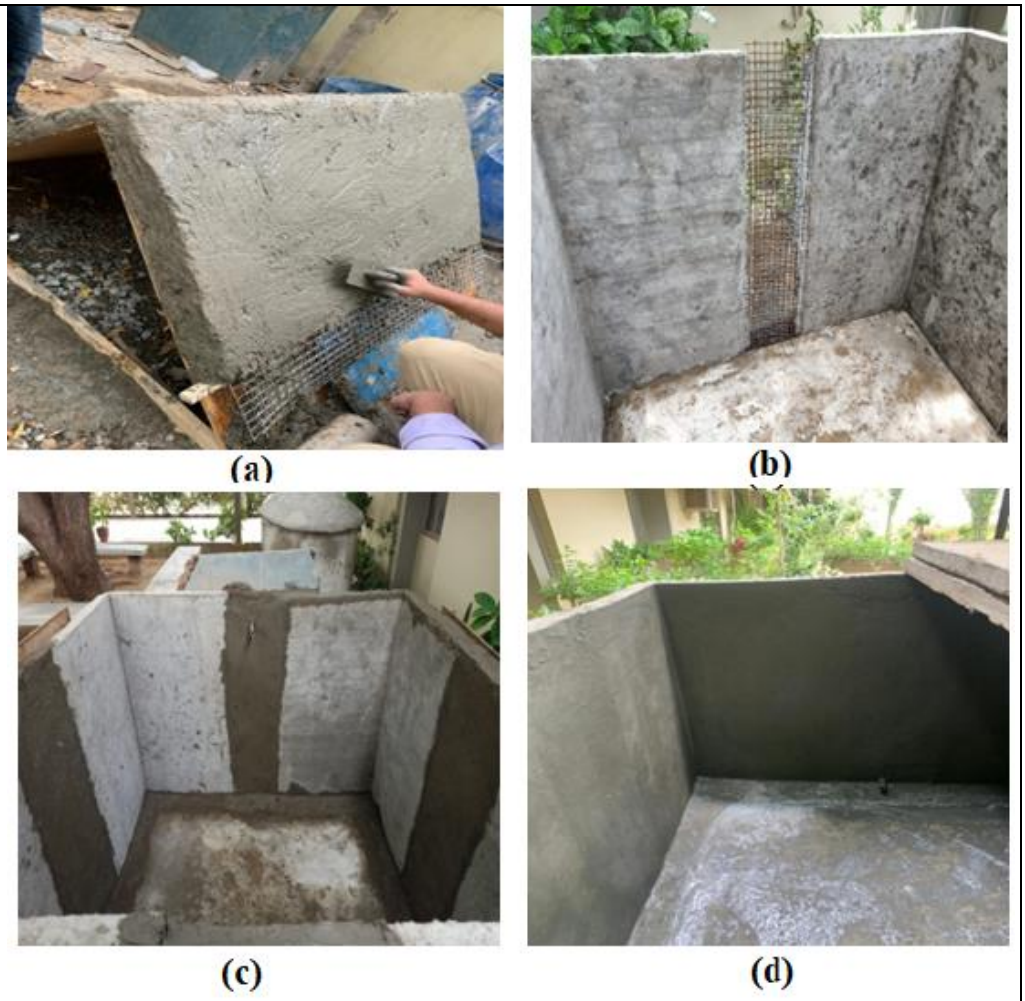
Final Year Project Showcase Batch-2019
Year 2023

	Department: Civil Engineering Programme: Civil Engineering
1	**Project Title:** Experimental study of use of Ferrocement for construction of water tank **Project Idea** The project is based on the idea of low-cost, easy to construct above ground water tanks, minimizing the structural weight, material consumption and steel usage, through incorporation of ferrocement as a substitute of conventional reinforced concrete by assembling pre-cast units made of ferrocement. The idea of fiber reinforced ferrocement tank through assembling of precast elements was conceived keeping in eye the ease of construction of water tank in areas where construction of tank was not easy, or immediate utility of tank was required. Moreover, the structural weight of the tank was to be reduced along with reduction of usage of steel to encourage sustainable construction and thus lower per tank carbon emissions
2	**Process** The existing design process of tank was studied and was overlapped with existing practices for design of ferrocement elements. For this purpose, extensive literature review was done pertaining to ferrocement construction. Since the ferrocement elements have lower thickness, and the walls are subjected to cracking due to the tensile behaviour of various elements, fibres were also incorporated to control extensive cracking in the element, after detailed literature review. Once the design of walls finazlied, the pre-cast elements were constructed keeping in mind the location of cold joints to be provided, which were located in the middle of each side of tank wall. A lap length of 8" on each panel was provided for the joining of pre-cast panel which was later covered with concrete. The corners were provided with extra layer of steel wire mesh to account for any additional stress concentration at the corners. For placement of Precase panels on the base slab, a slot on the entire base slab was provided so that each precase panel can be seated 3" deep into the base slab, both for interlocking of panels and to avoid leakage of water. After placement of all four panels in the slab, the joints were filled with concrete and the tank was covered with a slab designed for a live load of 60 psf. The tank was filled with water for real-time hydro-testing and is fully functional, being used mainly for ablution (wazoo) purpose and also watering of nearby plants, and is located in the ferrocement park opposite to the chairman office in Civil Engineering Department.
3	**Outcome** The outcome of the project is the design and construction of low-cost, lesser technical, low carbon footprint tank which is constructed in Department of Civil Engineering.
4	**Evidence (Theoretical Basis)** To investigate the behavior and economic viability of a ferrocement water tank, a comprehensive literature review was conducted, encompassing both local and international studies on ferrocement materials and structures. The design of the water tank adhered to ACI guidelines and codes, ensuring sound engineering principles were applied. Following the design phase, materials were procured, and the construction process commenced. The ground was first excavated and compacted to provide a stable foundation. The tank's lean and base were cast, from which grooves were incorporated into the base over its perimeter to accommodate four precast corners, which were subsequently joined later. Additionally, the roof was precast into two equal panels. After a curing period of 28 days, the tank was hydro tested with water to assess for seepage and monitor the behavior of its individual elements. This allowed for a thorough evaluation of its performance and structural integrity. Finally, a cost analysis was conducted to compare the expenses associated with constructing a ferrocement water tank versus an RCC water tank of identical dimensions. The objective was to ascertain the most economical option for water storage. The study's findings have the potential to contribute valuable insights

	to the application of ferrocement in water tank construction, emphasizing both its structural capabilities and economic advantages when compared to traditional RCC tanks.	
5	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement,	
a	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region) Pakistan is a economically challenged country, and prices of construction materials including steel and cement are high. Also production of the same increases the carbon footprint extensively. This FYDP is an attempted to provide basis for • SDG#6, Clean water and Sanitation • SDG#11, Sustainable Cities and Communities	
b	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.) The replacement of conventional steel reinforcement with lesser amount of steel mesh, will reduce the requirement of production of steel. Moreover, thinner sections would result in reduced demand of cement, both of which will contribute towards carbon footprint reduction.	
c	**Cost Reduction of Existing Product** The reduction in requirement of construction materials will contribute significantly to the cost reduction of above ground water tank reduction. The expected cost reduction w.r.t. conventional tanks is around 30-40%.	
d	**Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process** (e.g. What is the issue is current process and what improvement you suggests) The current process has been explained in the previous sections. However, the process can further be improved by replacing and testing conventional cement with eco-friendly cementitious materials, which will further reduce the carbon footprint.	
e	**Expanding of Market share** (e.g. how it expand and what is the problem with the current market The local market of Pakistan needs to be made aware of the possibility of construction of pre-cast water tanks. Once there is acceptance in the market, the idea can be commercially be produced.	
f	**Capture New Market** (e.g. Niche market or unaddressed segment) Once the awareness of pre-cast panels based construction of tanks is marketed, the idea could be utilized for quick and efficient construction of water tanks and has a potential to capture market.	
6	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) The end users include all the occupants of residential or any other type of construction. The tanks can also be constructed on temporary construction sites. The existing tank is being used for ablution purposes, so it may also be used to construct tanks for the mosques as well. The application goes as wide as any construction or human occupancy that may require small sized water tanks.	
7	**Team Members** (Names along with email address)	Gotam (gotambhorani3@gmail.com) Neeraj Kumar (nk3985608@gmail.com) Nam Chand (gulkumar5550@gmail.com) Ghulam Yaseen (yad74739@gmail.com)
8	**Supervisor Name** (along with email address)	Dr. Fawwad Masood (fawwad@cloud.neduet.edu.pk) Dr. Syed Salman Mobeen (ssalman@cloud.neduet.edu.pk)

10	**Pictures (If any)**	 (a) Construction of Pre-cast Panel (b) Placement of Pre-Cast Panel (c) Connection of Pre-cast panels (d) Internal Water Proofing of the tank

Choose an item.