This invention relates in general to reinforced concrete structures and more particularly to a self-supporting steel structure adapted to be coated with concrete or like pasty cement.

Prior reinforced concrete structures generally use forms for retaining steel reinforcements and also for shaping the contour of the poured concrete structure. Furthermore, the conventional steel reinforcing means for the various wall, roof and partition portions are not adapted to stress supporting interlocking engagement.

The present invention overcomes the above objections and disadvantages by the provision of an interlocking steel framework which is not only self-supporting but constructed to provide a thinning of all junctions upon the application of loading which structure is adapted to receive inner and outer layers of concrete by hydro spraying means to form unitary reinforced concrete structure without the use of expensive forms.

A further object of the invention is the provision of an interlocking plurality of steel reinforcing rods to form a self rigidizing building framework for covering with metallic screen which framework and screen is adapted to receive a coating of predetermined thickness and hydraulically sprayed concrete for forming a rigid unitary structure.

Another object of the invention is the provision of a system of concrete reinforcement bars forming interlocking wall and roof members which are self rigidizing for retaining metallic screen sheeting whereby the wall and roof member and screen are coated with pressure sprayed gas concrete for forming a rigid unitary structure.

A further object of the invention is the provision of a process for forming a self supporting unitary building structure by spraying concrete upon self rigidizing interlocking frame.

These and other objects and advantages in three embodiments of the invention are shown and described in the appended specification and drawings, in which:

FIG. 1 is a perspective view of a unitary reinforced concrete building in reduced scale.
FIG. 2 is a front elevation of one set of interlocking self rigidizing reinforcement members used in the structures shown in FIG. 1.
FIG. 3 is an enlarged fragmentary perspective view of the interlocking junctions of the wall and roof members shown in FIG. 2.
FIG. 4 is a fragmentary top plan view of the structure shown in FIG. 1 with portions thereof broken away.
FIG. 5 is an enlarged cross sectional view taken through section line 5—5, FIG. 1.
FIG. 6 is a perspective view of an alternate type of self rigidizing framework for a structure with a pyramid roof.
FIG. 7 is a second alternate form of a self rigidizing framework for a structure having a domical roof.
FIG. 8 illustrates a steel reinforced unitary concrete building having vertical walls 1 and 2 with a gable type roof of equal sides 3 and 4 with the junction thereof in a ridge 5 and with overhanging eaves 6 and 7.

The main vertical cross sectional reinforcement frame of the building, shown in FIG. 2, comprises a pair of spaced vertical steel rods 8 having an upper offset portion 9 with the rods positioned in coplanar spaced relation, as shown. A horizontal base rod 10 has each end 11 offset normal thereto and secured in parallel relation to the lower end of each rod 8 respectively by wire loop building 12, as shown. Each roof rod 13 has an offset portion 14, which offsets are centrally intersected at acute angles as shown and positioned at opposite sides of parallel superposed ridge rods 15 with the junction thereof wired together by loops 16, 17, and 18, better shown in FIG. 3. The outer end portions 19 of rods 13 intersect portions 9 at acute angles and embrace a pair of spaced parallel eave rods 20 for forming the eaves 6 and 7 of the building, as shown in FIG. 1.

The plan view of the reinforcement in the building shown in FIG. 1, is illustrated in FIG. 4, wherein spaced frames, as shown in FIG. 2, are retained in parallel spaced relation by ridge rods 15 and eave rods 20 which frames are secured by wire binding 12, 16, 17, 18 and 21, as shown in FIGS. 2 and 4.

The frame shown in FIG. 4 is covered externally by an outer metal screen 22 having predetermined interstices corresponding with a mesh to be hereinafter described, secured to the outer edges of the frame members by wire twisted loops 23 as applied at judicious points of contact. An inner metal screen 24 usually having smaller interstices than the outer screen is secured to the inner edges of the frame and retained thereto by wire loops 25.

It is now apparent that the frame and the parallel inner and outer screens thus assembled is self supporting and rigidizing and the junctions of the frame will tend to tighten and more securely rigidize the frame when the latter is subjected to vertical or horizontal forces or angular components thereof.

In processing the unitary construction, the aforesaid frame assembly is usually anchored in a concrete floor slab 24, as illustrated in FIG. 2, which retains the members 10 as reinforcement and an anchor for the vertical rods 8. The entire frame and screen 22 is manually sprayed with concrete by well known nozzle means until a desired thickness of wall and roof is obtained. The mesh of the external screen is chosen to suit the particular form of concrete or pasty cement sprayed thereon. Quarter to half inch mesh has been found satisfactory for gas concrete mixes which are particularly adaptable for this type of structure since an even heterogenous multitude of gaseous voids in gas concrete provide walls of great strength with desirable insulating properties at relatively low cost. The same nozzle sprayed treatment is given the inside screen 24 for completing the wall structure.

It is apparent that the entire surfaces of the frame and screen are in intimate contact with both the external and internal sprayed concrete which results in a unitary structure of great strength, simplicity, and low cost, which is highly resistant to weather.

It is apparent that prior to the spraying operations temporary frames may be secured within the frame to provide accurate openings for windows, doors and other openings.

It is to be noted that the structure described requires no joists and the ridge and eaves provided by the intersecting bars present in effect horizontal beams of great resistance to vertical and lateral stresses, in addition to the rigidity of the continuous slab structure of the entire formation.

It is to be noted that either the vertical ridge shown or the overhanging eaves shown in FIGS. 1 and 2 may be positioned in inverted relation inside the structure without sacrificing structural strength.

FIGS. 6 and 7 illustrate two of many alternate structures in which FIG. 6 shows a reinforcement frame for a building having a pyramidal roof and FIG. 7 illustrates a
3. A concrete reinforcement frame for a building structure comprising a means forming a base, unit frame means having a pair of vertical parallel spaced wall rods, the upper end portion of each of said wall rods forming an eave offset to extend normally outwardly with respect to each of said rods, a pair of roof rods with each having a like end portion forming a ridge offset with each said offset intersecting each other forming a pair of acute angle ridges and each opposite end portion of each of said roof rods intersecting each opposite said eave offset respectively forming a pair of acute angle ridges at opposite sides of said frame, a plurality of said unit frames secured in said base by the lower ends portions of said vertical rods in predetermined parallel spaced relation, a ridge rod positioned in each corresponding one of said ridge angles normal thereto and embraced by each opposite said ridge offset in each said unit frame, said ridge rod being secured by said ridge offsets into a rigid relationship therewith with the application of weight on said roof rods, an eave rod positioned in each corresponding one of said eave angles normal thereto and embraced by each of said eave offset and the said opposite end portion of each of said roof rods in said unit frame, each said eave rod being secured by said eave offsets into a rigid relationship therewith when concrete is applied on said roof rods, wire means binding each said ridge rod to each opposite said ridge offset and binding each said eave to each said opposite end portion with each said eave offset, and planar screen members of predetermined mesh secured to the outer edges of said wall rods and said roof rods and said ridge offsets and said eave offsets forming planar reinforcements between said rods and offsets.

2. The construction recited in claim 1 including a unitary outside concrete coating on said screen and said rods and said offsets of predetermined thickness forming a building enclosure.

3. The construction recited in claim 2 including a unitary inner concrete coating on said screen and said rods of predetermined thickness forming an interior surface in said building enclosure.

4. In a concrete reinforcement frame for a gable roof of the character described, at least a pair of coplanar roof rods for forming a gable, each of said roof rods having a like upstanding offset portion extending generally upwardly and intersecting each other forming an elongated X configuration including a pair of roof like acute angles, a pair of parallel positioned ridge rods retained within said angles respectively and normal thereto embraced by each said offset portion for forming an interlocking ridge for said frame, wire means secured around each junction of each said ridge rod with both said offset portions for holding said roof and ridge rods of said frame in fixed interlocked relation, said roof rods encased by concrete, said ridge rods being secured by said offset portions into rigid relationship therewith when concrete is applied on said roof rods.

5. In a concrete reinforcement unit frame for a building of the character described, at least one a substantially vertical rod anchored at the lower end thereof with the upper end portion offset extending normally therewith from forming an eave portion, a roof rod for forming a gable with one end portion thereof intersecting said eave portion substantially coplanar therewith and forming a squa X configuration including a pair of acute angles, a pair of parallel positioned eave rods retained within said angles respectively and normal thereto in contact with said eave portion and the said end portion of said roof rod forming an interlocking eave reinforcement part of said frame, wire means secured around each junction of each said eave rod with said eave portion and said end portion of said roof rod for holding said roof and said end portion of said roof rod encased in concrete, said eave rods being secured by said eave portions into rigid relationship therewith when concrete is applied on said roof rods.

6. In a concrete reinforcement frame of the character described, a first and second reinforcement rod in divergent position with the inner edges thereof substantially co-planar and the end portions thereof intersecting forming an X configuration with a pair of acute angles, a pair of spaced reinforcement rods positioned in said angles and substantially normal thereto with each one thereof in contact with both said first and second rods, binding means around the intersection of each of said parallel rods with each of said end portions of each said first and second rods for securing said first and second rods against coplanar movement toward each other, said first rod encased in concrete, said pair of spaced reinforcement rods secured by said first and second rods into rigid relationship therewith when concrete is applied on said first rod.

7. A process for producing a unitary reinforced concrete building which comprises the steps of: offsetting the end portions of a plurality of wall rods and disposing same vertically with the offset portions extending outwardly at predetermined locations corresponding to the sides of said building; offsetting a plurality of roof rods, interlocking the offset portions thereof to define upstanding X configurations including a pair of acute angles, interlocking the offset end portions of said wall rods with the ends of said roof rods opposite their offset portions to define outwardly extending X configurations including a pair of acute angles, and placing horizontally disposed rod means in each of said acute angles; spanning said roof rods with planar screen of predetermined mesh and supportively securing same to said roof rods; and applying concrete to said screen, said roof rods carrying the weight of said concrete, whereby each of said horizontal means is squeezed into rigid relationship with the said adjacent interlocking rods upon the application of said weight to said roof rods.

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