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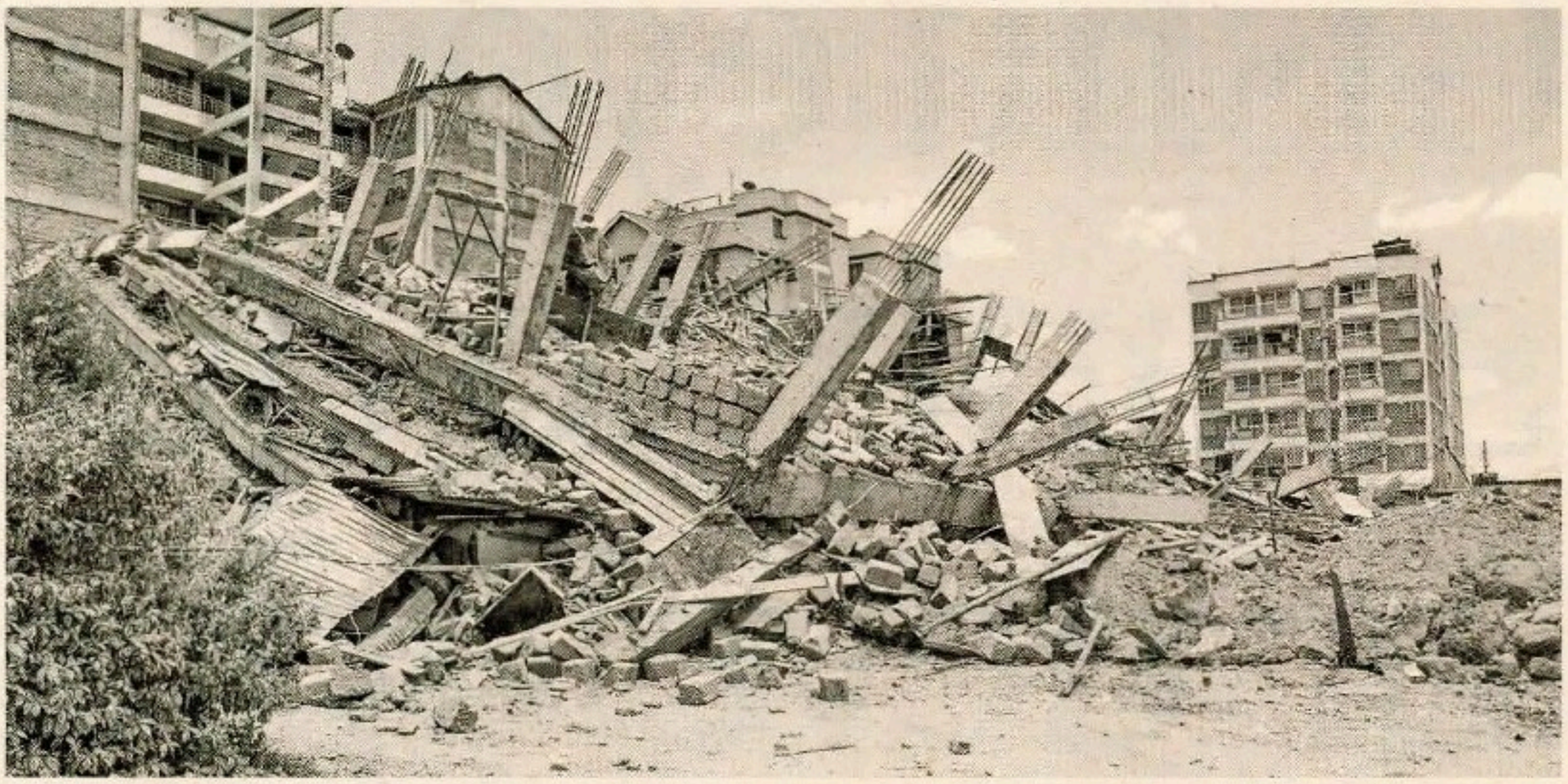
Concrete mix errors that collapse buildings



A rubble of a building that collapsed in Ruiru, Kiambu County, while under construction in October. –FILE

Buildings have been collapsing in Kenya and the unfolding narrative is consistent with reasons frequently cited: a section of the professional chain decided that the rules defining building constructions can be abridged.

There is a lot of blame game among relevant stakeholders in the construction industry with few investigations leading to prosecution.

However, a more detailed examination reveals that the quality of construction materials plays a huge role in the durability of buildings. A National Construction Authority 2020 survey showed that poor workmanship accounted for 35 percent of building failures, substandard material got 28 percent and poor structural design for 25 percent.

Typical case is concrete which is a key construction material made up of cement, sand, aggregates and water. The prescribed ratio to make a Class 20 concrete for example, is 1:2:4 of cement to sand to aggregates.

Cement invariably accounts for the highest cost in a concrete mix because it is the primary binding agent. While attempting to save on costs, a common mistake made in some sites is the deliberately use of less or cheaper cement that does not meet the specifications of existing standards. This significantly affects the overall strength and quality of the concrete.

For sand, many contractors use river sand, heedless of the fact that it can be contaminated with clay and silts that absorb water which forms air spaces in concrete. As it dries out, the spaces become weak points.

The absorptive nature of clay and silt further increases demand for water which consequently lowers the strength of concrete. The more water you add to concrete the weaker it becomes.

The quality of aggregates also affects concrete strength. Aggregates mined from weathered rocks or overstrained materials will have elements of soil and clay, causing the issues mentioned earlier.

Worse, is when one uses flaky, crispy-like aggregates often sold to unsuspecting end users. The result is a highly compromised packing density with lots of air spaces. In some cases, they scoop aggregate with soil and mix all of it to the detriment of structure under construction. The ideal aggregate particle is rounded or cubicle shaped with an evenly sized particle distribution.

Quality implementation at construction sites portends another major concern. Workers, especially when tired, add more water to concrete to make application easy, losing count of the number of buckets they use to mix components. Should it rain, there is no telling how much water will be in excess. They will simply use an eyeball approach to determine water levels without running any tests.

DIRTY SAND

Some sites wrongfully interpret the ratio of 1:2:4 to mean 1 bag of cement to two wheelbarrows of sand and four wheelbarrows of aggregate as opposed to an equal volume ratio, causing low concrete strength.

Avoiding errors at mixing is critical to ensuring the structure has the requisite strength to stand on its own and resist applied loads. Even the best cement will make useless concrete when proportions are unknown and the workers use dirty river sand, flaky aggregate and sewage water.

To prevent these errors, qualified construction professionals should be engaged and a strict regulatory framework to verify adherence to standards and consistency must be observed.

Projects should conduct mix designs in approved testing labs using actual materials they will use. This must be supplemented by physical testing of the concrete to ascertain strengths well before the project starts. Any changes in the construction materials must be matched with a change in mix designs.

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