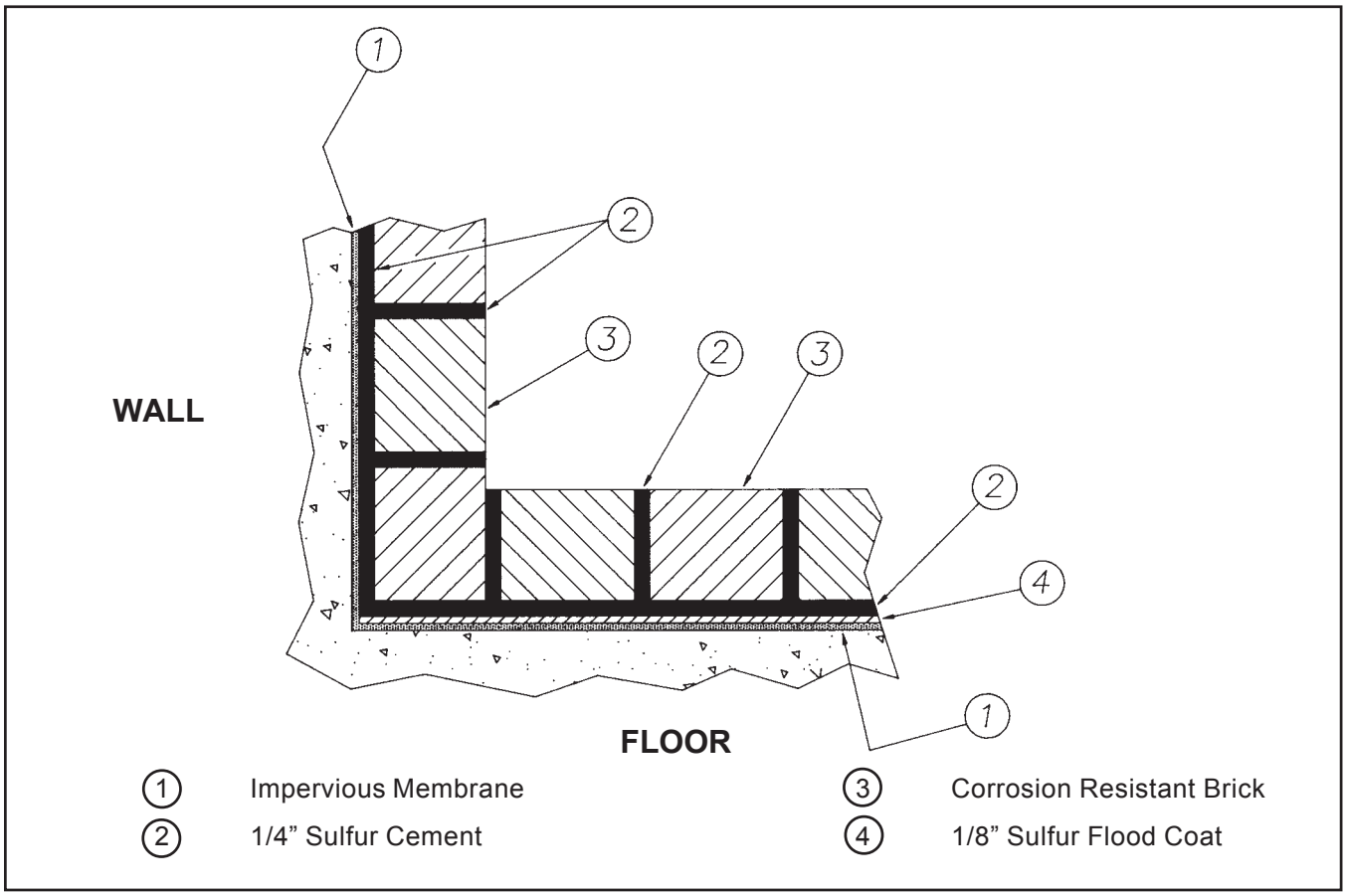
TECHNICAL SERVICES

ATLAS maintains a staff of Technical Service Representatives who are available to assist you with the use of ATLAS products. In the event of difficulties with the appliation of ATLAS materials, the installation should be stopped immediately and ATLAS' Technical Service Department consulted for assistance.

ESTIMATING INFORMATION - Quantities are based on a square foot basis for rectangular and square tanks; data does not apply to cylindrical tanks. Factor for 1/8" sulfur cement flood coat on tank bottom is 1.44 lb. per sq. ft.

Sheathing Thickness	Brick Size	Brick Type	Material Used	Vitrobond® 1/4" Joints	Carbo-Vitrobond 1/4" Joints
2-1/4"	Singles 8" x 3-3/4" x 2-1/4"	Red Shale	Pounds Mortar	5.20	4.75
			Number Brick	4.37	4.37
3-3/4"	Doubles 8" x 3-3/4" x 4-1/2"	Red Shale	Pounds Mortar	6.36	5.81
			Number Brick	3.68	3.68
7-1/2" and more	Doubles 8" x 3-3/4" x 4-1/2"	Red Shale		Multiply figures directly above by the additional no. of 3-3/4" courses of brick used in the sheathing.	
3"	9" x 4-1/2" x 3"	Fire Clay	Pounds Mortar	5.55	5.07
			Number Brick	3.28	3.28
4-1/2"	9" x 4-1/2" x 3"	Fire Clay	Pounds Mortar	8.10	7.39
			Number Brick	4.79	4.79
9" and more	9" x 4-1/2" x 3"	Fire Clay		Multiply figures directly above by the additional no. of 4-1/2" courses of brick used in the sheathing.	

Estimating tables are based on theoretical coverages and cannot be guranteed by ATLAS nor do we assume liability for its use. Contact ATLAS for specific information.



STANDARD SULFUR CONSTRUCTION

In Standard Sulfur Construction, one mortar is used throughout the masonry sheathing regardless of the number of tiers of brick used. The thickness of the joints used in the sheathing depends on the type of mortar used. Hot melt sulfur cement requires a 1/4" joint. Most tank installations use Standard Construction of one or more tiers.

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