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From the library of Chris Zynda

Chris Zynda is President of ASA and Safety Subcommittee Chair. He is a member of ACI Committees 506, Shotcreting, and C660, Shotcrete Nozzleman Certification, an ASTM member, and a certified ACI Examiner.

## Pneumatically Placed Concrete for Walls of Industrial Plants

by J.Q.A. Greene, Vice President, Gunite Concrete and Construction Company

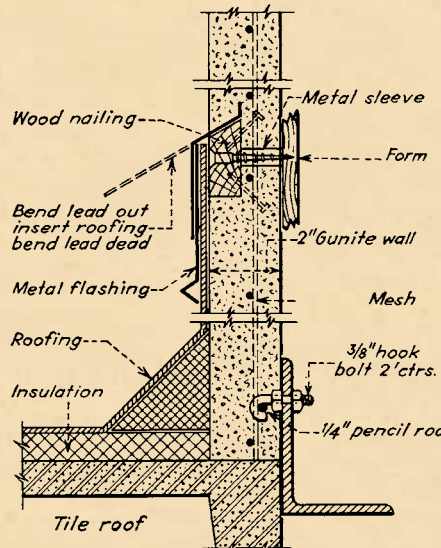
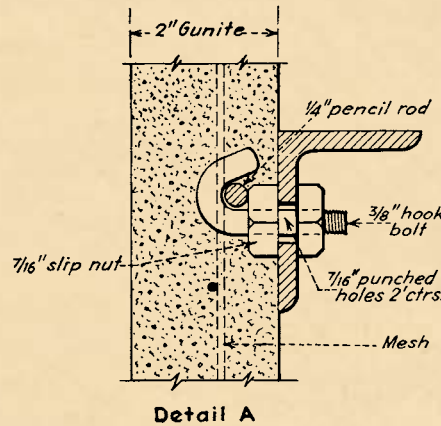
WALLS FOR INDUSTRIAL BUILDINGS are important elements of defense structures, both as to cost and the time required for construction, and one of the modern materials used for the exteriors of many outstanding plants of the national defense program is pneumatically placed cement mortar, or shotcrete. This type of wall design has been used in the Curtiss-Wright Corporation plant at Buffalo, N. Y., the General Motors plant at Melrose Park, and for two large additions to the Glenn L. Martin plant at Baltimore. The U. S. Army has also used this type of wall for the Air Corps warehouse at Barksdale Field at Shreveport, La. The following paragraphs review the general features of design and construction for this type of wall when used in single-story steel frame industrial buildings.

Columns along the walls of industrial buildings vary considerably in spacing with 16 ft. as a commonly used interval. These columns are most frequently steel H-sections with the flange sides running parallel to the direction of the wall. These steel columns support the roof system of steel truss and purlin design. A typical section through this type of wall is indicated in the accompanying drawing.

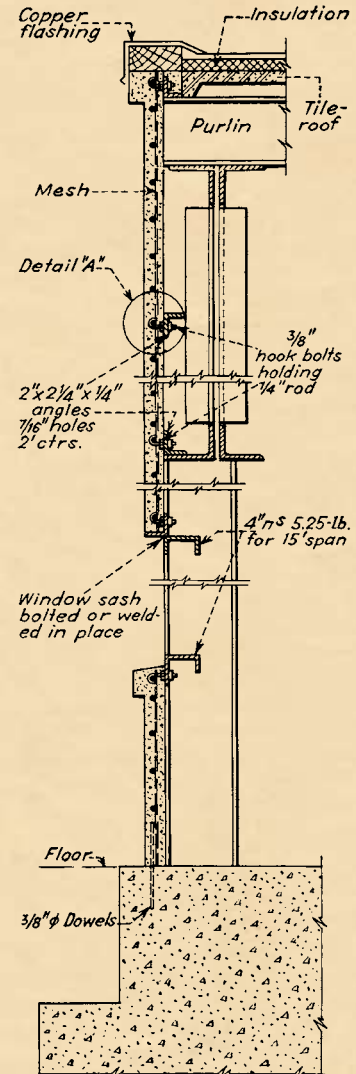
The wall design may vary because of operations carried on within the structure but a common design includes a horizontal band of shotcrete extending from footing level to the bottom of the windows, followed by a horizontal band of window sash of variable height, with the upper section of the wall consisting of another horizontal band of shotcrete extending to the roof line. Details to be observed

in the design of this type of wall include: (1) steel members at both lintel and window-sill openings designed to allow sash to be bolted or

welded into place and not embedded in the wall material, and (2) steel should be designed so that the shotcrete wall will set out far enough for



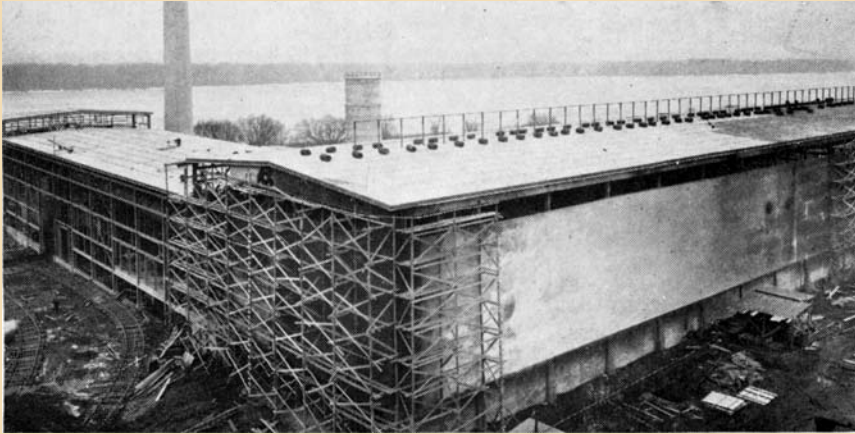
Detail at Monitor Ends



Single Exterior Wall

Design details for a wall of pneumatically placed concrete

# Shotcrete Classics



*Walls for an industrial plant are usually 2 in. thick and are applied at a rate of about 1000 sq. ft. per 8-hr. day per unit*

clearance for wood forms between finished wall and edges of truss laterals or wind-bracing members.

Forms used for shotcrete walls may be considerably lighter than is usually specified because the material, when applied against a form, is placed in a relatively light coat over a considerable area of the form, which tends to stiffen the form materially before the balance of the mortar is shot into place. The forms, which are placed between the structural supporting members, may be reused as many as ten times and when built out of plywood, leave a very satisfactory surface on the exposed interior wall.

The drawings indicate a method of attaching the reinforcing steel, including the  $\frac{1}{4}$ -in. pencil rods, and the mesh that is tied to these rods. For this type of construction the anchors are usually  $\frac{3}{8}$ -in. hooked bolts set at 2-ft. intervals, attached to the angle supports. Customary reinforcing is

usually 4-in. x 4-in. mesh of No. 8 gage or 3-in. x 3-in. mesh of No. 10 gage galvanized. The details of the angles used for horizontal stiffening of the shotcrete and the connection at the ends of monitors are indicated in the drawing. The connection illustrated for the monitor is also of use back of firewalls and where the wall comes in contact with the roof, where the connection is important and must be correctly handled to secure satisfactory results.

The mix of the shotcrete is usually 1 part cement to 4 parts of sand, and the method of mixing and placing follows well recognized practice. It is assumed that the preparation and placing of this type of material is understood by the reader.

#### **Placing procedure**

A skilled nozzle man—skilled operators are essential for wall construction—is able to bring the surface of

the shotcrete to within  $\frac{1}{4}$ -in. of the final desired thickness and this surface may then be scraped or screeded to remove the few high places. After this adjustment has been made, the screeded surface is given a flat finish coat by flashing with the nozzle, using the same materials and the same mix, leaving the entire surface with a uniform finish.

The mesh should have a sectional area of from 0.2 percent to 0.3 percent in each direction, based on a single layer of electric-welded fabric for a 2-in. wall. This fabric should be doubled at all corners.

The foregoing information on exterior walls may be considered typical and well suited for conditions in the Midwest to the northern limits of the United States. In the extreme southern states the wall section could be reduced and a lighter mesh used.

On buildings where the exterior walls are of shotcrete it is quite feasible to use this material and process from placing double partition walls on each side of a truss. These partitions are of the fire-wall type, and protect the structural steel forming any intermediate wall or any dividing truss. For such construction, ribbed paper-backed mesh may be used for forms by interposing some  $\frac{3}{8}$ -in. rods between the  $\frac{1}{4}$ -in. rods on the face of the structural steel. These rods can be tied to the quarter-inch rods and spaced so as to prevent the paper-back mesh from sagging. Incidentally the mesh on the paper is not included in determining the reinforcing value of the mesh used. Paper is left in place between the walls.

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*In addition to projects mentioned above we have placed this same type of "GUNITE" walls on Curtiss-Wright Aeronautical plant at Lockland, Ohio, and Glenn L. Martin bomber plant at Omaha, Nebraska, etc.*

*"GUNITE" is also used for building side walls on housing projects and in most of the large bomber plants the coal bunkers and similar plate linings are of "GUNITE".*

*We will be pleased to furnish you with any additional details you may require such as specifications, prices, etc., without obligation on your part. Address your inquiry to:*

#### **GUNITE CONCRETE AND CONSTRUCTION COMPANY**

1301 Woodswether Road,  
Kansas City, Missouri.