



INTRODUCTION TO CUSTOM HOLLOW METAL



Hollow Metal Manufacturers Association

Division of the National Association of Architectural Metal Manufacturers

This manual was developed by representative members of the Hollow Metal Manufacturers Association Division (HMMA) of the National Association of Architectural Metal Manufacturers (NAAMM) to provide information and guidance on the selection of hardware for hollow metal doors and frames. This manual contains advisory information only and is published as a public service by NAAMM and its HMMA Division.

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The term "hollow metal work" refers to many of those components of building construction that are made of cold formed sheet metal. It applies to a wide range of products, including not only doors and frames, but partitions, curtain wall framing, radiator and convector enclosures, and numerous other similar items. With the exception of single family residences, there are relatively few buildings, in fact, in which hollow metal work is not used. By far the most widely used of these products are doors and frames, and for that reason this Manual is concerned principally with those items.

Hollow metal doors and frames were introduced early in the century, and the use of hollow metal products has steadily expanded since then, keeping pace with the growth of the building industry. Yet there have been few attempts to provide the architect with authoritative and unbiased technical information regarding the manufacture, design and use of these products.

It is the purpose of this Manual to provide such information, in the belief that it will benefit not only architects but the industry as well. Its chief aim is the promotion of good design practice, the use of quality materials and careful workmanship. The establishment of appropriate standards in respect to these matters will be helpful to all concerned; not only the architect and manufacturer, but the contractor and the building owner as well.

The information provided, though general in nature, pertains particularly to custom work, for reasons that will be explained. This manual is not intended, however, as a comprehensive treatise on the subject. Such an undertaking would not only require more time and resources than have been available, but might also be of dubious practical value. Instead, the aim has been to provide basic and concise information which hopefully will help the design professions to better understand how hollow metal work is made and how it should be designed and specified.

Why CUSTOM Hollow Metal?

Just as with many other products, the term "custom" as applied to hollow metal doors and frames, denotes a product made to order, as opposed to one that is uniformly produced in quantity and stockpiled for sale. More importantly, it also implies a wide latitude in size and design, careful attention to engineering details and manufacture, resulting in a superior product.

In respect to hollow metal work, however, "custom" does not necessarily imply premium cost, as it often does with other products. In general, the cost of custom hollow metal doors and frames is highly competitive with that of stock products having comparable quality of construction. This is another reason why many architects specify custom work where design character, rugged construction, or quality workmanship is essential. Specifically, the principal advantages of custom hollow metal doors and frames are these.

Design Freedom: The variety of door designs available is limited only by the architect's ingenuity. While the more "typical" flush, paneled, or glazed doors are generally the most economical, the choice is by no means limited to a series of catalog designs. Any arrangement, size or shape of panels or glazing, in doors of any reasonable size or shape can be provided.

If desired, doors and frames may be manufactured of stainless steel, or clad with stainless steel or other material. Doors and frame assemblies for specialized applications may also be specified as: Fire-Rated, Thermal Rated, Bullet Resistant, Commercial and Detention Security, Blast and Pressure Resistant, Sound Retardant, Radiation Shielding and others.

The size and shape of the opening are also unrestricted. The architect has the freedom to specify any combination and or variation of single or multiple opening frames. These can incorporate a variety of section designs, limited only by the architect's imagination. Frames with curved or arched heads are readily provided in custom work, and multiple openings may have any plan configuration the architect desires.

The architect is encouraged to consult early in the course of development with a NAAMM manufacturer to insure that proposed designs are practical and meet application requirements.

Hardware Options: As more fully explained in the Hardware Section of this Manual, there are no limitations, either, as to the types of hardware that may be used on custom hollow metal doors. Where appropriate, pivots may be used in place of hinges; and door closers, instead of surface-mounted, may be any of the concealed or semi-concealed types. Panic hardware may have concealed instead of exposed rods; and door edges may be made to accommodate any type of weatherstripping. Whatever type of hardware the architect may select, custom made doors can be specifically designed to properly accommodate it.

Finishes: Although painted finishes are by far the most common, the choice is not limited to these. Other finishes can be provided on doors, permitting the architect to specify the most appropriate finish in each case. When other finishes such as texturized metals, vinyl coating, or even laminates are desired, they can be provided.

Specifying Custom Hollow Metal

The major advantage of custom hollow metal is the architect's design freedom. Where special requirements so dictate, thicker material may be used for either doors or frames, and special reinforcements are readily provided.

Typically the steel used in HMMA doors and frames is thicker than that used in products of stock design, resulting in superior strength and stability. Door faces have no detectable seams or joints, all welds being made on the door edge and so finished as to be completely invisible.

Most frames, whether for a single door or a larger opening have accurately fitted and welded corners, and are shipped as rigidly assembled units. This insures squareness and facilitates providing proper door clearances and fit when installed in the building.

Another inherent advantage of custom work is that shop drawings of all items are submitted for the architect's approval before fabrication is begun, thus providing the architect an opportunity to check all details of design in advance of manufacture.

The Story of Hollow Metal

The history of the development of hollow metal doors and frames is a profile of the American genius for combining beauty with good functional design while offering an improved product at reduced cost. The interesting story revealed by a review of door and frame catalogs since 1906 substantiates this.

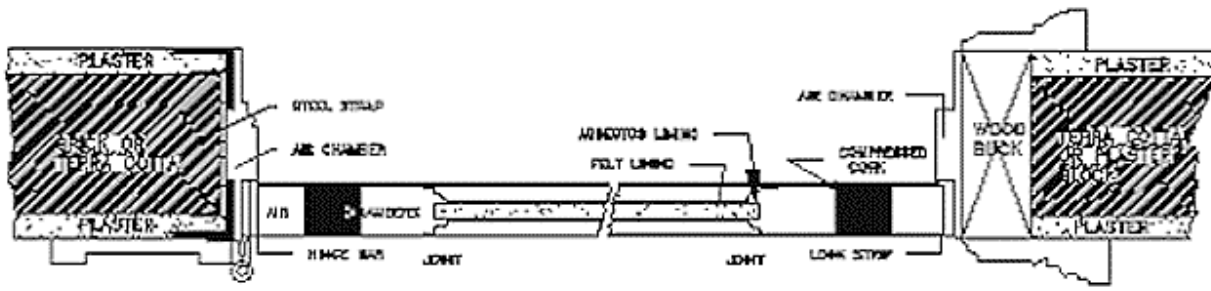
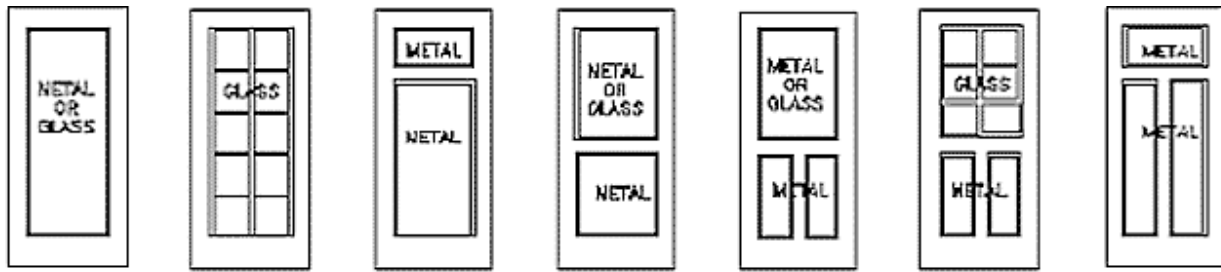
The early development of pressed steel frames and steel doors as we know them today seems to have had its birth place in the Jamestown, New York, area, where there apparently was a concentration of sheet metal craftsmen. In their 1910 Sweet's catalog, the Dahlstrom Metallic Door Company of that city stated:

"We are the originators of the Hollow Metal Fireproofing... Being pioneers, our patents cover broadly the most desirable features and ensure simplicity of construction. Our welded joints and sealed double lock seams make the connections invisible, adding beauty and strength to the unsurpassed fire-proof quality of our doors.'

The point was stressed that no wood was used in the doors and frames, and this was one of the chief motivations for this new development of hollow metal construction.

The great fires in Baltimore and San Francisco "were due chiefly to the vast mass of wood furniture and doors," according to the 1910 catalog of the Art Metal Construction Company, another Jamestown firm. Before the introduction of hollow metal, many doors and frames were of Kalamein construction, basically a wood structure encased in light gage sheet metal as a deterrent to flammability.

The purpose of the Jamestown development was to make the steel self supporting and virtually seamless, eliminating the wood core. The frames were all of a three-piece construction, however-a carry-over from wood construction-with optional trim being installed separately, to provide for adjustment to the preconstructed rough opening.



ANGLE IRON FRAME CONSTRUCTION

WOOD BUCK CONSTRUCTION

SECTIONAL VIEW OF THE "DAHLSTROM" FIREPROOF DOOR

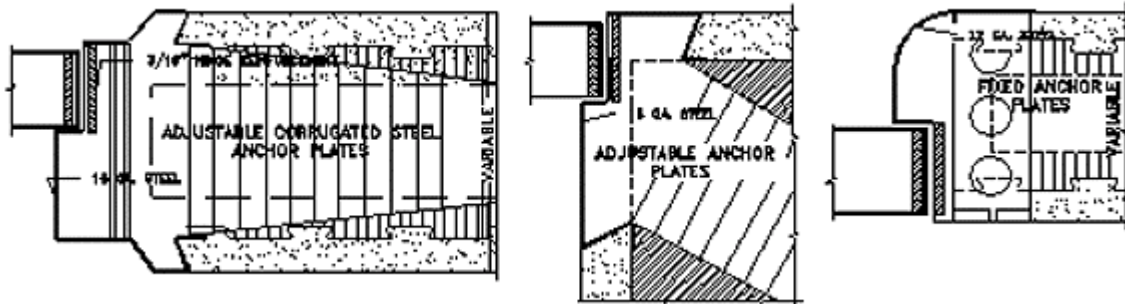
Showing sheet steel frame, four styles of casings, and two methods of securing same to the wall.

The drawing above, from the Dahlstrom catalog of 1909, shows a typical stile and rail hollow metal door (with no structural wood core), and frame combination as offered then. The next development appeared in the 1915 catalog of the Dahlstrom Metallic Door Company under the heading "Special Frames for Hospital Doors," it was stated:

Extended flanges serve as finish, and no casing (face trim) is required, but can be used if desired. The corners are acetylene welded, making rigid and tight joints that cannot open up. Several methods of sanitary base features will be submitted on request"

"A recent development is a specially constructed door buck and jamb particularly suited for hospital buildings. It is made of cold rolled steel plate in standard forms as illustrated below, or made according to architect's details, all securely anchored to the partitions.

As with other NAAMM manuals, this publication is the result of several years of work by a committee representing many of the leading manufacturers in the field. The pictures shown on the following pages are but a few examples of the flexibility with design of custom hollow metal.

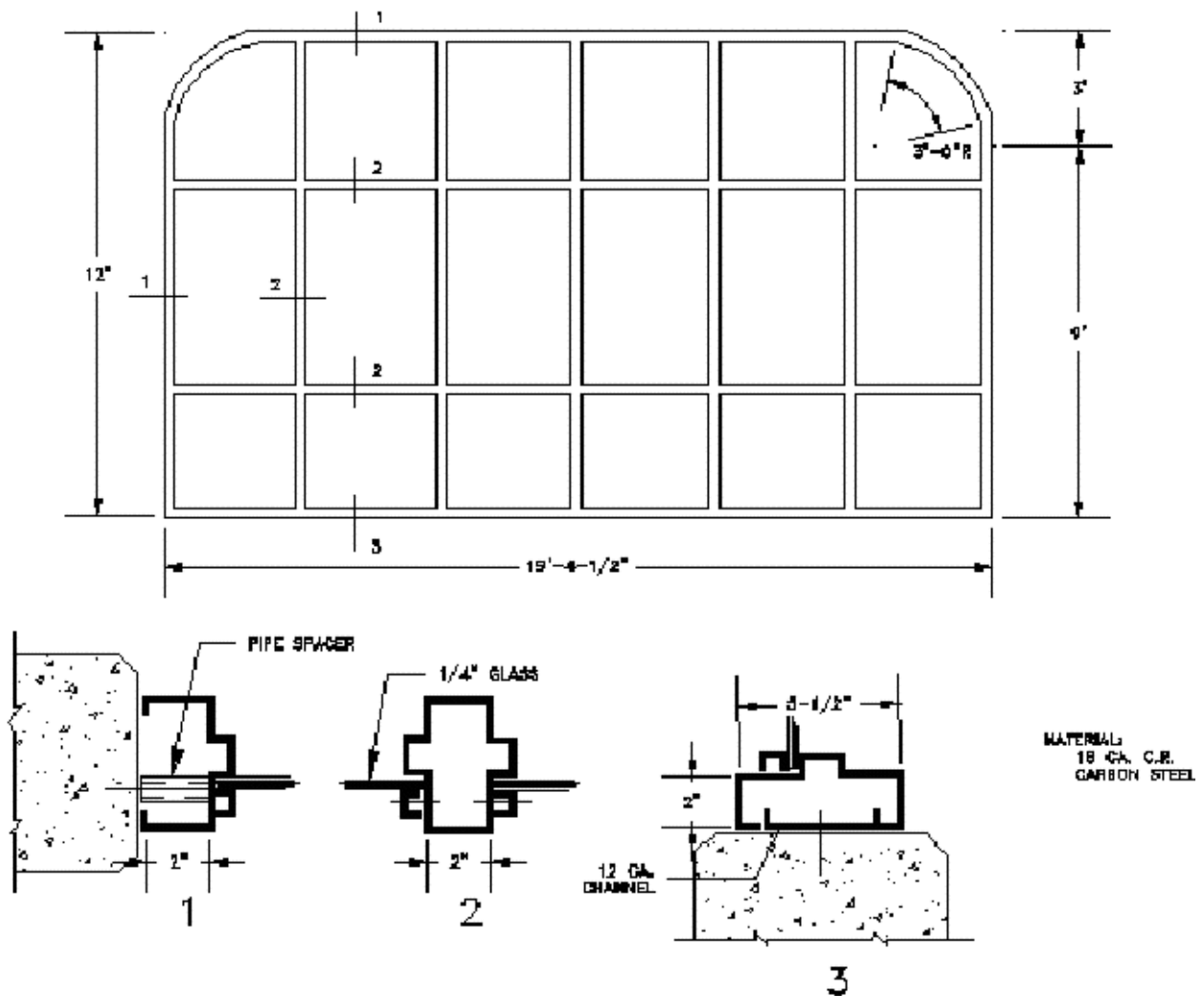


SEVERAL DESIGNS OF SANITARY DOOR TRIM

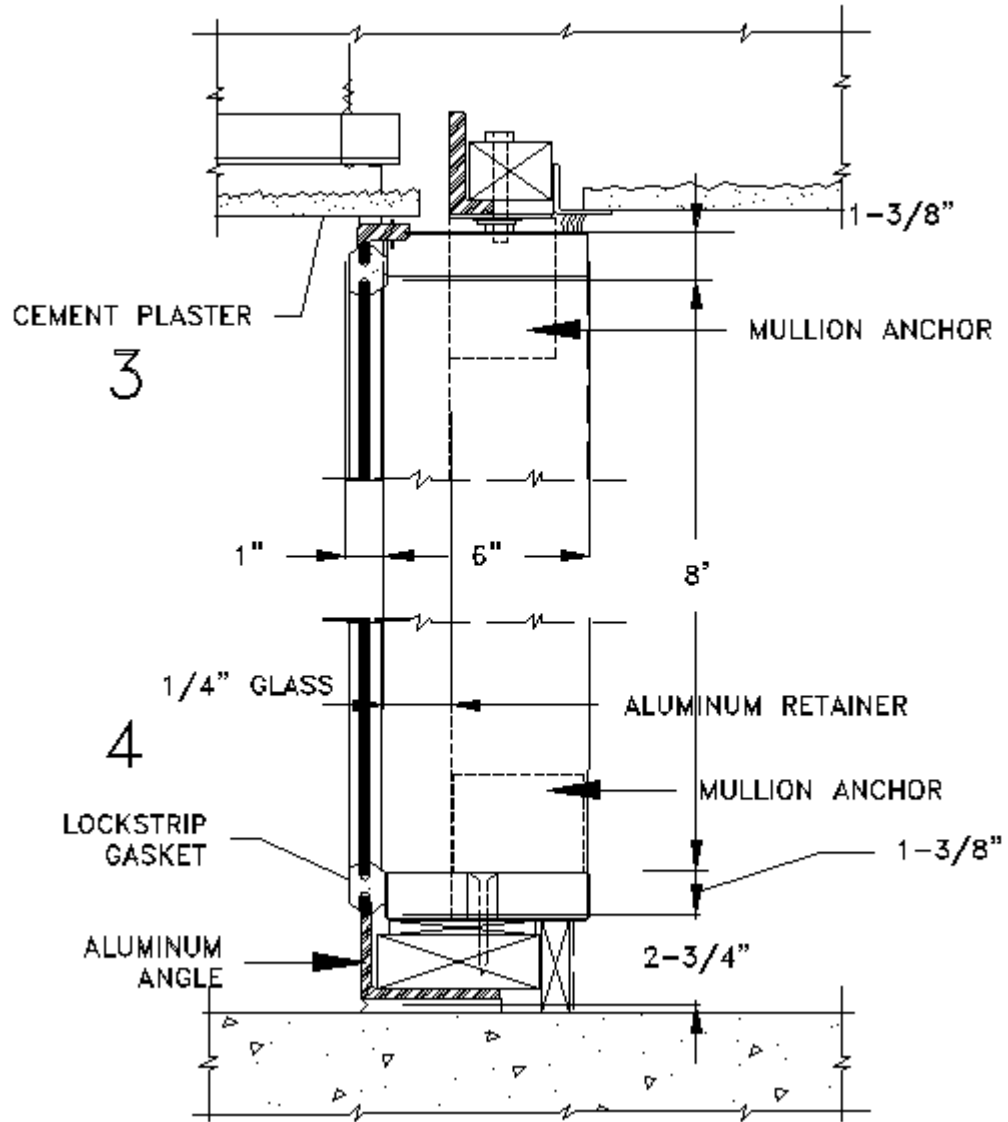
OTHER HOLLOW METAL WORK

Detail drawings and photographs of curtain walls, interior partitions, entrances and other representative examples of the versatility of custom hollow metal work.

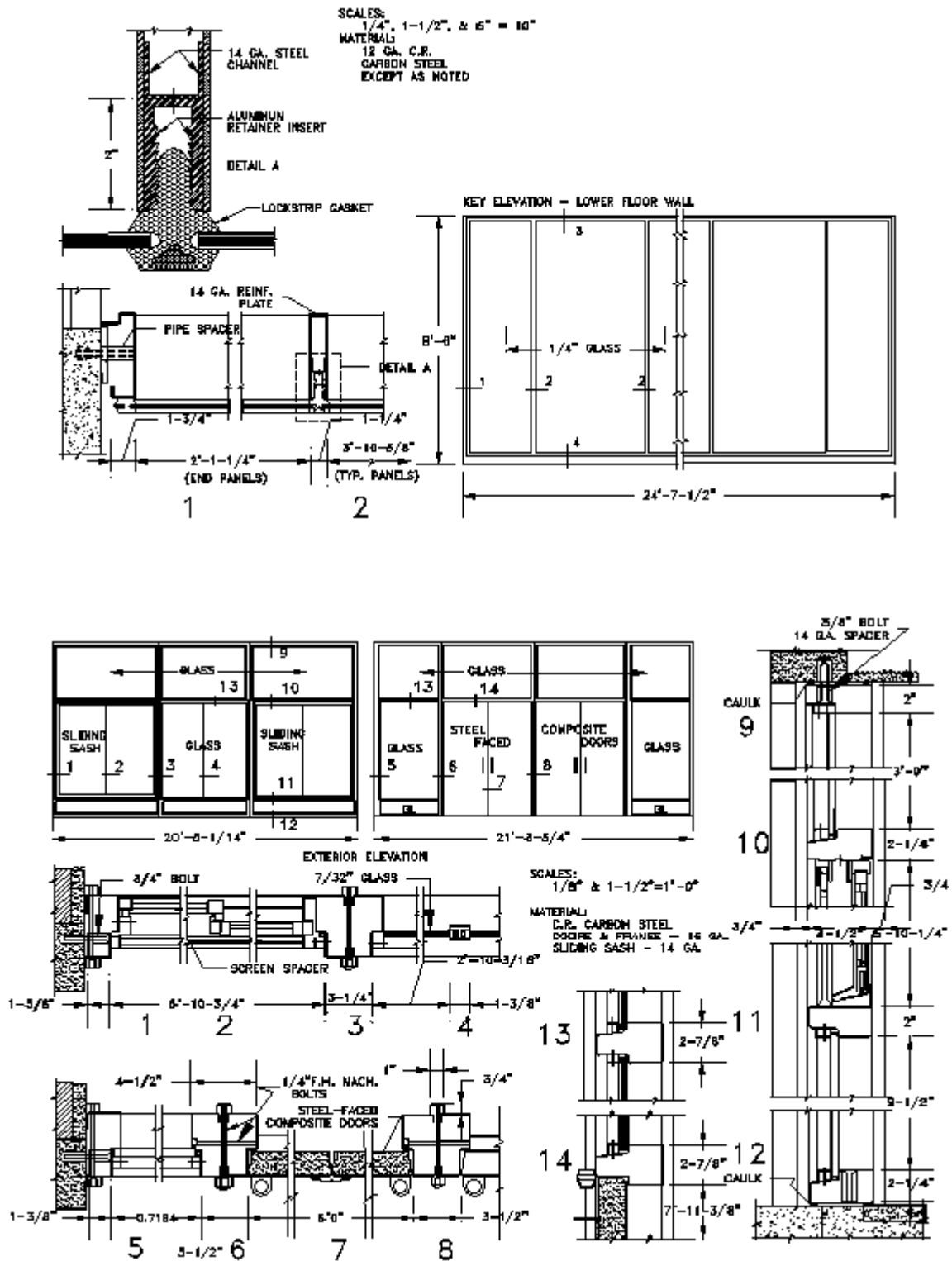
EXTERIOR VIEW OF LIBRARY BUILDING (WINDOW DETAIL)



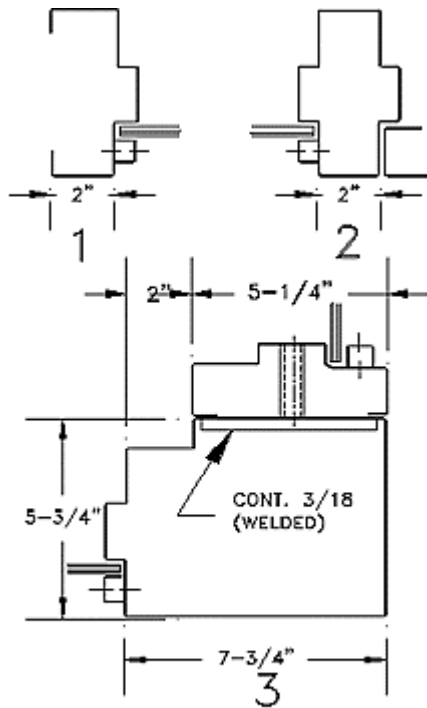
WINDOW WALLS (DETAIL)



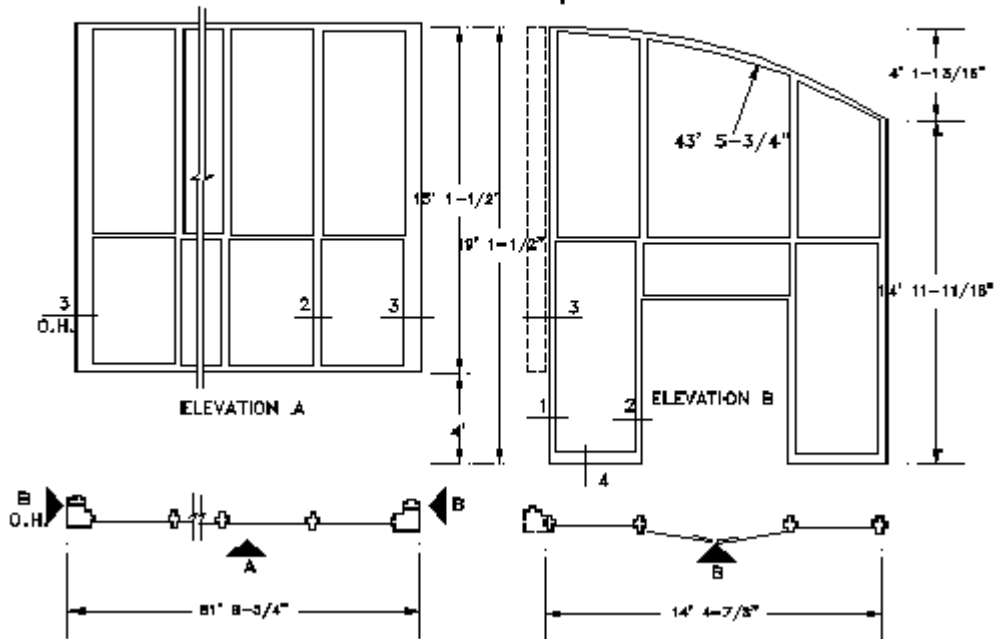
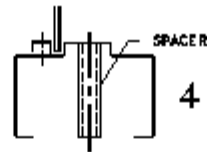
LOBBY WINDOW WALL (DETAIL)



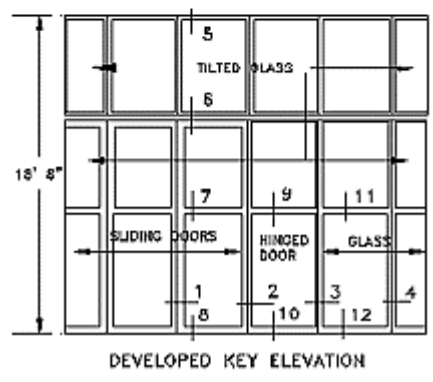
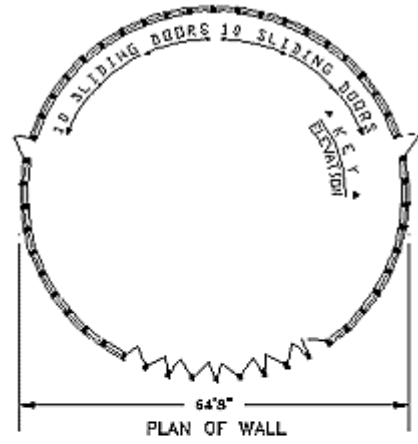
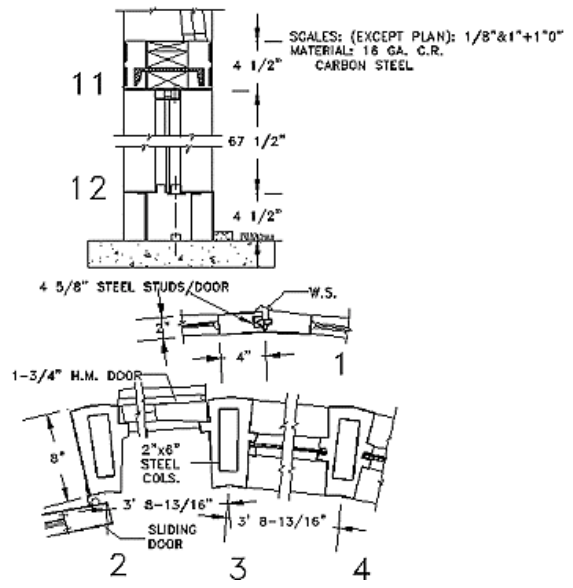
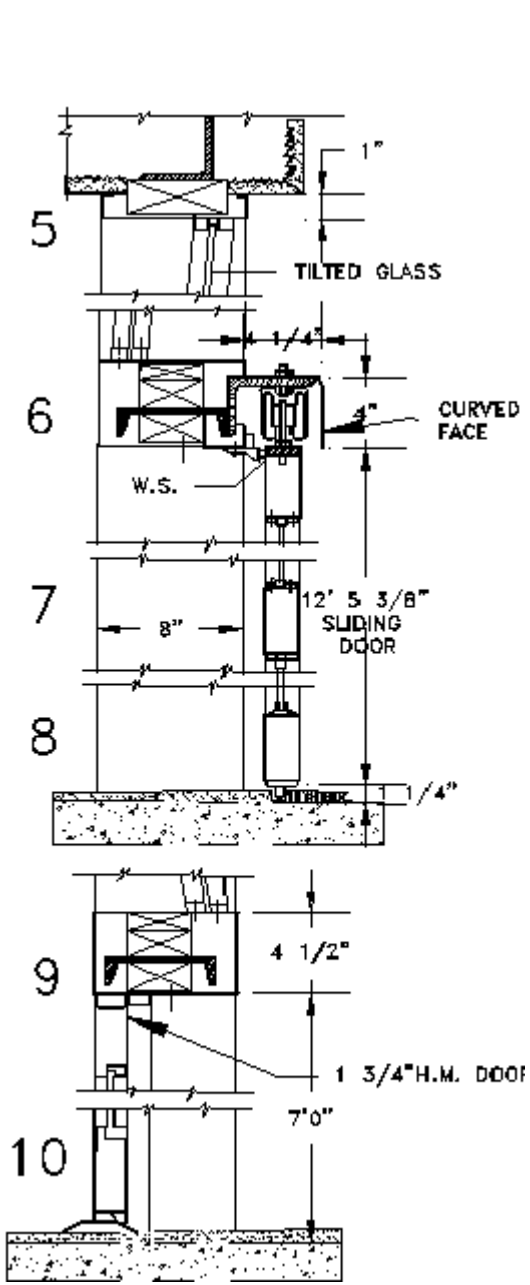
INTERIOR CORNER VIEW OF LIBRARY (DETAIL)



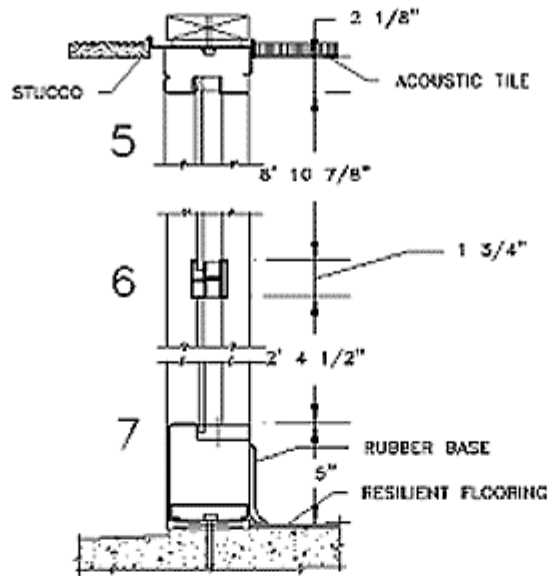
MATERIAL:
16 GA. C.R. STEEL



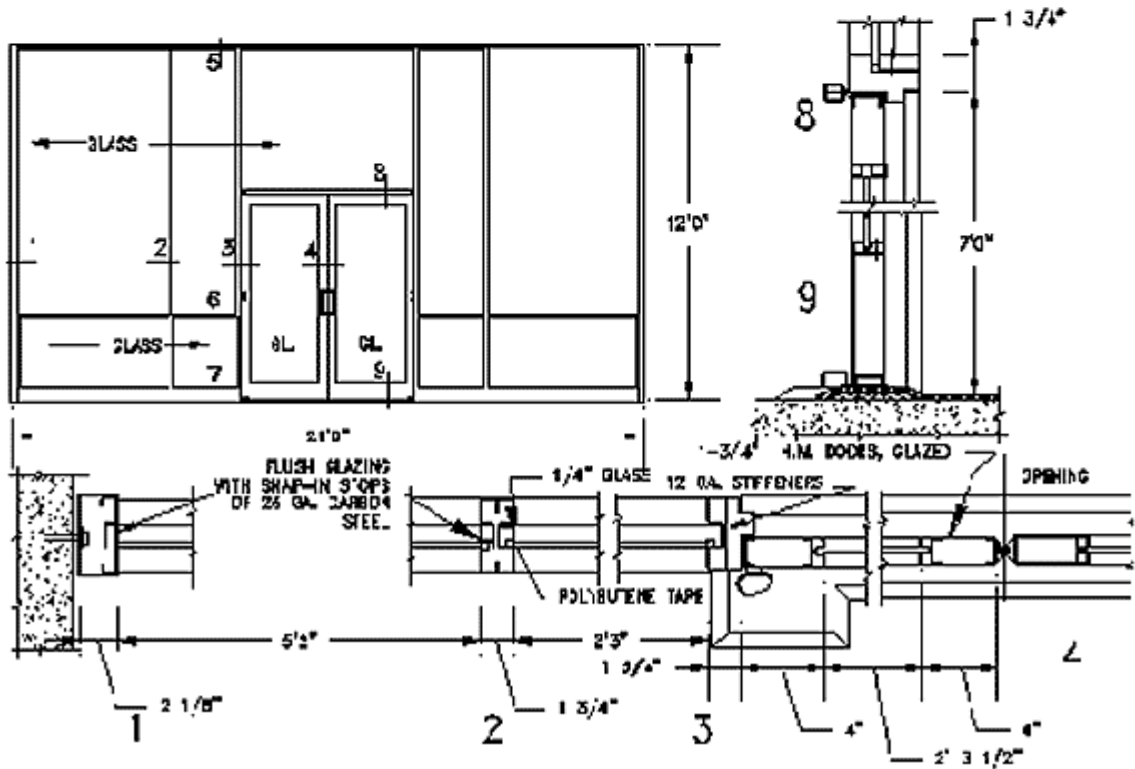
EXTERIOR WALL (DETAIL)



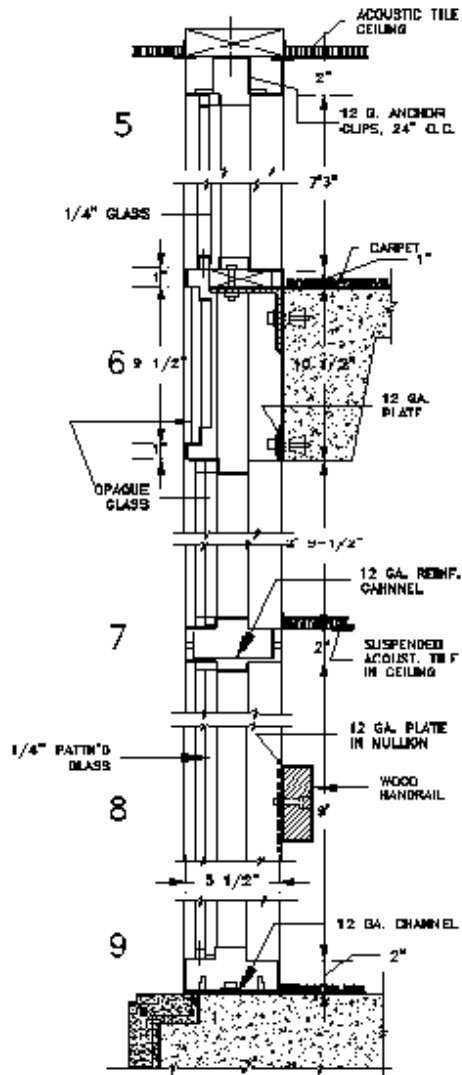
MAIN ENTRANCE BAY (DETAIL)



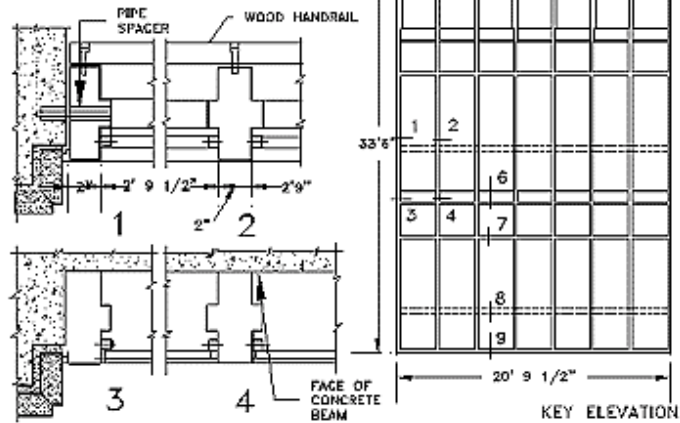
SCALES: 3/16" & 1 1/2" = 1'0"
MATERIAL: 16 GA. C.R. CARBON STEEL



INTERIOR LOBBY WALL (DETAIL)



SCALES: 3/32" & 1/2" = 1'0"
 MATERIAL: C.R. CARBON STEEL
 16 GA. EXCEPT AS OTHERWISE NOTED



FRONT ENTRANCE (DETAIL)

