Structural Design Dilemma

1. Check the adequacy of a residential building in terms of its structural design.

Architectural plan and structural drawings of a residential structure is provided along-with this problem statement. The structure is designed as per Fe500D and M20 grade. Building location: Varanasi, Type of Flooring: Marble, Type of Bricks: Clay.

Participating teams need to check the adequacy of design as per the code guidelines. Key codes to be referred are IS 456:2000, IS 13920:2016, IS 1893:2016 and IS 875. Verify whether the design is under or over-reinforced.

How will such a building behave in an event like an earthquake?

Suggest suitable modifications to make the design optimum. These modifications could be in terms of rebar grade, concrete grade, member dimensions or any other factor which the teams deem fit. Is there any savings potential in terms of material consumption by making these modifications? What is the optimum rebar grade or a combination of grades for this building?

Assume that the rebar grades available in the market are Fe415D, Fe500D, Fe550D and Fe600. Properties of all grades are given in the below table:

	Fe415 D	Fe500 D	Fe550 D	Fe600
YS (min)	415	500	550	600
UTS/YS (min)	1.15	1.15	1.15	1.12
Elongation (min)	18	18	16	14.5
Total Elongation at Max Force (min)	5	5	5	5

Concrete grades available are M20 and M25.

How can the ductility of rebar help in case the building is subjected to severe earthquake shaking?

Any missing data can be suitably assumed with proper justification.

While working on the problem, participants need to don the hat of a structural engineer and think from the perspective of a consumer who spends his life-long earnings in construction of his dream home. He has hired you so that he gets the most economical and structurally stable construction.

2. Develop a material estimator for estimating the amount of building materials before the actual construction starts. Estimator has to be developed for residential type buildings only. Bear in mind that this estimator will be used by consumers who have no technical background.

You can find the relevant Structural Drawings here.

NOTE-

- **Any team can have only 5 team members.**
- **The last date for abstract submission is 21 October 2020.**

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