Getting the ultimate in abuse-resistant plaster systems

FIRE PROTECTION, SOUND CONTROL, APPEARANCE—-THESE AND OTHER CRITERIA ARE PART OF THE DESIGN PROCESS FAMILIAR TO EVERY ARCHITECT. DESIGNING FOR HIGH ABUSE RESISTANCE, HOWEVER, HAS TAKEN ON INCREASED IMPORTANCE IN RECENT YEARS. WHY? THE BIGGEST REASON IS LIFE-CYCLE ECONOMICS.

Abuse-resistant systems are those which survive well in their environments, and which can be repaired at minimal cost. The importance of such systems has grown with increased activity in those construction segments where abuse-resistance is essential: Schools, hospitals, correctional facilities, high-security buildings, banks, etc.

Designing abuse-resistant systems, however, can add significant cost to a project. Thus, it is necessary to determine a project's specific abuse-resistance needs, and to design a system to meet them. A life-cycle cost analysis of this system should be performed to balance cost with need. Frequently, the most effective abuse-resistance solutions are plaster systems, because they offer a wide variety of abuse-resistant bases, basecoats and finishes that permit an unlimited number of performance combinations.

The criteria which define abuse-resistance

Abuse resistance may be defined as the ability of a system to resist forces at three specific areas of damage: Surface abrasion and indentation, penetration or puncture and security breaches.

Surface abrasion and indentation result from force exerted across a surface—for example, when a rolling cart scrapes or dents a wall.

Penetration or puncture through the membrane results from force exerted into a surface—for example, when a thrown object strikes a wall and penetrates its surface.

Security breaches are through penetrations of the wall or ceiling, as by forced entry or penetration of a bullet.

From surface to penetration to security considerations, there is a progression in the degree of damage threatened to the system. This progression challenges the architect to design for different levels of abuse-resistance, and challenges manufacturers to provide products to address those levels. A series of tests has been created to determine the resistance of products and systems to the various types of abuse. An explanation of these tests is given in the technical article on page 11.

Achieving the desired level of abuse-resistance

Table 1 contains products and systems listed in ascending order of abuse resistance. This list permits comparison of available products and systems in terms of abuse-resistance criteria. Note that the cost of the products and systems also increases as performance improves. However, an expensive system can be economical if it reduces maintenance or replacement costs.

The importance of flexible design solutions

Different designs require different levels of abuse-resistance, so design flexibility is essential. What's right for a school or a hospital may not be acceptable for a bank or a prison.

By their very nature, plaster systems provide more design flexibility than drywall, masonry and other types of construction. Why? Because plaster systems provide more options in component selection. Gypsum or metal lath, veneer or conventional, standard or high-strength plaster basecoats, gauging plaster/finishing lime or prepared plaster finish, conventional or high-strength veneer finishes—each component has its own special characteristics which are enhanced or modified depending on what other components are combined with it into a system. Thus, plaster systems provide designers with a progression of solutions to meet all levels of abuse-resistance.

For example, if high resistance to surface abrasion is the key to the design, IMPERIAL Finish Plaster is the choice (see photos a and b). If a high level of penetration-resistance is also important, the gypsum base of a veneer system may not be acceptable. Instead, DUROCK Cement Board may be used for increased resistance. Even higher impact resistance may be achieved with a full thickness of STRUCTOBASE Basecoat Plaster (see photos c and d). If security is paramount, the designer may decide to specify a high-density security wall, such as STRUCTOCORE Security Wall Systems, with their steel forming sheets for continuous reinforcement of the plaster.

The importance of life-cycle factors

Making design decisions based on short-term goals often reduces long-term performance. Installed costs of various plaster systems typically are higher than those for standard drywall installations. But when life-cycle costs are compared—and life-cycle costs are of first importance when designing for high abuse-resistance—plaster systems typically are the more economical choice.

a

b

c

d

Typical system for high abrasion resistance, good impact resistance and superior appearance, such as that needed for a university building, is two-coat IMPERIAL Veneer Plaster over IMPERIAL FIRECODE Gypsum Base, photos a and b.

For extreme abuse resistance (but not security resistance), STRUCTO-BASE Gypsum Plaster/steel-stud-framed metal-lath system provides excellent abrasion resistance, excellent impact resistance and ultimate appearance for hospitals and other high-abuse facilities, photos c and d.

USG has components and systems to match design needs

Five basic levels of abuse-resistant plaster systems are available from United States Gypsum Company. A description of these levels is contained in "United States Gypsum Company Abuse Resistant Systems," P672; write Editor, FORM & FUNCTION, 125 South Franklin Street, Chicago, IL 60606-4678, for a copy. Even within these levels, there can be subtle differences due to factors such as the finish plaster used. By consulting with a United States Gypsum technical representative, designers can tailor systems to meet their specific needs. ■

Table 1. Abuse-resistance of products and systems

Security Resistance

STRUCTOCORE Security Wall **(Best)**

(Other assemblies provide varying levels of penetration-resistance but none approach STRUCTOCORE System)

Penetration Resistance

STRUCTOCORE Security Wall System **(Best)**

Metal lath/STRUCTO-BASE Gypsum Plaster/ IMPERIAL Veneer Plaster

1-layer 3/4" SHEETROCK brand Abuse-Resistant Gypsum Base with mesh reinforcement/ 2-coat DIAMOND Veneer Plaster

2-layer IMPERIAL FIRECODE Base/ 2-coat IMPERIAL Veneer Plaster

1-layer 3/4" SHEETROCK brand Abuse-Resistant Gypsum Base/ 2-coat DIAMOND Veneer Plaster

2-layer SHEETROCK brand Gypsum Panels, FIRECODE Core

1-layer DUROCK Cement Board/ 2-coat veneer plaster

1-layer SHEETROCK brand Abuse-Resistant Gypsum Base/veneer plaster

1-layer IMPERIAL FIRECODE Base/ 2-coat IMPERIAL Veneer Plaster

1-layer IMPERIAL FIRECODE Base/ 2-coat DIAMOND Veneer Plaster

1-layer SHEETROCK brand Gypsum Panels, FIRECODE Core and gypsum fiber board **(Poor)**

Surface Abrasion Resistance

IMPERIAL Plaster **(Best)**

DIAMOND Plaster

Keenes Cement/lime/sand

Gauging plaster/lime

SHEETROCK brand Abuse-Resistant Gypsum Panels

SHEETROCK brand Vinyl-Faced Gypsum Panels

SHEETROCK brand Abuse-Resistant Gypsum Panels with mesh reinforcement

Standard drywall and gypsum fiber board **(Poor)**