WOODEN BUILDINGS.

In this area actual structural damage to timber dwellings was not very pronounced. This is mainly accounted for by the fact of the area being flat and buildings constructed close to ground-level. It is noticeable that wooden buildings on sidling ground or elevated house-blocks almost invariably suffer through insubstantial bracing of the foundation-piles. Under no circumstances should a building of any type be built partly on original and partly on made ground, even though the latter has been down a number of years.

The racking effect, on the ground floor in particular, of multiple-storied timber construction is very apparent in some cases, and supports the opinion that the customary system of diagonal bracing is seriously at fault. The practice of breaking the diagonal-bracing members at every wall-stud gives a very inefficient system. For a single story it appears much preferable, from a structural viewpoint, to keep the diagonal brace in one piece and to cut the studding. For multiple stories, where a greater vertical load is imposed, a more expensive but thoroughly effective alternative is to check the stud to give a square thrust face to the diagonal stress. This weakens the stud against bending, but its resistance in this capacity is so slight as to be negligible.

As noted during the Murchison earthquake, 1929, continuity of structure in the frame of buildings over one story is a desideratum.

Heavy plastering and architectural ornamentations on ceilings are a source of danger. Plaster applied to a surface of expanded metal adheres most satisfactorily. On ceilings and walls the use of wire netting over the laths is beneficial in preventing falls of plaster.

In this district tiles and slates were not dislodged to any extent, practically all the damage being caused by falling chimneys.

A number of concrete chimneys survived the earthquake, but there does not appear to be one original brick chimney standing, save a short one built into the brick bearing-wall at the Parkvale School. Built in 1919, it projects about 3 ft. 6 in. above the eaves, and appears to be of cement mortar. The provision of four small L irons, with bands every 2 ft. 6 in. to 3 ft., at each of the outer corners of a brick chimney will in most cases provide against the collapse, if not the fracture, of the stack.

It must be realized that the severest stresses are concentrated in the ground-floor frame of multiple-story structures. Hence, in wooden shops, as the adoption of extensive display windows precludes all possibility of adequate bracing on the property-line, provision must be made for stiffeners at the rear of the window areas. Interior cross-partition and end walls need to be strong and substantial.

Plate-glass windows must not be under restraint in their fittings. Ample clearance, according to the flexibility of the building, should be allowed to take up elastic motion of the frame, both longitudinally and transversely.

In conclusion, it may be stated that good foundations, ample bracing, and careful construction will ensure wooden buildings against earthquake damage.

STRUCTURES WITH BRICK BEARING-WALLS.

Whereas brick, in general, as a construction medium has been roundly condemned, the workmanship and design, and not so much the material, is deserving of the severest criticism. Outstanding examples of varying magnitude of this type of construction are in evidence to discountenance the deplorable impression arising from a superficial inspection of this area.

Foundations.—Naturally, the first requisite for successful brick construction is a rigid foundation to tie the base of all bearing-walls. In this area a reinforced-concrete spread footing 2 ft. 6 in. to 4 ft. wide, according to the load to be carried, has given every satisfaction. From this the brick bearing-wall is stepped up without any cavity to the damp-course above ground-level. Where this type of foundation has been used there is little indication of weakness or failure at the damp-course. On compressible subsoils and on water-logged strata, where spread footings are required, more attention needs to be paid to the provision of foundations of such dimensions as to give uniform distribution of pressure.

Bond.—A widespread practice that should be discouraged is the use of unorthodox bond. For instance, 9 in. walls are built with three courses of stretchers and one of headers in sequence. English bond can be used in a wall as thin as 9 in., and gives greater protection against failure from the "whipping" action induced in panels.

Mortar.—Straight cement mortar appears to be warranted, even in curtain walls, but experiments are required to test whether the full strength of the brick can be developed through the bond. From inspection of existing work, it appears that the mortar and brick are well bonded on that portion of the brick upon which the mortar is plastered, but the opposite face does not always adhere. This difficulty should be surmounted by adequate soaking of the bricks, working the brick into its bed, and working the mortar in the joints with the point of the trowel.

As it is unnecessary to attain a mortar any stronger than the brick used, it is suggested that research should be carried out under working-conditions to investigate the proportion of lime that may be incorporated to produce a more fatty mortar and still give sufficient strength and bond.

Bonding-metal.—The use of bonding-strips or expanded metal has been very haphazard. In the majority of buildings it has not been used at all, in others at every twelve courses, if and when remembered, again at quoins only. With the soft friable lime mortar in common use the omission has not been of much moment.