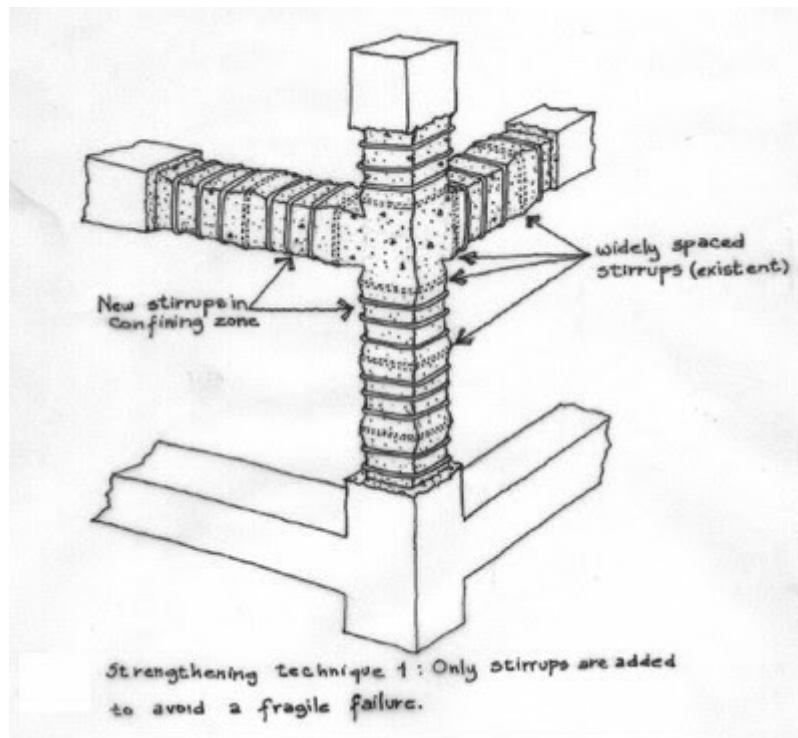


DUCTILE DETAILING AND ITS SIGNIFICANCE + HOW TO ACHIEVE DUCTILITY



In our previous News letter, we discussed about the four virtues of Earth Quake Resistant Buildings. Ductility of Buildings is a key virtue. As discussed earlier, ductility is the ability to prolong yielding or in simple words, prolonging deformation and failure.

Why should we prolong yielding of steel?

As we know, we design to resist a certain earth quake acceleration/ground movement (based on zone where the building is located) and not for unlimited ground acceleration.

The zoning of places is done by looking at the history of seismic activity in the region and by studying the soil strata. This does not mean that an earth quake of more severity will never occur. Earth quake is a natural occurrence and we can only have an approximate estimation and hence ductility is as much important. What if in a location like Bangalore where it is zoned as Zone 2, experiences a larger seismic acceleration similar to that expected in Zone 3.

The building would have been designed only for a seismic acceleration expected in Zone 2.

However due to larger acceleration, chances of irreparable damages are more.

- By plugging in a certain ductility will help in reducing the irreparable damages.
- Also in case of a larger ground movement, it helps in increasing the evacuation time there by saving lives.

How do we achieve ductility and will this cost more?

A structural engineer builds up a model and simulate the acceleration and compute the deformation and the related forces developed in all members and designs. There are some design considerations and detailing principles for achieving ductility and it is mandatory to do so in Zone 3 and above for all buildings irrespective of size or height.

Basically, the overall amount of shear steel ie the links/stirrups increases and the overall amount of longitudinal steel slightly reduces when we do ductility design+ductile detailing.
ie, Between, Just a seismic design vs seismic design + ductile consideration will keep the total steel quantity almost same.

In zone 2 , seismic resistant design is mandatory irrespective of size or height of the building. Ductility design/detailing is not mandatory. However as mentioned before, zone 2 may experience larger scale acceleration and to prevent damages, a little addition of ductility is desirable. This can be achieved by using Fe500 D steel instead of Fe500 at a nominal additional cost. Also the stirrups in joints and laps shall be closely spaced.



Image of badly damaged low rise buildings during a low to moderate intensity earth quake. This shows the importance of keeping even smaller buildings ductile and seismic resistant.

Conclusion : Safety is a virtue as much important as function and a nominal increase or sometimes no increase in cost can ensure this. All required is a careful attention and consideration.

DESIGN DIMENSIONS is a structural design firm *registered in Bangalore* and providing structural design solutions for all types of Buildings across **BANGALORE & COCHIN**.

We also have been successful in working remotely for a project each in Chennai and Dhanbad.

LEADERSHIP

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