



re:news

DESIGN INSTALLATION SYSTEMS, INC. 8110 River Drive • Morton Grove, IL 60053 • 847-470-8100 • www.disinc.net

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Exceeding the Expectations of the Construction Industry Since 1982

March 2004



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materials under the most harsh work conditions has all become second nature to us. Our masons, tuckpointers and their support staff in the field work hand in hand with management and office personnel to complete projects to the highest standards.

Although many building details are common, every situation demands close inspection and careful execution. Experience has taught us that no detail is insignificant and that there is no time when substandard work is acceptable. In this issue, we will outline some of the methods we use for stabilization of brick in restoration work. Demolition of a wall or wall section is often looked upon as the first step in a rehabilitation project. However, if the wall is not properly secured, demolition can have severe and unintended consequences.

Introduction

Design Installation Systems, Inc. has been working on masonry buildings from its inception. For more than two decades we have faced challenges relating to masonry failures. We have amassed an extensive knowledge base on the subject and feel that there is no substitution for experience.

In the northern Illinois area, buildings are exposed to a variety of climatic conditions and each building material reacts to the elements differently. Building materials and construction details vary but they all have one thing in common; if the material is used improperly or if it is not installed correctly, it will fail.

In this issue, we will examine some aspects of brick masonry construction. Brick is a time-tested building material used in the construction of structures and facades. Because of this common usage, Design Installation Systems has gained knowledge in all aspects of masonry construction and maintenance. Staffing qualified people to plan and execute projects ranging from tuckpointing to rebuilding, Design Installation Systems is the right choice for any masonry restoration project.

Over the last two decades DIS has accumulated the technical know how and equipment to complete all types of brick work. On the surface, a brick wall is still a brick wall; the challenge faced by designers of wall systems today is to incorporate changes in design and materials into that wall without modifying its outward appearance. Matching new materials to old, providing and installing support and flashing



The brothers Fricano are both highly qualified and experienced masons. John has been with Design Installation Systems since 1989 and Pat since 1991. Both foremen are expert in all aspects of masonry, stone and terra cotta construction. We at DIS would like to thank them for their years of service and their continued dedication to quality construction.

Pat and John each entered the trade doing new construction. They enjoy the challenges associated with hi-rise restoration work and getting close-up looks at work completed by masons before they were born. They can take pride in the fact that they are carrying on a proud tradition in a highly specialized trade.

Masonry Restoration

Although there are many types of masonry construction, we have decided to narrow our focus to face brick. Face brick is a generic term that describes the outside brick facing of a building. It is exposed to the weather and therein lays a great number of the causes for its deterioration or failure. However, weather is not the sole cause of brick related issues. Face brick is not structural; it is unable to support its own weight in low rise or high rise applications. Proper design and installation are crucial to a stable and long lasting finished product.

With proper installation brick facades are extremely durable, but a poor installation can lead to problems just months after completion of the work. A successful application requires first and foremost good design. Engineers and architects have developed standards for this type of construction. Following those designs becomes, at least in part, the responsibility of the mason contractor. Misinterpretations, mistakes and omissions in the installation are always evident during the demolition phase of a reconstruction project.

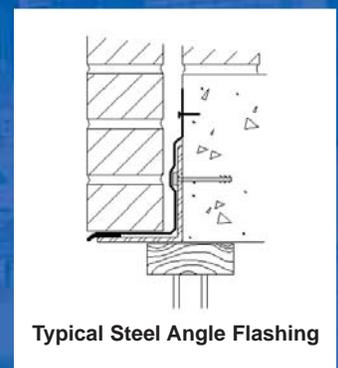
Major elements in a proper installation include support, expansion joints, flashing and weeps. These components placed into wall systems around the brick and mortar make the walls work. The high quality of our craftsmen and an intimate understanding of masonry wall mechanics allow us to remove failed walls and install walls that last.

In modern construction, steel support angles are often used to support brick over openings and to "shelf" brick from floor to floor in multistory applications. New coatings for steel have proven effective in eliminating steel corrosion. This is extremely important because rust degrades the strength of the support member and expands inside the wall, displacing the brick. Alternate materials such as stainless steel are sometimes incorporated into walls systems. DIS has most of these traditional and their newer alternatives in stock at our in-house metal fabricating shop.

Flashing materials at supports and wall bases were seldom used in traditional brick work. Today there is a wide variety of flashings to choose from. They range in type from loose laid fabric to fully adhered membrane to sheet metal fastened to the backup material. These materials are all designed to allow water entering the wall to exit without adversely affecting the wall system. Flashing, working in conjunction with weep holes, prevents water from entering the building and allows the wall system to remain dry. This is important as freezing water will also displace and crack brick. At DIS, we understand the importance of these components and, because of that, we know the value of properly integrating them into our work.

Expansion and control joints have been overlooked at times and wall construction problems occur because of it. Control joints are vertical separations in the face brick. They allow sections of the wall to move, to some extent, independently of each other. Expansion joints work on the same principal, but expansion joints typically continue on through the structure. Locations of joints are calculated based on a number of factors, empirical and alternative methods are used by engineers. In restoration work, control joints can be retro-fitted into an existing wall or can be incorporated into the design during the rebuilding process.

Step cracks and spalled brick are signs that stress within the wall are overwhelming the integrity of the materials. We have worked on a large number of buildings that required expansion control. Buildings with noticeable bowing of the walls or other signs of stress require a great deal of careful attention. Entire sections of masonry have been seen to fall as a result of this during the demolition phase of this type of work. There is no substitute for experience.



Moisture Issues



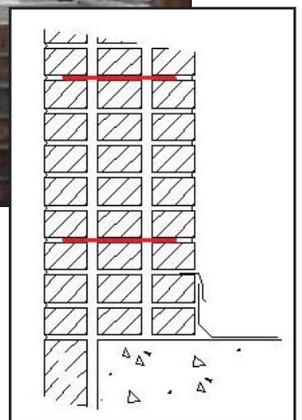
Masonry wall construction typically includes a number of common elements; structural "back-up", steel support angles, flashing and weeps, and face brick. In years past, the importance of flashing and weeps were under emphasized. In many instances, this has led to rusting of structural steel elements within the wall. As the steel turns to rust it not only loses its capacity to carry loads, but the rust expands and forces unintended movement of the wall. Prior to failure of the steel, the wall shifts; this shifting breaks the brick's ties to the back-up and creates cracking of mortar joints and brick.



Prior to beginning any work, the masonry above the steel must be stabilized and supported, (see Structural Elements in this issue). With supports in place, the existing angle is replaced, the new steel is primed and painted then bolted into place. Flashing is placed over the angle so that any water entering the wall system will be directed out. The new brick placed on this flashing will have weeps placed at the flashing to allow trapped moisture to flow freely out of the wall cavity.



In some cases water infiltration has caused damage to the structural back-up itself. In a case like this, the face brick has to be removed entirely, and then the back-up must be removed and rebuilt. In a masonry structure, one common construction method is to use concrete block. If the structure is to be significantly higher than it is wide, the block needs to be reinforced. The cells of the block are filled with structural strength grout and steel reinforcing bars. Once the structure has achieved its design strength, face brick can be built around it and fastened to it.



These walls also incorporate horizontal reinforcing within the mortar joints; this reinforcing is often referred to as ladder ties. The face brick is built around steel straps incorporated into the mortar joints. This strapping is one way of tying the face brick to the back-up masonry.

Project Profiles



■ Hotel, Michigan Ave., Chicago, Illinois

Consultant:	Crest Consulting Engineers
Assignment:	Masonry & Limestone Restoration
Duration:	7 years

The stone and masonry façade of this significant Michigan Avenue hotel requires continuous maintenance along with rebuilding of distressed areas. Parapet wall dismantlement and reconstruction on this south loop gem sometimes includes substantial structural refurbishment to assure decades of stability. Steel beams and concrete repairs are completed seamlessly with major masonry rebuilding. All precision work is coordinated in house and completed by the craftsman of Design Installation Systems.



■ UIC - School of Medicine, Chicago, Illinois

Client:	University of Illinois @ Chicago
Consultant:	Construction Technology Laboratories
Assignment:	Parapet Wall Reconstruction
Duration:	1 Year

This project consisted of completely dismantling and rebuilding the ten foot high limestone and masonry parapet walls at this historic university building. As all of the decorative limestone was salvaged and reused to preserve the architectural integrity of the building, extensive surveys were performed and documented. The engineered rigging required to accommodate the height of the parapet walls and the extraordinary weight of the limestone piers added to the complexity of the project. Custom trolley systems, beams and hoists were used by the craftsmen to facilitate the movement of the large, decorative stones.



■ 233 East Walton, Chicago, Illinois

Client:	233 Walton Place Building Cooperative
Consultant:	Klein & Hoffman, Inc.
Assignment:	Masonry Reconstruction
Duration:	2 Years

Located in the shadow of the John Hancock building, this 15 story landmark needed total removal and rebuilding of the north and east masonry facades. Unlike most projects of this nature, DIS decided to complete the work from swing stage scaffolds. Using this type of equipment eliminated the need, and the cost, of encasing the two sides of the building in scaffolding built up from the ground. This innovative technique reduced disruption to the building owners, minimized landscaping damage and allowed for greater flexibility in access to work areas. The completed project is a testament to the thoughtful planning and careful execution of the work.



■ The Carlyle, Chicago, Illinois

Client:	Draper & Kramer
Consultant:	CTL
Assignment:	Masonry Reconstruction
Duration:	2 Years

This prominent Lake Shore Drive hi-rise was in need of maintenance to stave off the adverse effects of being located on the lake shore. Wind and rain had eroded a significant number of mortar joints, in some cases this lead to water infiltration. Design Installation Systems was asked to help locate and repair water damaged steel within the wall and to replace broken and deteriorated brick in the façade. Once repairs were completed, tuck pointing and sealant work returned the masonry to its intended water tight condition.

Structural Elements

Stabilization & Support

There are real dangers involved with the demolition of unstable masonry. Taking tools to a wall is only one step in an intricate process. Before any removal is attempted, the area must be closely observed by a trained and experienced person. Cracked, spalled or displaced brick could be a symptom of a major problem in the wall system. Often, a problem being observed at one point in a wall is related to an adjacent problem. If reckless removal begins in the wrong area, overall system failure can make itself evident by collapse of the entire loose section. There is no substitute for thoughtful analysis and careful execution.

Stabilization of masonry requires expert means and methods. Straps, bolts, clamps and rods are some of the equipment put into place to keep masonry walls in place. City of Chicago building inspection ordinances have gone a long way in defining many problems with unstable brickwork, but all building owners need to be aware of a potential problem regardless of a building's height or location. Only a close up, careful inspection can spot most problems. The alternative is waiting for an inevitable failure, resulting in partial or full collapse.

In addressing an area of concern, the contractor is responsible for stabilizing the work area and assuring a safe environment for the workers and the public. This is a responsibility we at Design Installation Systems take very seriously. Regardless of the state of the existing structure, we stabilize all areas where brick or structural steel supports need to be removed. Some methods are standard in the industry, while others have been developed by DIS in house.

The black steel supports shown are angle frames custom built by DIS. These frames were fastened to the interior of the ten foot high, composite parapet wall for stabilization during demolition.



One common method for supporting brick is to install stainless steel rods



Adjustable clamps developed by DIS sometimes substitute for embedded rods.



Fabrication of custom fitted cornice supports. All work completed at Design Installation Systems' shop.

Cornice supports place on the building to stabilize the cantilevered stones. These will remain in place until the parapet wall can be rebuilt.

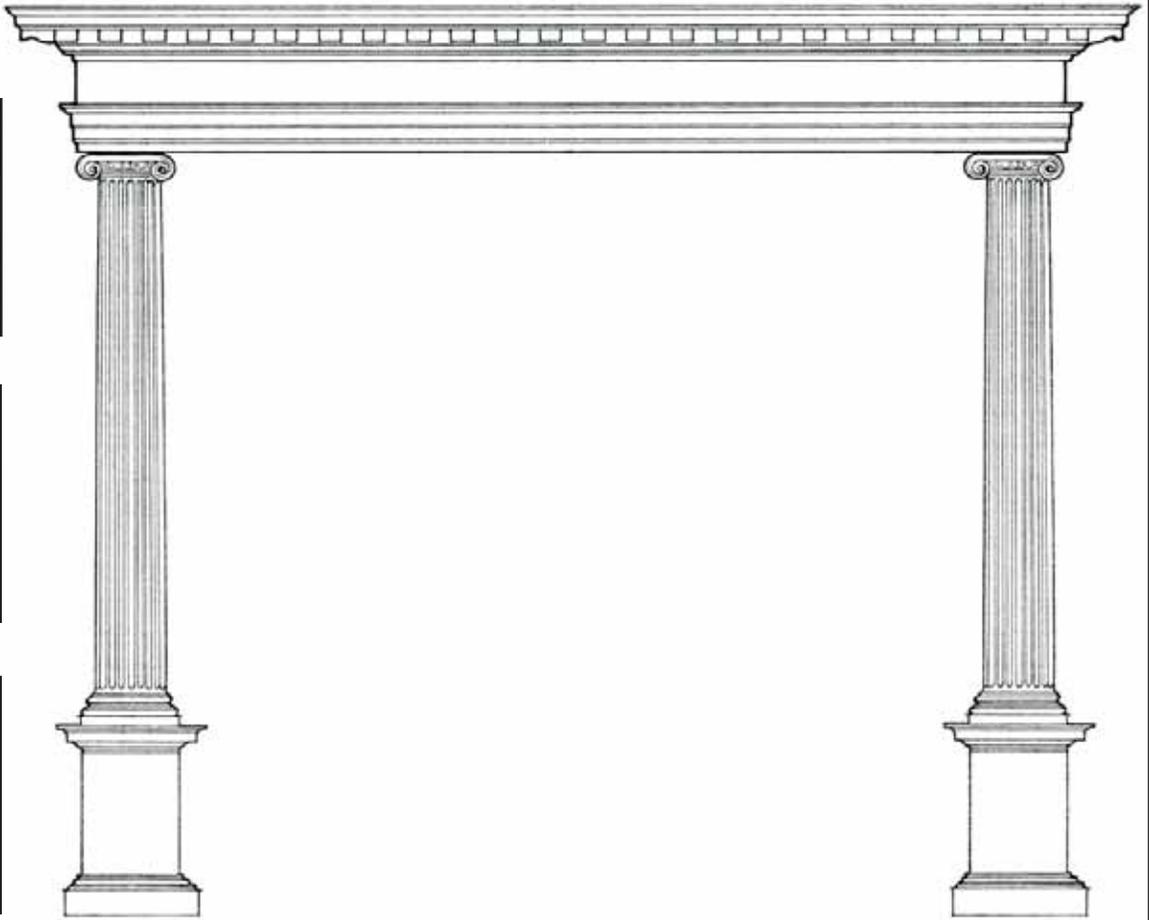


Masonry corners are particularly susceptible to instability when a wall is in distress. Steel straps are used to keep the corner in place until demolition can begin.

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