Atlas Minerals & Chemicals, Inc.

DATA SHEET

2-22CN (1-98²)
Supersedes 2-22CN (1-93)

MODIFIED DUAL CONSTRUCTION FOR TANKS

DESCRIPTION

The 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 dimensions and shape of the areas to be protected, the maximum operating temperature of the vessel and other such conditions. The selection of the corrosion resistant mortars depends upon the corrosives involved.

When only a single tier of brick is required to protect the membrane, the use of Modified Dual Construction should be considered. This construction, designed and patented by ATLAS, uses a sulfur cement in the back joint of the side walls and a resin mortar in the joints between the brick. A resin mortar is also used to lay the bottom. Modified Dual Construction has three major advantages:

1. It is economical. The use of an inexpensive sulfur cement in the back joint reduces total material costs. The heat from the molten sulfur cement also accelerates the setting of the resin mortar so that construction can proceed at a more rapid rate and installation costs are reduced.
2. It saves time. Not only does the installation proceed more rapidly but the tank can be placed into service more quickly since less time is required for final curing.
3. It protects the membrane. With a plasticized material, like sulfur cement, in the back joint the possibility of cutting the membrane when the masonry sheathing expands and contracts is eliminated. This danger always exists when a resin mortar contacts the membrane.

Modified Dual Construction has a higher temperature use than Standard Construction with sulfur cements, since, in this case, the back joint of sulfur cement as well as the membrane, is protected by the temperature reduction across the brick. The construction is not recommended for use where the corrosives involved attack sulfur cements.

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 must 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". Since resin mortars are used, several precautions must be taken. Most of these mortars are chemical setting and they require an accumulating heat of reaction for proper setting and curing. Even though the molten sulfur cement assists this process, it is still important that the temperature at the time of installation be above 60°F (16°C). Portable heaters should be used to bring the temperature to this minimum. If this is impossible consult ATLAS' Engineering Department for special techniques which may be used.

The mortars must be mixed and handled in accordance with the information given in the appropriate Data Sheets. Brick must be clean, dry and at moderate temperature before being laid. During and after completion of the installation, the area must be kept dry and free from foreign matter such as construction dirt, portland cement, plaster and other contaminants which would interfere with the setting and curing of the resin mortar. The vessel cannot be placed into service until all of the joints are cured.

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 tank work, a thickness of 3-3/4" is required. If different sizes other than red shale brick described above are used, the thickness will vary.

In Modified Dual Construction, a flood coat of sulfur

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cement is first applied over the floor membrane. The hot cement is quickly spread on the bottom with a straight edge, such as a piece of masonite. After it hardens, the brick is stacked on cardboard at a convenient location within the tank and construction of the walls is started at one corner. The brick, smooth surface facing into the tank, is buttered on the end and on the bottom with the bead on the edge of the brick next to the membrane being beveled into the tank. The brick is shoved home to the right and the beveled edge prevents the resin mortar from exuding into the back joint. A 1/4" back joint must be maintained so that the sulfur cement can be poured. Spacer chips are helpful in maintaining this width. The resin joints are made 1/8" wide and the excess mortar is struck from the joints, with particular attention given to a trim bed joint so that no difficulty will be encountered when the bottom is installed. The bond course is laid around the perimeter of the tank, working from right to left so that the brick is shoved rather than pulled into place. Since the bond course sets the pattern of the tier, it should never have a corner completed with less than half a brick.

The sides are then completed by laying succeeding courses around the perimeter. After each course is laid in resin mortar, the back joint for that course is filled with sulfur cement. The heat from the molten material will hasten the setting of the resin mortar but care must be taken to make sure that the set is firm before a new course is laid. This precaution will prevent the previous course from being moved out of alignment which might form voids in the brickwork and impair its stability. Splits 1-1/8" or singles 2-1/4" should always be on hand during an installation in case they have to be used to course out at the top. Sometimes doubles laid as 8" soldiers can also be used for this purpose.

When the sides are completed, the bottom of the tank is laid in resin mortar with the courses running across the smaller dimension for ease of installation. A bed of resin mortar is trowelled on the flood coat of sulfur cement on the bottom. This bed is about two courses wide and 1/8" thick and the bricks are laid in it, smooth surface up. Construction again proceeds from right to left, two courses at a time and the excess mortar is struck from the joints. When the bottom nears completion and the remaining area becomes difficult to work in, 2 x 4's braced with struts, are used to block off the brick already laid. This prevents the swimming of the brick which would allow the joints to open. Before putting the 2 x 4's in place, all the excess mortar must be struck from the bed joint of the final course to leave a trim corner. If this is not done, the mortar will set and become difficult to remove without damaging the flood coat. The bracing is kept in place until a final set occurs. It is then removed and the remaining area is laid with the workmen standing on the set courses. It is important that the mortar is set hard before work on the remaining area starts so that there is no chance of damaging the sheathing.

The installation of masonry sheathing in cylindrical vessels follows the same procedures as far as the side tiers are concerned and uses the broken bond pattern. The procedure for laying the bottom is usually performed by laying one course of brick along the diameter with all other courses laid broken bond pattern and parallel to this diameter. Another method is to lay a course of brick on the diameter with a second course laid perpendicular to it, also across the diameter. The resulting quarters are then completed by laying parallel courses in one quadrant and in the adjoining quarters laying parallel courses in a perpedicular direction. The brick in the fourth quadrant is laid in the same direction as the first quadrant.

OTHER CONSTRUCTIONS

Where more than one tier of brick is required for adequate protection, Dual Construction should be used. It is designed especially for multiple tier work and possesses all the advantages of Modified Dual Construction. When the corrosives involved prohibit the use of either of these two constructions, Standard Construction with resin mortars should be used.

Cylindrical vessels usually do not require expansion joints but long, rectangular tanks, subject to elevated temperatures, do use such joints as well as end pads. ATLAS' Engineering Department will be pleased to give specific recommendations and instructions 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 application of ATLAS materials, the installation should be stopped immediately and ATLAS' Technical Service Department consulted for assistance.

WARRANTY

ATLAS warrants that its products will be free from defects in workmanship and materials under normal use for a period of one (1) year from the date of shipment by ATLAS (provided the products are installed before the expiration of the shelf life). THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR THE PURPOSE FOR THIS PRODUCT WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. ATLAS' LIABILITY FOR ALLEGED BREACH OF THIS WARRANTY SHALL BE LIMITED TO REPAIR OR REPLACEMENT OF THE DEFECTIVE PRODUCT (BUT NOT INCLUDING REMOVAL OF THE DEFECTIVE PRODUCT OR INSTALLATION OF REPLACEMENT PRODUCTS). ATLAS SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES DURING THE WARRANTY PERIOD OR THEREAFTER. **ATLAS' WARRANTY IS VOIDED IF PAYMENT FOR PRODUCT IS NOT RECEIVED IN FULL.**

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 Thick-ness	Brick Size	Brick Type	Material Used in Areas	Back Jt. Vitrobond 1/4" joints	FACING JOINTS - 1/8" WIDE				
					Alkor	Carbo-Korez	Carbo-Alkor or Furathane	Chemester Mortar	Rezklad SR Mortar
2-1/4"	Single 8" x 3-3/4" x 2-1/4"	Red Shale	Pounds Mortar Tank Side	2.88	0.89	0.82	0.86	1.07	0.97
			Pounds Mortar to Flood Coat Tank Bottom	1.44	1.97	1.82	1.89	2.34	2.14
			No. Brick in Side or Bottom	4.58	—	—	—	—	—
3-3/4"	Double 8" x 3-3/4" x 4-1/2"	Red Shale	Pounds Mortar Tank Side	2.88	1.34	1.23	1.29	1.60	1.46
			Pounds Mortar to Flood Coat Tank Bottom	1.44	2.40	2.21	2.31	2.86	2.61
			No. Brick in Side or Bottom	3.84	—	—	—	—	—

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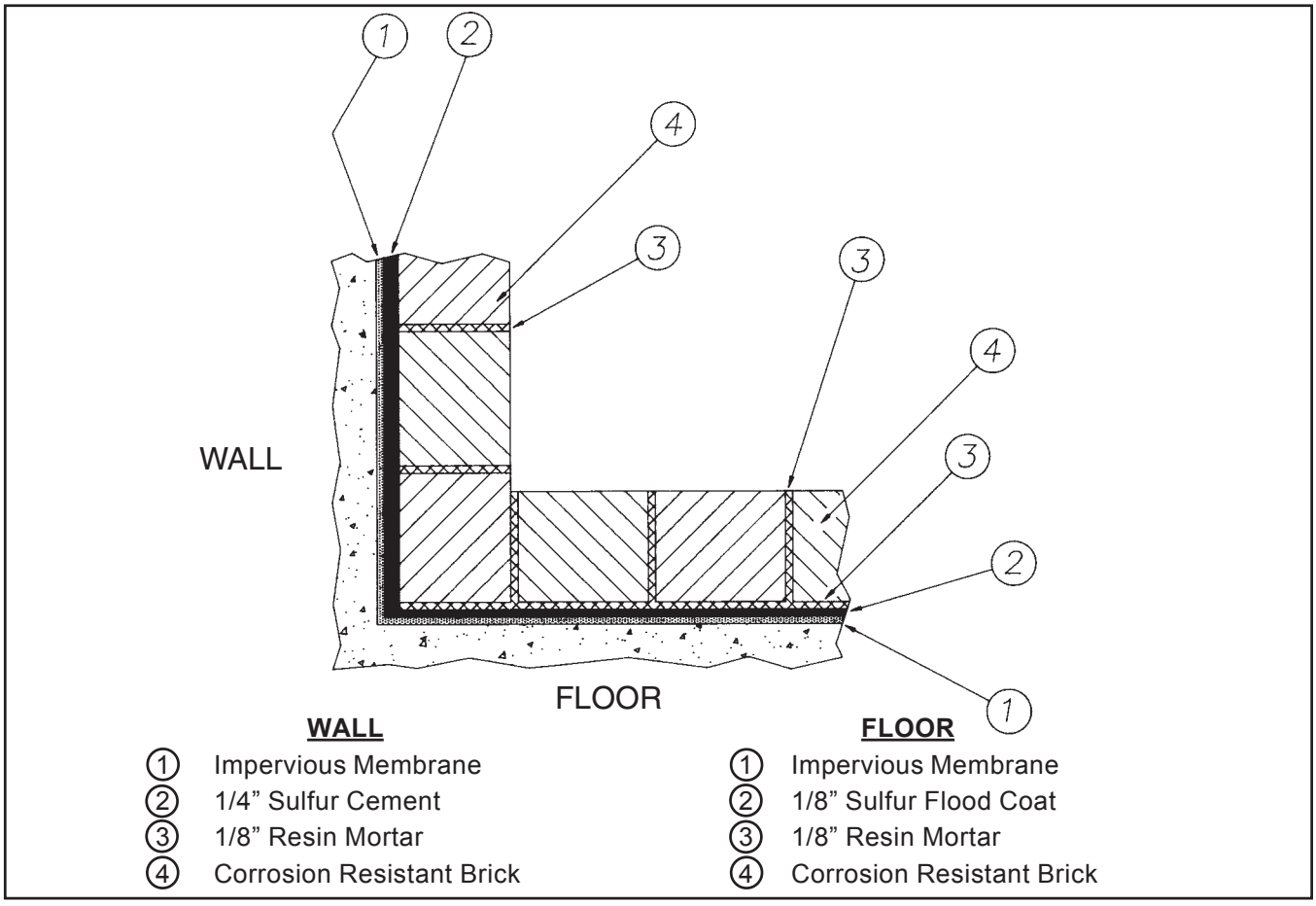
Estimating tables are based on theoretical coverages and cannot be guranteed by ATLAS nor do we assume liability for its use. Contact ATLAS for specific information.



WALL

1. Impervious Membrane
2. 1/4" Sulfur Cement
3. 1/8" Resin Mortar
4. Corrosion Resistant Brick

FLOOR

1. Impervious Membrane
2. 1/8" Sulfur Flood Coat
3. 1/8" Resin Mortar
4. Corrosion Resistant Brick

MODIFIED DUAL CONSTRUCTION

When only a single tier of brick is required, it is sometimes advantageous to use Modified Dual Construction. It is installed by laying up the course with a resin cement and then filling the back joint, next to the membrane, with a sulfur cement. Like Dual Construction, this procedure helps reduce sheathing costs and is recommended when natural or synthetic rubber or plastic membranes are used.