Some Examples for CO-PO(1-3)Mapping and Corresponding Assessments

-Civil Engineering

By

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Topic: Mix Proportioning

Mix proportioning is a process of arriving at suitable proportions of concrete ingredients based on their characteristics to achieve desired strength and durability characteristics of concrete. Here, students will have the freedom of selecting different types of cements, aggregates, admixtures to arrive at a given grade of concrete say M40.

Contd.,

- To introduce complexity, students can be asked to provide solutions for the same M40 grade concrete but to be used in different field conditions such as Hot weather concreting, Underwater concreting, Mass concreting, High early strength requirement in say 3 days.

PO1: **Engineering Knowledge**: ***Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems***

Example Situation 1:

CO3: Able to understand mix proportioning techniques for field applications.

Assessment for CO3: (Question in Tests)

Briefly explain the various methods of mix proportioning techniques.

- ***Is CO reflects the intended measurement from PO 1?***
- ***Does the assessment correlates well with the CO?***

Mapping from SAR(say)
CO3- PO1.

- ***In this case, CO does not reflect the intention of measuring application of either science, maths or engineering principles. It can measure only remembrance in this topic.***
- ***Further, the assessment, does not test the requirement of application of engineering principles used in mix proportioning as per PO1, PO2 and PO3. Hence, the correlation between CO-PO is weak.***

PO2:Problem Analysis: *Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.*

Example Situation 2:

CO3: Able to apply mix proportion principles to design a concrete mix for field applications.

Assessment for CO3: (Question in Tests)

Proportion a concrete mix for M40 grade concrete by IS method. Given data: maximum nominal size of aggregate: 20mm; minimum cement content: 340kg/cum; maximum w/c ratio: 0.45; workability: 75mm slump; exposure: very severe; concreting type: pumping mode; quality at site: good; aggregate type: sub-angular; sp. gr of cement – 3.15, aggregate – 2.68, flyash – 2.08, SP 1.08, Design using IS 10026 – 2009.

- ***Is CO reflects the intended measurement from PO 2?***
- ***Does the assessment correlates well with the CO?***

Mapping from SAR(say)
CO3- PO2

In this case, students are expected to apply the mix proportion principles and hence the assessment is in line with the CO and hence to PO1.

The strength of correlation can be considered good for PO1 as engineering principles are used to arrive at mix proportion.

Contd.,

- However, the assessment does not test the students ability to identify, formulate and do some research for arriving at a suitable concrete mix for a given situation nor it challenges a student for design requirement since many variables of the design have already been identified in the problem and hence the strength of mapping of CO3 for PO2 and PO3 in the above example can not be considered good.

PO3: **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Example Situation 3:

CO3: Able to analyse characteristics of mix constituents and *design* a concrete mix for field applications using mix proportioning principles.

Assessment:/ASIGNMENT/ ***ABC Construction Company is entrusted with manufacturing of precast elements for elevated express way. The precast elements are required to attain 40 MPa in 7 days. Design a mix for least cost. The mix should comply with the requirements of IS 10262 and IS 456.***

• ***Is CO reflects the intended measurement from PO 2, PO3 ?*** • ***Does the assessment correlates well with the CO?***	Remarks: CO2 – PO2, PO3

In this case, students are expected to identify and formulate various design parameters such as type of cement which can be used for early strength gain, water content (W/C), workability required to manufacture such precast elements. They are also required to look for specifications as per the codal provisions and then apply engineering principles to arrive at mix proportions for a least cost.

The assessment correlates well with the CO and hence maps strongly for PO2 and PO3.

COs (Summary)

Example Situation 1:

- **Able to understand mix proportioning techniques for field applications.**

Example Situation 2:

- **Able to apply mix proportion principles to design a concrete mix for field applications.**

Example Situation 3:

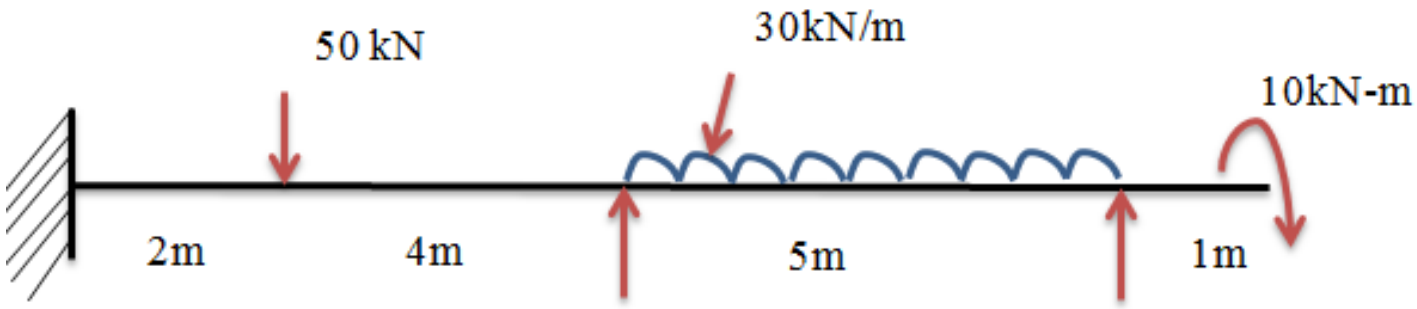
- **Able to analyse characteristics of mix constituents and *design* a concrete mix for field applications using mix proportioning principles.**

- Examples from few more courses..

Course:- Analysis of Structure-II Example-2

CO 1: Able to analyse for SF and BM in framed structure.

Mapping : CO 1- PO1, PO2

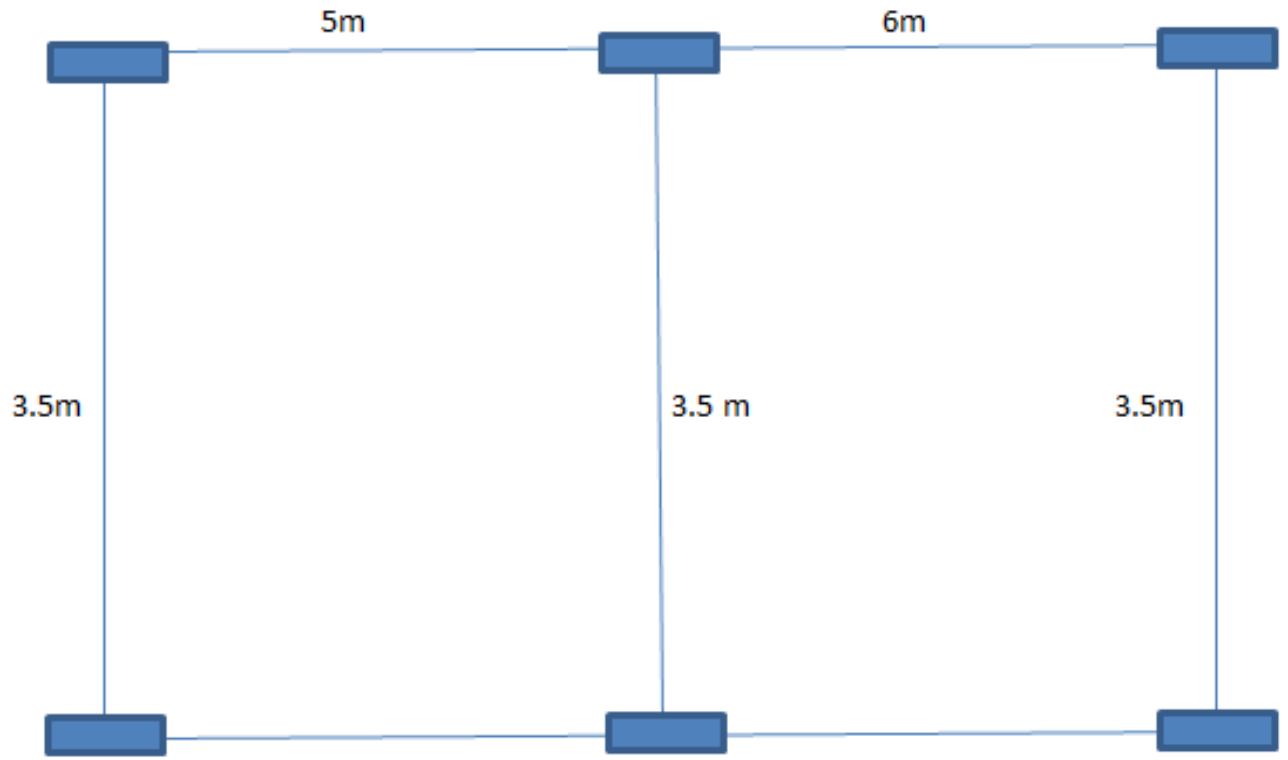


Is it a Complex engineering problem ?

Does it Map well with PO1 and PO2 ?

Course:- Analysis of Structure-II Example-2

A two storey ware house has the column and beam lay out as shown. Assuming sections of beams and columns prepare load diagram and draw of SFD and BMD.



1. A student has to **Identify** end conditions and load distribution pattern
2. Has to **refer** IS 875 for load calculations
3. Has to **formulate** the load diagrams
4. Has to **analyze** the structure using any of the methods like MDM, SDM, Kani's method etc.

- ***Problem can be considered complex..***
- ***Strength of correlation is Good for PO1 &PO2.***

Course:- Environmental Engineering-I Example-3

- Example situation 1:

CO3: Describe basic structure of drinking water supply systems and design the component systems of water treatment facilities

Topic: Disinfection Process

TLO : Able to describe various methods of disinfection process.

CO-PO Mapping in SAR (say)

CO3- PO1, PO2, PO3, PO6 and PO7

Assessment for CO3:

Question in Tests:

a) Briefly explain the various methods of Disinfection process.

b) Briefly explain the various forms of Chlorination.

(In this case, CO does not reflect the intention of measuring application of science, maths or engineering principles. It can measure only remembrance in this topic. Further, the assessment does not test the requirement of application of engineering (subject) fundamentals used in PO1, PO2 and PO3. Hence, the correlation between CO-PO is weak.)

Example Situation 2:

- **CO3:** Describe basic structure of drinking water supply systems and design the component systems of water treatment facilities

TLO : Able to estimate dosage of chlorine required for disinfection of water .

CO-PO Mapping in SAR (say)

CO3 – PO1, PO2, PO3

Assessment for CO3:

Chlorine usage in the treatment of 20000 cubic meter of water per day is 8kg/day. The residual chlorine after 10 minutes contact is 0.2 mg/lt. Calculate the dosage of chlorine after 10 mins contact is 0.2 mg/lt. Calculate the dosage of chlorine in mg/lt and chlorine demand of the water.

-In this case, students are expected to apply the knowledge of Math, Science and subject specialization concepts and hence the assessment is in line with the CO and hence to PO1. The strength of correlation is good as engineering and domain fundamentals are used to arrive solution to the problem.

Contd.,

- However, the assessment does not test the students ability to identify, formulate and do some research for arriving at a suitable design parameters for a given situation nor it challenges a student for design requirement since many variables of the design have already been identified in the problem and hence the strength of mapping of CO3 for PO2 and PO3 in the above example cannot be considered good.

Example Situation 3:

CO3: Describe basic structure of drinking water supply systems and design the component systems of water treatment facilities

TLO : Able to estimate chlorine demand and residual chlorine content for a given water sample through lab experiments.

CO-PO Mapping in SAR (say)

CO3 – PO1, PO2, PO3, PO6 and PO7

Assessment for CO3: (Assignment)

A part of the town name Vajarahalli has been served water with nearby surface water source. The estimated population for the same area is 50,000 with water demand of 135 lpcd. Estimate the quantity of bleaching powder required per year to disinfect the desired quantity of water by collecting the sample from the source. Submit the analysis report along with solution to problem.

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- ***-The report should contain the details on Available Chlorine, Chlorine Demand and Residual Chlorine for given water sample along with break point chlorination graph.***
- ***-Residual Chlorine content should meet IS 10500 drinking water standards. Also provide the list of Codes/manual which is referred to perform the test at laboratory.***

In this case, students are expected to identify and formulate the problem by collecting the sample from the said location and by conducting experiment at laboratory. This assignment question also calls for analysis and interpretation of experimental data to arrive solution to the problem.

Contd.,

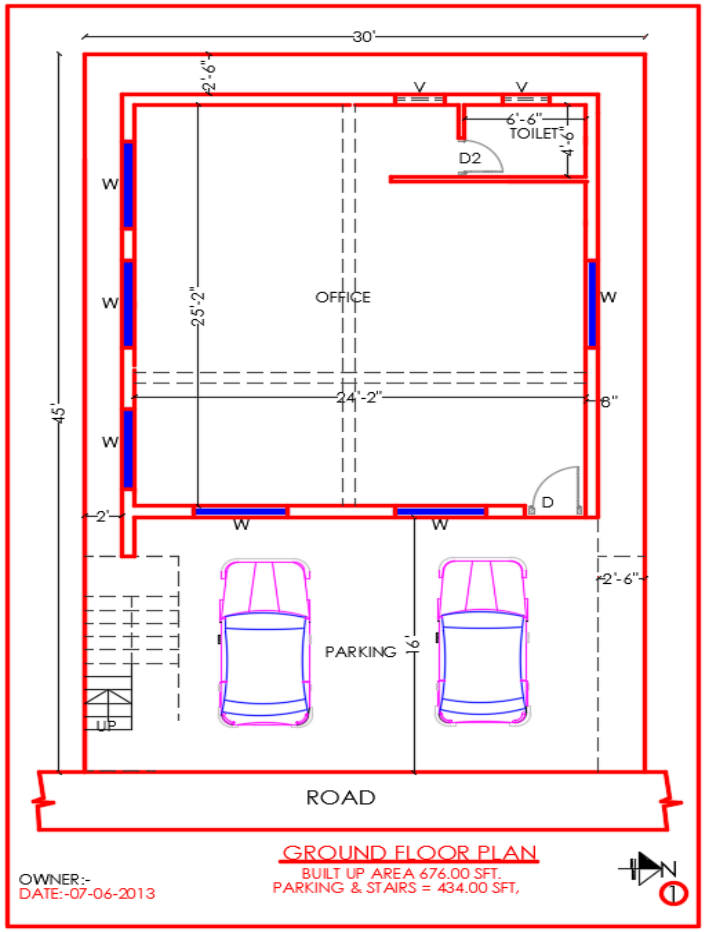
- To carry out the experiments students have to carry out literature work to know the procedure prescribed by manual/codes. Since the student at the end of the experiment ensures the potability of the water to the public, the same problem correlates strongly to PO2, PO4 and also to PO6.

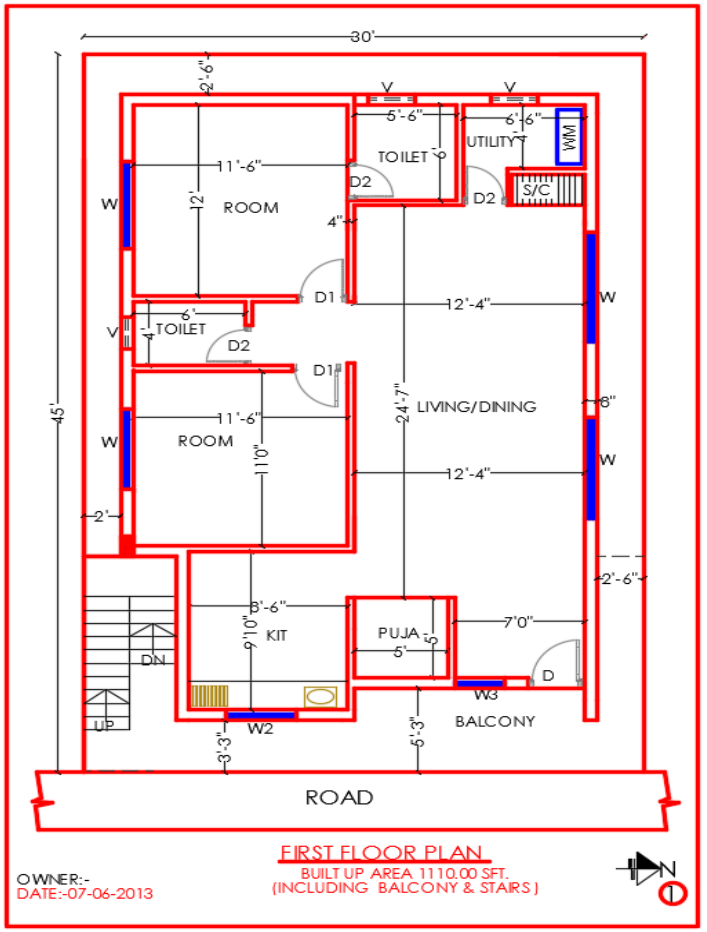
Course:- Reinforced Concrete Design Example-4

A Residential building comprising of ground +3 upper floors has been proposed using a RCC framed structure infilled with 200mm thick cement concrete block masonry wall as main walls and 100mm thick cement concrete block masonry walls as partition walls. Propose a suitable slab-beam and column layout. Analyse and design an interior slab, an interior beam, an interior column stairs and column footing. The floor plans are attached.

Note:

1. The design should conform to BIS codes of practice.
2. Consider locally available materials.
3. Second and third floor plans are identical to first floor plan.
4. The dimensions of RC elements should match with the construction practices prevailing in your city.
5. The toilet slabs are to sink by 200 mm.





This is a typical identify, analyse and design problem..

Strength of correlation is good for PO2 and PO3

THANK YOU