

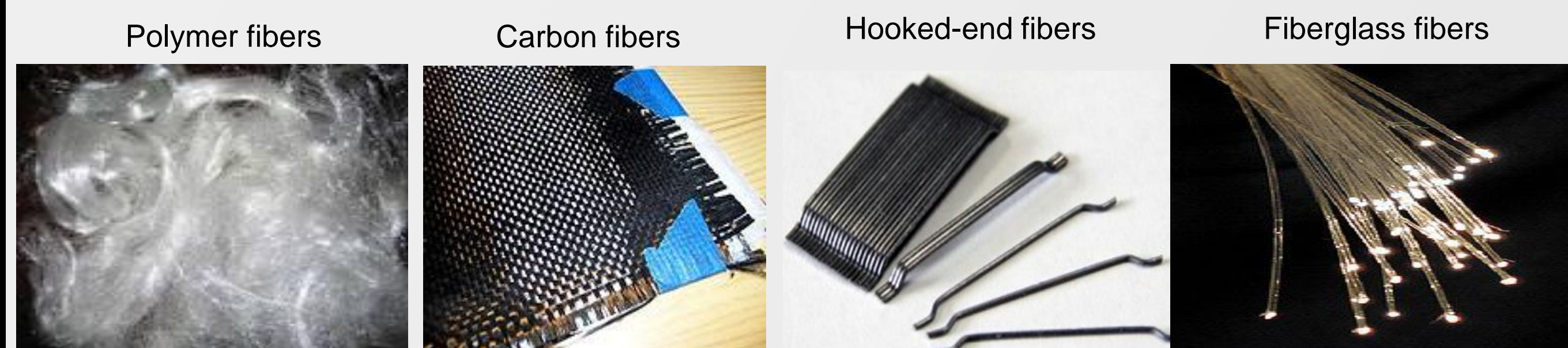


Introduction

Reinforced concrete structures are common and almost every other structure is a concrete structure. Fibers are used in concrete to modify the properties of concrete and called as fiber reinforced concrete.



Different types of fibers are available in market, such as carbon fibers, glass fibers, steel fibers, etc. Steel fibers are available in a variety of shapes and sizes. It is commonly know that the fibers are helpful to increase the tensile strength of concrete and also result into strain hardening.



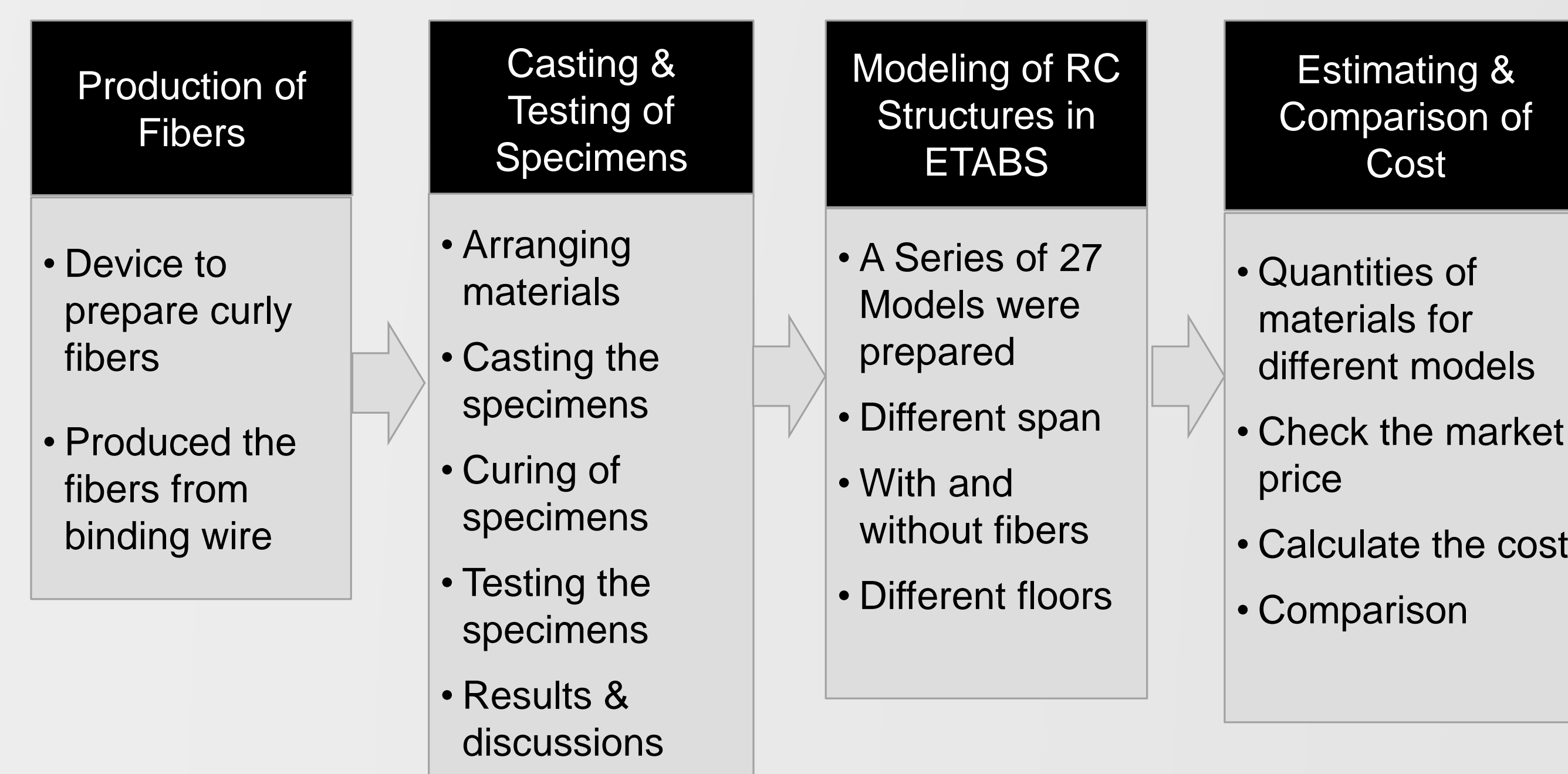
Commonly used fibers in concrete

In this work, we produced and verified the effectiveness of curly fibers. Different reinforced concrete structures are designed by using fiber reinforced concrete in ETABS.

Objectives

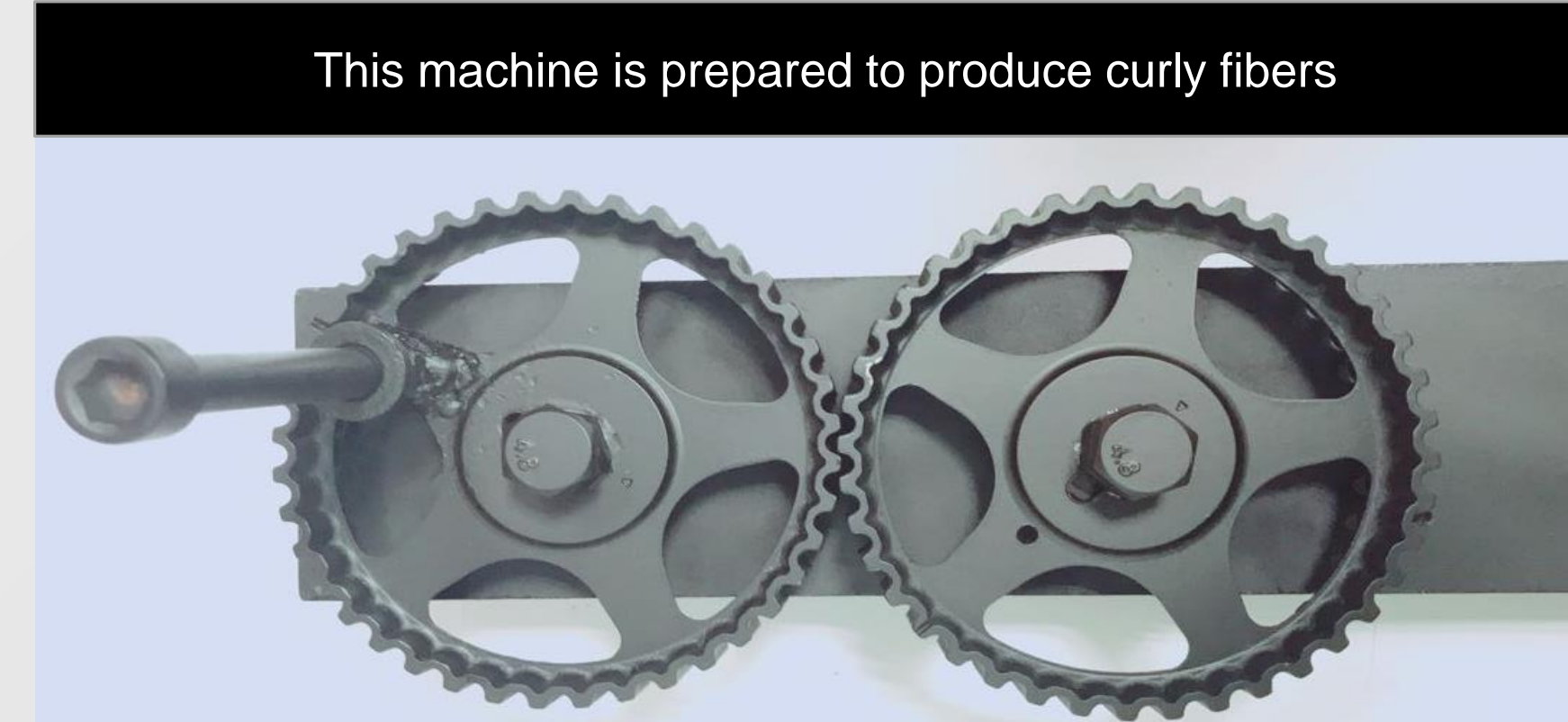
- To form the economical fibers and study the effect of fibers on properties of concrete.
- To know the requirements of analysis and design of a multistory RC structure.
- To learn and apply ETABS for analysis & design of RC structures.
- Effect of using fiber reinforced concrete on cost of structure

Methodology

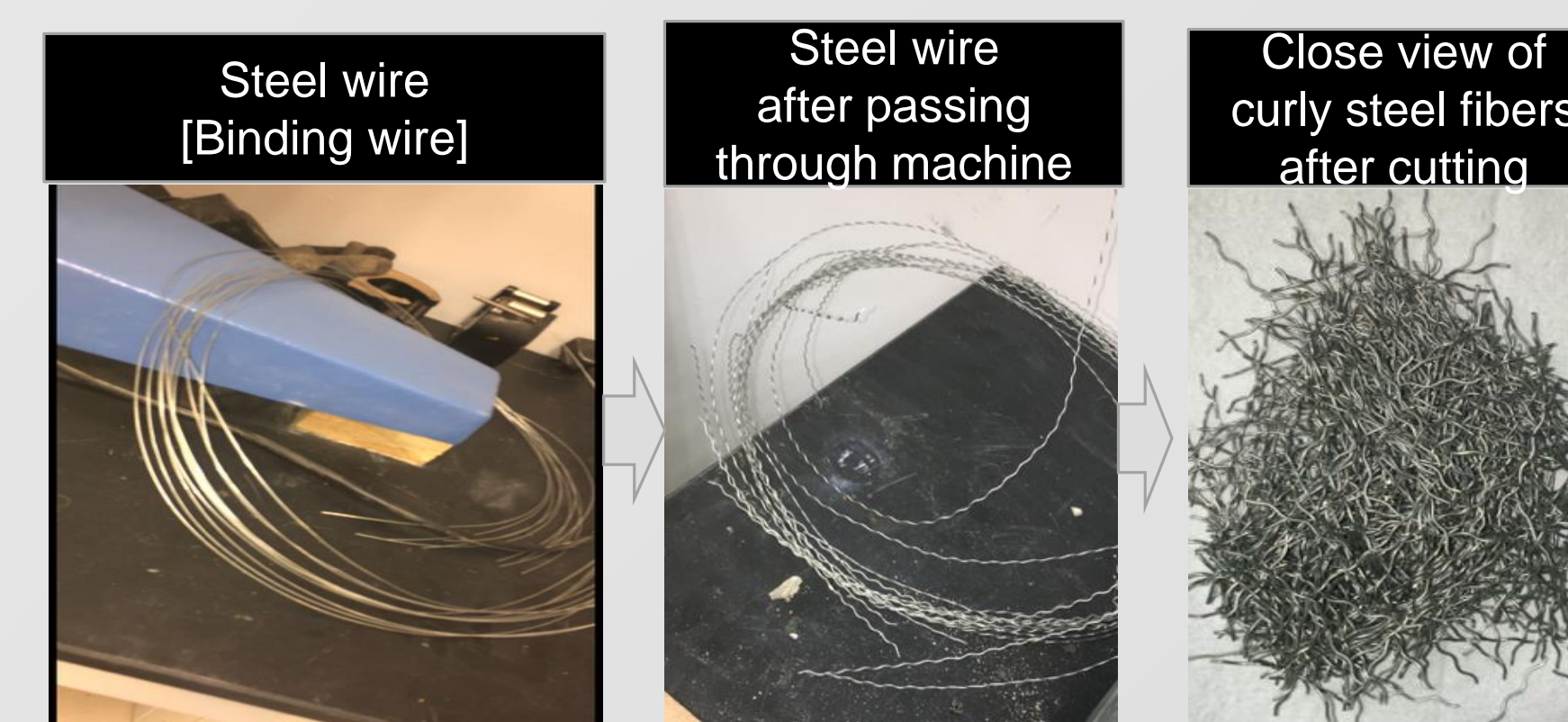


Production of Fibers

A machine is made by using used car parts to produce the curly fibers. Curly fibers are produced from the binding wires.



To produce fibers, first the binding wire is passed through the machine and then cut into required length. The curly shape is expected to increase the anchorage of fibers inside the concrete.



Casting of Specimens

To check the performance of fiber produced, we prepare the standard size specimens from different mixes as shown in the table.

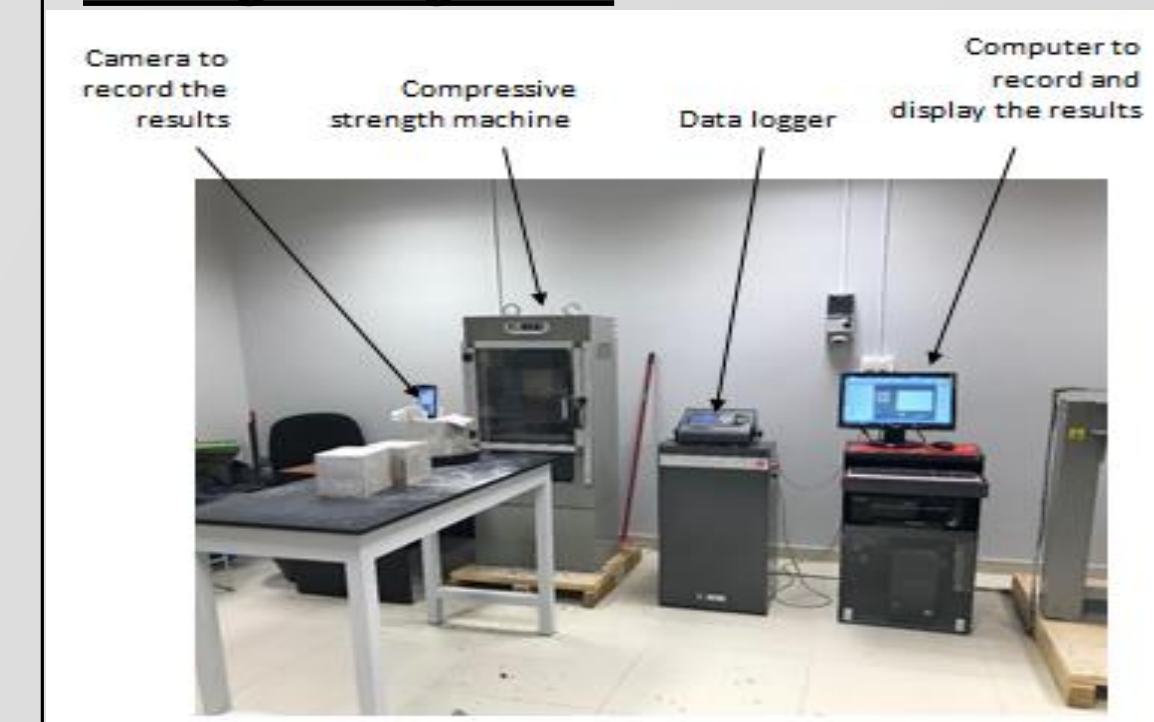
Name of mixes	W/C	Quantity of Aggregates Fine (Kg)	Coarse (Kg)	Cement (Kg)	Water (Kg)	Admixture (gram)	Fiber (gram)
Ordinary concrete	0.35	7.07	10.66	7.43	2.82	0	0
Concrete with air content	0.35	7.07	10.66	7.43	1.9	37.15	0
Concrete with fibers and air content	0.35	7.07	10.66	7.43	1.9	37.15	118

Testing of Specimens

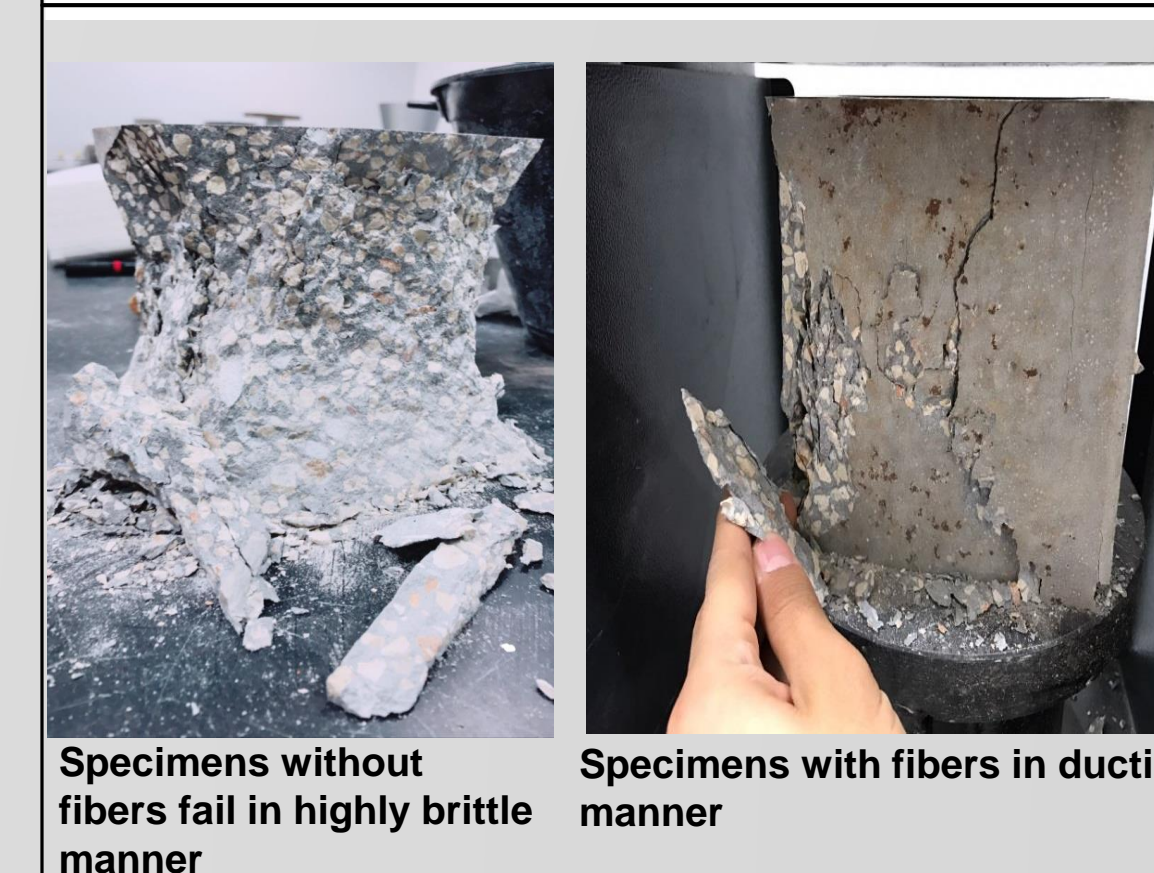
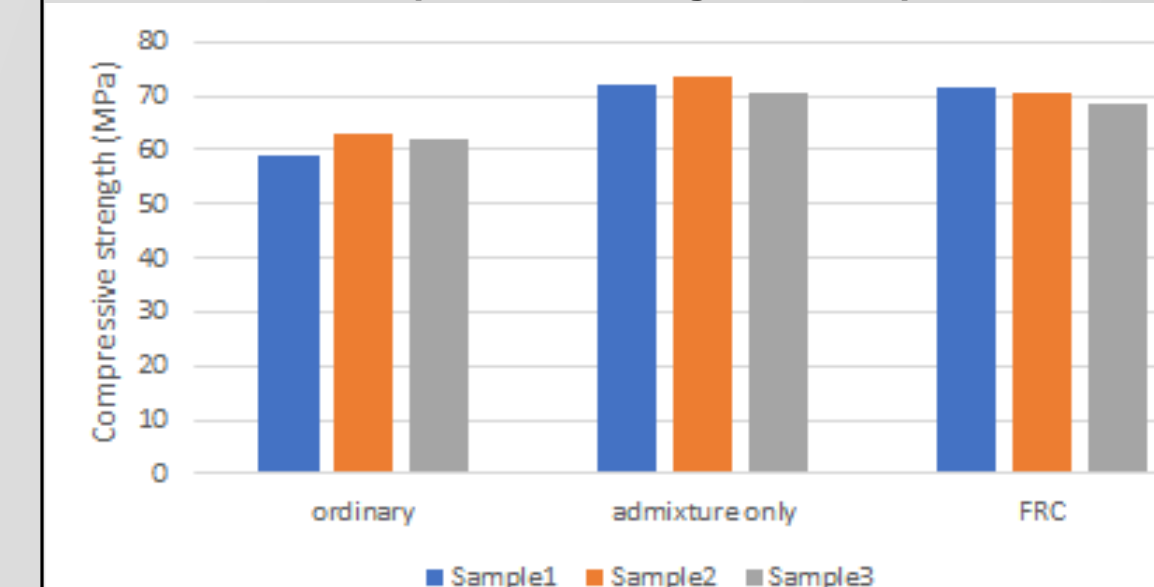
Specimens were tested in compression according to ASTM standards & found that.

- Without addition of fibers and admixture, the average compressive strength was 59.8MPa, and it increase to 71 MPa due to addition of admixture, while addition of fibers do not affect the compressive strength because we used minimum doze of fibers.

Testing Arrangement



Variation in compressive strength of the specimens

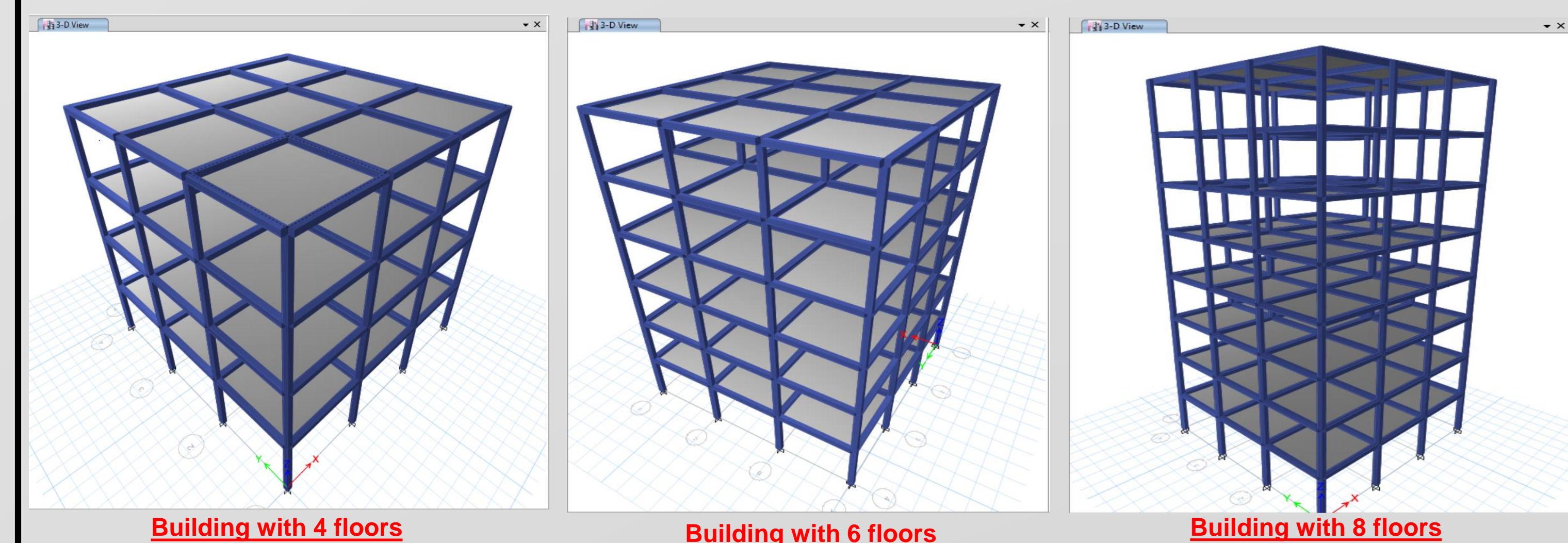


- The compressive strengths of all specimens are more than 50MPa, thus concrete is high strength concrete.
- Without fibers, failure of specimens was highly brittle, while addition of fibers result into ductile failure this shows the effectiveness of fibers.

Analysis and Design of RC Structures by Using ETABS

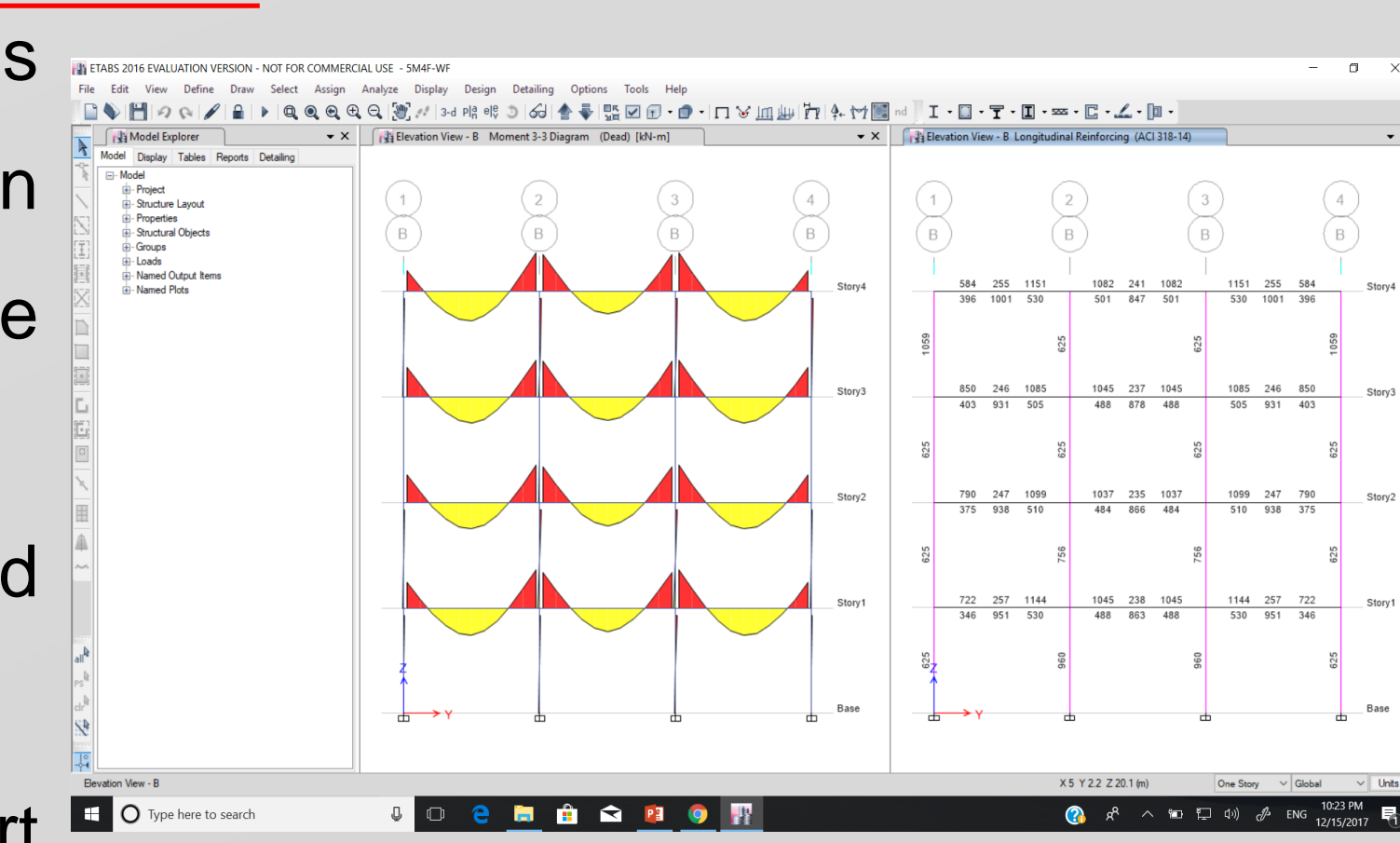
A series of 27 models of full scale reinforced concrete structures is studied by using ETABS. The structures are different in terms of span (5m, 6m and 7m) and number of floors (4, 6 and 8). To study the affect of use of fibers on cost of structures, each model is studied for following conditions.

- Model by using ordinary concrete (basic model).
- Model with fibers reinforced concrete in columns only.
- Model with fibers reinforced concrete in beams and columns.



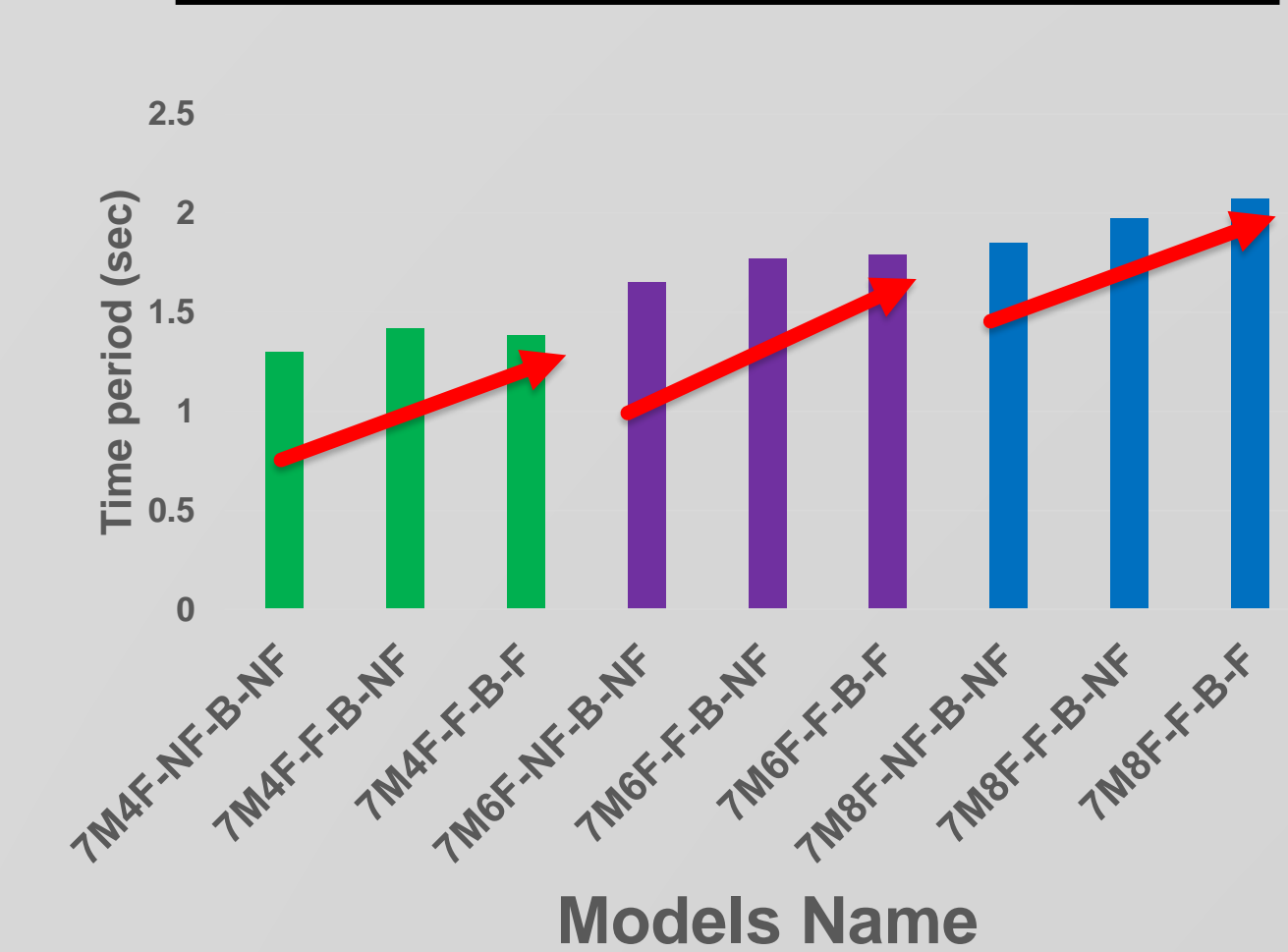
Construction cost for each model is calculated and model are compared in terms of natural time period and the construction cost.

- Due to addition of fibers time period reduces, this result into soft structures.
- Addition of fibers results into smart members thus construction cost reduces.

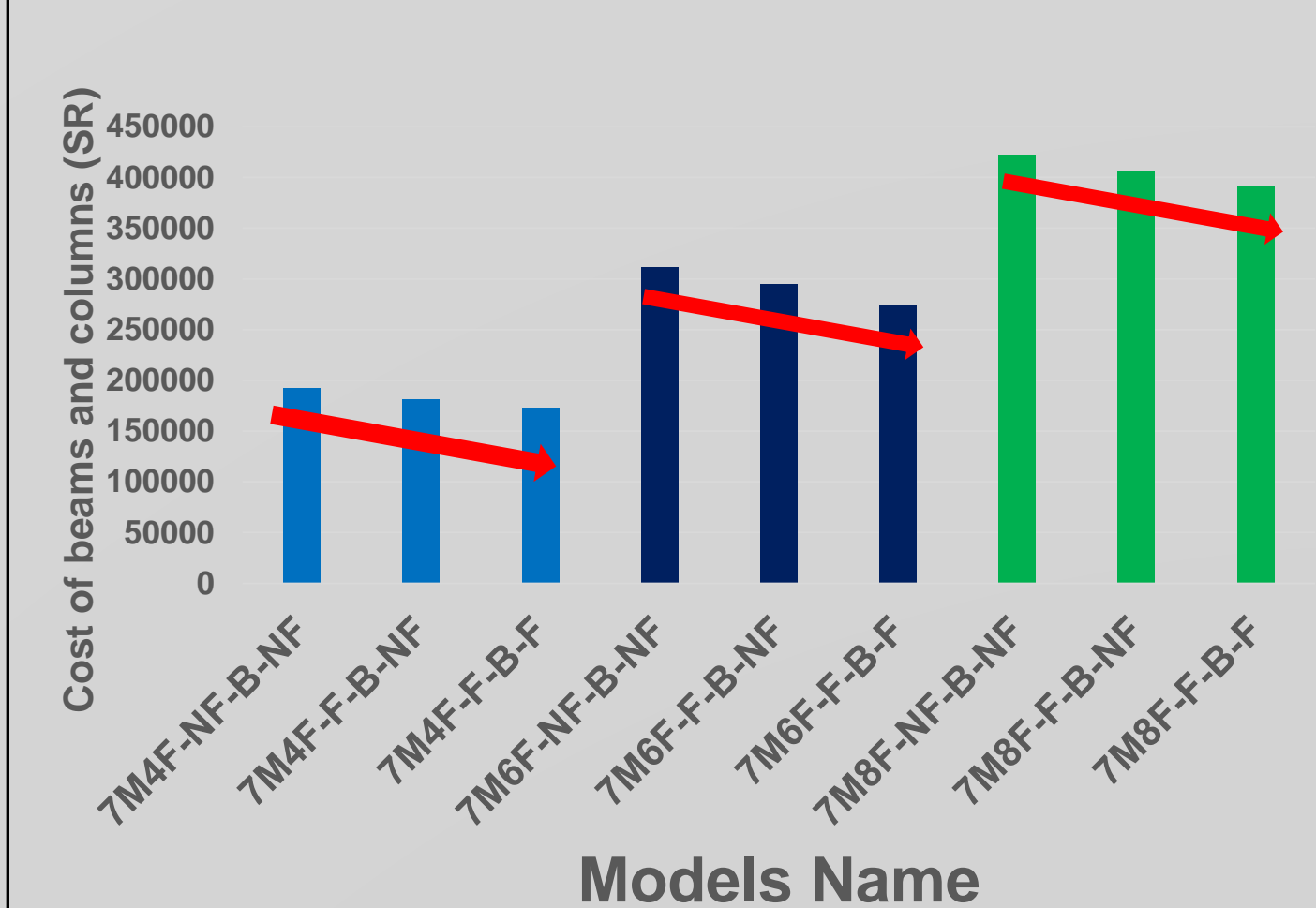


Analysis and Design Results for a Typical Model

Variation in Time Period for Different Models



Variation in Cost for Different Models



Summary & Conclusions

- Stage -1:** An arrangement is made to prepare the curly steel fibers. Fibers are prepared form binding wires, this result into inexpensive fibers. Curly fibers are supposed to have good anchorage inside the concrete. Cube specimens were produced and tested in compression as per ASTEM standards. The results shows that these fibers are effective to produce the ductile behavior.
- Stage-2:** A series of 27 models of reinforced concrete structures are studied by using ETABS for two different fibers conditions; 1st: fibers in columns only, 2nd: fibers in both beam and columns. The results shows increase in time period due to addition of fiber, this conforms that the addition of fibers result into more soft structures. The comparison of cost shows that the construction cost of structures decreases due to addition of fibers.