

Introduction

The masonry “Thin wall concept” was originally introduced in the early 1980’s by Acme Brick to further expand the marketing of brick in an element not practical or feasible at that time due to the costs and time associated with the typical “Masonry Double Wall’s”. The “thin wall” concept was originally designed to do the following.

1. Reduce the cost of masonry screening in order to make it more cost efficient and subsequently introducing it to more markets under prohibitive costs restraints.
2. Design a product that will have less general maintenance over a long period of time.
3. Design and engineer a product that will compete with the un-predictable soils of North Texas.
4. Greater design flexibility.
5. Greater seismic resistance and more ductility.
6. More water resistance.
7. Enhanced design life through heavier connections and elastic masonry cement.

The “thin wall system does not support any gravity loads other than its own weight. It is this system that allows the reinforced masonry to span further between pilasters and provide structural capacity to form a “Structural Brick Screening Wall”

System Description

The design allows the masonry panels to be built on site and or can be prefabricated at another location and lifted and installed into their final position resting in between columns and distributing their own weight accordingly. This allows the panels to “float” and move between columns in accordance to the hydraulic forces acting upon it. It also eliminates the necessity of a costly grade beam that could also be a deterrent upon the panels resulting from excessive “pvr’s” and or a high “plasticity index” which are present in our native soils. This could result in an “upheaval” forcing the panels upward subsequently dislodging the column caps or top coursing of the pilasters.

As the design and construction of “thin wall” varies from location to location, so does the design and construction of the Structural Brick Screening Wall. The design is based on factors pertaining to your particular area and the information and recommendations in this guide are not intended to replace your local experience and engineering judgment.

Structural brick of high quality that meet ATSM standards is essential to the successful construction of the “masonry thin wall”, these brick along with proper reinforcement increases the structural capacity of the brick wall resulting in the “floating panels” described above. The reinforcement along with the brick and highly elastic tensile strength mortar provides for the flexibility of the wall to withstand the hydraulic load put upon it. Generally, brick is selected for its color, texture and durability and the most common brick is the “king size” a hollowed brick of nominal thickness. Mortar should be Type “S” mixed with mortar sand and non-contaminated water. Type “S” mortar exhibits higher flexural bond strength while providing the sufficient compressive strength required in the “structural thin wall”. The durability of the wall is highly influenced by the quality of the mortar joints and great care should be ensured that dense joints are achieved. Joints should be tooled to a concave or a tight “V” finish to densify the mortar surface and improve bond between the mortar and the brick. “Raked” joints are not acceptable in the “structural thin wall” method.

Design Criteria

The design of screening wall is an important quantitative measure that should be researched in accordance to your area of the country. Screening Walls will not last forever and the owner and designer should establish a reasonable structural design life for each project. This will require consideration of the economic factors such as initial cost and future maintenance costs. The design life will have an impact on the selection of materials, maintenance procedures by the owner and the expected performance is also an important qualitative measure for the design of the project. The following are some of the design parameters that should be considered in the design of the screening wall.

1. Plasticity index of the soils
2. PVR's of the soils
3. wind loads
4. adjacent automobile traffic
5. seasonal weather elements
6. carbon monoxide
7. Seismic performance
8. loads (should not support any loads other than itself)
9. building codes
10. maintenance

Maintenance responsibility

The above discussion of the “structural thin wall” is intended to help reduce the general maintenance of future repairs to the screening wall. As mentioned above brick walls do not last forever and with limited maintenance or no maintenance will result in a shorten life span of the wall considerably. Under the consideration of the above mention parameters of the construction and design of the “structural screening wall” the following are some elements of consideration to prolong the life span of your screening wall.

1. Soil should be a minimum of 3” from the bottom of the panels to prohibit any “upheaval” or pushing of the panels. Soil under or against the wall panels reduces the hydraulic movement or “floating” of the panels between the pilasters which subsequently causes “pinching” and or panel deterioration.
2. Lawn maintenance personnel should not come in contact with the bottom courses of each panel. This could cause the bottom courses to break and fail which also causes the panels to “fatigue” and collapse.
3. The grades must be maintained to allow water to flow **away** from all pilasters and piers. Grades must be constructed to insure that water does not collect in and or around the piers and pilasters. This will insure limited soil movements that would have and adverse affect on the piers causing extreme un-accounted for hydraulic pressures resulting in excessive movement and subsequent wall failure.
4. Irrigation heads and water spray should not be directed toward or against the wall to insure prolong life span of the mortar and reinforcement.
5. Non installation of irrigation controls. Meter boxes, rain gauges, light timers or any structure of this nature on the panels. These structures will restrict the “floating nature” of the panels resulting in pinching and subsequent wall failure.
6. Tree selection for planting along the wall should also be taken into consideration due to the root structure of the particular tree, it is highly advisable not to plant any willow trees, cottonwood, mesquite, or any tree with a high active root structure to insure that the roots do not interfere with the hydraulic nature of the wall.
7. Planter's, bushes, running vines or any other restrictive element must be avoided around the screening wall, these elements will restrict the floating of the panels and also cause damage to the walls.
8. Grass clippings, soil, trash, equipment, should also not be piled up against the wall, this will also have and adverse effect on the wall.
9. Efflorescence; a powder like salt residue that may occur on masonry or concrete surfaces should be removed.
10. Water sealants on the wall to prohibit water infiltration and deterioration of reinforcement and reduce the expansion of the brick resulting in the shorten life span of the wall.
11. No cast stone or concrete molded elements on the panels, this results in the restricting the “floating” of the panels and adds a degree of pinching between the pilasters and columns.
12. Periodic “tuck pointing” along with sealing to insure all mortar joints are secure.

The effects of the above on the “structural thin wall” are extremely prohibitive to the prolong life of the wall. Soil movement resulting from poor drainage or excessive irrigation can cause adverse vertical displacement and extensive deterioration. It is the owner's responsibility to maintain at least a 3” clearance and have a positive water flow away from the wall and pilasters with no restrictions. Over time soil movement from any of the above mentioned can create significant mortar and brick cracking. Brick as mention before has an expected life-span of approximately 65 years, however brick is not maintenance free and the owner should expect some maintenance such as water proofing and or replacing of brick to

insure a long life span of the wall. The subject of mortar was mentioned and as brick will require some observation to also maintain its reliability and this may require “tuck-pointing” along with sealing. As a standard maintenance, it is advisable for the owner to periodically inspect the mortar for cracks on a three to five year cycle.

The flat surfaces of the panels and columns can create possible accumulation or “ponding” of water on the top of the wall, these results into water infiltration into the existing brick and mortar, resulting in the deterioration of the reinforcement and mortar not to mention the force of the temptures on a water soaked brick. Water will migrate into the brick and mortar causing a complete deterioration of the reinforcement, subsequently precipitating a “rusting process” causing the dimension of the reinforcement to increase pushing the mortar out of the joints. This process will increase corrosion and efflorescence and leave a residue after the moisture evaporates. It is advisable that the owner also makes two to three year inspection and considers applying water sealants after necessary maintenance is performed.

Sealants provide the first line of protection against the water intrusion into the wall system. Water repellents are desirable for a variety of reasons. The principle reason is to limit water ingress and infiltration due to wind –driven rain. By reducing the water that enters the wall, the repellent provides several benefits, both aesthetic and related engineering performance, that justifies their use.

1. Efflorescence control.
2. Reduction of algae growth in the capillaries of the masonry.
3. Atmospheric pollutants such as carbon monoxide
4. Freeze-thaw damage
5. Thermal efficiencies of masonry wall are maintained since water is a good thermal conductor.

There are two general types of water repellants; *coatings and penetrates*. The first type creates a continuous film or coating that bridges the pores and small cracks of the surface. These repellents tend to bond along the pore linings rather than build films across the pore openings. This insures “breath ability” in the wall assembly. These products are generally effective at averting water leaks but are limited in their ability to allow total dissipation of water from inside the wall assembly. It is not recommended to use these types in climates with freezing temperatures. The second type of repellent is a penetrate that soaks into the surface of the brick and mortar subsequently causing a natural aversion to water yet leaves the small pores of brick open to breathe. *Penetrate* are more appropriate in climates with freezing temperatures that *coatings*. The useful life of a sealant is dependent on the grade of the product and varying amounts of exposure to sunlight and weather conditions. For example, some manufacturers guarantee some high grade electrometric coatings for 10 to 15 years in moderate climates. We advise using an electrometric type coating with a normal life of 8 to 12 years. All additional treatments should be of the same type and manufacturer of the original sealant since incompatibility of cumulative coatings may create chemical changes, discoloration and or clouding. It is advisable that the owner perform a periodical inspection yearly of the wall and perform these applications as part of the annual wall maintenance. It is of our opinion and experience that it is of the utmost importance to perform these activities of application of a water sealant annually to insure against any water contamination and subsequent wall failure. We also advise consulting a licensed and bonded contractor for the selection and application of any sealant. Prior to application, the wall must be clean, free of efflorescence and with the proper moisture content. Since sealants are difficult to remove after application, we recommend that small areas be used to test the performance of different sealants. Sealants should be installed at the application rate and under the correct climatic conditions as recommended by the manufacturer.

Conclusion

Masonry structural “Thin Walls” do not last forever, and that the required maintenance ***must be performed by the owner*** to maintain the longevity of the structural wall. It is recommended that an annual inspection is made and necessary maintenance be performed. It also important that all surrounding property owners of the screening wall maintain the parameters discussed above. If these guidelines are followed and maintained properly, the wall will maintain its’ longevity for many years.