



## Final Year Project Showcase Batch 2018 Year 2022


<b>Department: Civil Engineering</b> Programme: <u>Civil Engineering</u>		
<b>1</b>	<b>Project Idea</b>	To use alternative, adequate and sustainable system in the design and construction of small residential housing units such that the material cost and labor cost reduces
<b>2</b>	<b>Process</b>	Analysis, design and implementation of an alternative load bearing system in small residential housing units to reduce the overall cost
<b>3</b>	<b>Outcome</b>	Cost and time of construction reduces by at least 30% to 40%.
<b>4</b>	<b>Evidence (Theoretical Basis)</b>	<p>The use of an alternate load bearing system / material, which is low cost, affordable as well as sustainable, is highly demanded. Lightly Reinforced Masonry or plain with precast slab is appearing to be an alternative structural system for low and medium income groups. Reinforced Masonry Units resist loads like RCC structures, but Reinforced masonry structures are cheaper than normal RCC structures. It is based upon load bearing structural system. It is mainly composed of hollow concrete block wall, supporting precast hollow-core slabs. For further adequacy, sometimes the hollow masonry is highly reinforced with thin steel bars. This study includes analyzing adequacy of small-scale housing units designed with hollow block wall with hollow core slab. Analysis is performed using manual computation as well as using FEA using the design specifications of ACI 530 code. In addition to the theoretical analysis and adequacy assessment of the proposed load bearing system, small scale experimental work is also carried out to assess the compressive strength of blocks, mortar and masonry prisms. Masonry prisms represent the masonry behavior rather than only block behavior. Hollow blocks are selected for testing from different local suppliers ranging from low quality to good quality. The test results show that the strength of hollow blocks supplied by some reliable local supplier is found to be adequate for the expected load on the housing unit but the strength of majority of the blocks from local suppliers (Thalla) are found to be falling below the minimum requirement for the adequacy of load bearing systems. Finally, the cost of hollow block load bearing masonry system is compared with the normal RCC framing structure for an identical small residential unit having 80 square yards area. The</p>



		cost of Reinforced Masonry system is found to be 33% reduced compared to the RCC framing. Additional benefit of using Hollow Masonry block units is the reduction in overall weight of the structure.
5	<b>Impact on Sustainability of Urban Regions or SDG-11 “Sustainable Cities and Communities”</b>	This project is aimed to reduce the construction cost by reducing the amount of steel and cement. The production of both these materials produces huge amount of Carbon monoxide and carbon dioxide gases, which are detrimental for the environment, which eventually impacts the sustainability of societies. Another aspect in this project is also to reduce the overall weight of structures, which reduces the failure ignition and deterioration mechanism of the structures, thus improving their durability. One more good impact of using hollow blocks and hollow core slabs in buildings is that it makes these Thermally insulated and Sound absorbent.
6	<b>Competitive Advantage or Unique Selling Proposition</b> (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them). Please keep relevant options, delete the rest of them, and correct the sequence	
a	<b>Attainment of any SDG</b> (e.g. How it is achieved and why it is necessary for the region)	The project would also aim to address the following SDGs: <b>SDG#8:</b> Decent Work and Economic Growth <b>SDG#9:</b> Industry, Innovation and Infrastructure <b>SDG#11:</b> Sustainable Cities and Communities <b>SDG#12:</b> Responsible Consumption and Production <b>SDG#13:</b> Climate Action The above SDGs are directly or indirectly addressed in this project because this project is aimed to reduce the construction cost by reducing the amount of steel and cement, which will also reduce the emission of huge amount of Carbon monoxide and carbon dioxide gases, which emit during the production of these materials. Another aspect in the current project is the used of precast hollow core slabs and precast load bearing hollow blocks, which will eliminate the use of on-site formwork and on-site concrete mixing, thus a clean and quick way of construction. One more good impact of using hollow blocks and hollow core slabs in buildings is that it makes the structure light weight, thermally insulated and sound absorbent.
b	<b>Environmental Aspect</b> (e.g. carbon reduction, energy-efficient, etc.)	This project is aimed to reduce the amount of steel and cement used in the construction of civil infrastructures. The production of both these materials produces huge amount of Carbon monoxide and carbon dioxide gases, which are detrimental for the environment.
c	<b>Cost Reduction of Existing Product</b>	Reducing the amount of steel and cement in residential housing units directly impact and reduces the



		construction cost. It is found that at least 33% cost is reduced by using the studied load bearing system, compared to the conventional RCC framing system. Additional cost impact will also be on the sizes of foundations in the proposed load bearing system, which will also be reduced because of reduction in the overall weight of the structure
<b>d</b>	<b>Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process</b> (e.g. What is the issue is current process and what improvement you suggests)	As already mentioned above, the project proposed an alternative load bearing system, which is cost effective too. The project reduces the overall construction cost and time by using pre-cast hollow blocks and pre-cast hollow core slabs, which removes the use of temporary formwork as well as on-site concreting. It also saves construction time by removing the time and labor consuming activities, like, formwork, concreting and curing. The project will also result in weight reduction of the structure which will also reduce the foundation sizes and will also enhance the durability of the structure.
<b>e</b>	<b>Expanding of Market share</b> (e.g. how it expand and what is the problem with the current market)	Since the project proposes an alternative but reliable load bearing system, compared to the conventional RCC framing system. The two major structural elements in this system are the hollow blocks and the hollow-core slabs. Currently the blocks available in the market are of very weak strength as currently the blocks are used primarily as partition in the walls and not for load bearing. Current project requires use of good strength blocks, which are not very common. Only one supplier is found to be providing the desired strength of hollow blocks. Similarly, there is No supplier of pre-cast hollow core slabs currently available. Although the manufacturing and production of both of these structural elements is not difficult nor requiring huge finance. Therefore, there is a huge vacancy on the supplier side of both of these products.
<b>f</b>	<b>Capture New Market</b> (e.g. Niche market or unaddressed segment)	For the production and supply of hollow-core slabs, it might require a bit new market as there is none exists in the local market
<b>7</b>	<b>Target Market</b> (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service	The results and implementation of the current project shall benefit the following: <ul style="list-style-type: none"> <li>• Low to medium income groups in reducing the construction cost of residential houses</li> <li>• The suppliers or new entrepreneurs for supplying the starting supplying hollow blocks and hollow core slabs</li> </ul>
<b>8</b>	<b>Team Members</b> (Names along with email address)	Erum Hussain <a href="mailto:hussain4103344@cloud.neduet.edu.pk">hussain4103344@cloud.neduet.edu.pk</a> Maharukh Naz <a href="mailto:naz4103049@cloud.neduet.edu.pk">naz4103049@cloud.neduet.edu.pk</a> Ahmed Azhar <a href="mailto:azhar4103538@cloud.neduet.edu.pk">azhar4103538@cloud.neduet.edu.pk</a> Syed Mohammad Salman <a href="mailto:Salman4103499@cloud.neduet.edu.pk">Salman4103499@cloud.neduet.edu.pk</a>
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	<p><b>10</b> Pictures (If any)</p>	 <p>Reinforced Masonry</p>  <p>Curing of Masonry Prisms</p>  <p>Testing of Masonry Prisms</p>
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