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PROPOSAL, PLANNING AND ANALYSIS OF NEO-METRIC EDIFICE

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Abstract – *Neo-metric edifice is a modular building which is eco-friendly and energy efficient, built with modern construction materials. Now-a-days, the constructions are increasing tremendously. So, all the future buildings should be built environment-friendly. Our paper reviews about the Neo-metric edifice and its techniques. The main objectives of the neo-metric edifice are*

- *Resource efficient*

Making the construction resource efficient by efficiently using the water, power and other resources.

- *Sustainability*

Sustainability means to meet the needs of present generation without compromising the ability to meet the needs of future generation.

- *Reusing, reducing and recycling waste*

In this paper, the proposal, planning, design and analysis of the neo-metric edifice is given.

Key Words*: *Modular building, eco-friendly and energy efficient, resource efficient, sustainability, trans-per crete, paper-niture

1. INTRODUCTION

Neo-metric edifice is a modular green building in which the word 'neo-metric' means modular and the word 'edifice' means building. The super structure is the combination of pre-stressed and pre-cast concrete so that the building will be strong, more durable, more efficient and for rapid construction. The cracks formed during the process of pre-stressing are healed by the self-healing concrete. The additional structures are built with ferro-cement. It can be otherwise called as ferro-concrete or reinforced concrete. The construction material comprises of wire meshes and the cement mortar.

The roads in the edifice are also neo-metric ie., kinetic roads and the self-healing roads by which it enhances the features of the road used in the edifice. Energy conservation comprises of the following**:** Water efficient rest room systems, insulating windows, pervious concrete, kinetic roads, transper-crete and paper-niture.

1.1 Scope

The main scope of the neo-metric edifice is to provide good infrastructure and to increase the smart city value. This also helps in implementing green building concepts and makes it sustainable.

2. SIGNIFICANCE

It is stronger than the other conventional buildings. It also have the crack healing properties and less construction time. It helps in rain water conservation and energy conservation. It helps in recycling water and wastes. The inclined parking systems helps in reducing parking problems. As a whole, it results in sustainable building.

3. SUPER STRUCTURE

The super-structure comprises of pre-stressed and pre-cast concrete. The cracks formed by the pre-stressing are healed by using the self-healing concrete.

3.1 Pre-stressed and Precast concrete

The Pre-stressed concrete is achieved by casting concrete into pre-assembled forms in combination with rebar and steel cable (strand) reinforcement. These cables are tensioned (stretched) to approximately three-quarters of their ultimate strength. Once the concrete cures to its required strength, the tensioning is released. The steel cables reacting to the release, transfers the tensile stresses into the concrete, rendering an even stronger structural component.

The precast is preferred since the material has intrinsic properties of thermal inertia (allowing a more constant temperature both in cold and hot regions) and acoustic insulation. Not only is the structural stability maintained for longer periods, but concrete construction prevents the spread of the fire from one building to another.

It is sufficiently strong to resist impacts, blasts and natural catastrophes like earthquakes, tornadoes and floods. Factory production allows a wide choice of surface finishing, color range and special shapes**.** Precast concrete has another advantage: its mouldability which entails designers to copy classical details like keystones and capitals or match the finish of materials like weathered stones. The precast concrete industry can source a wide range of aggregates locally and offer a tremendous variety of colors and visual

effects. Made of natural raw materials (stones, gravels, sand, cement), locally available almost everywhere and in an enormous quantity, precast concrete minimises the whole life cycle impact on the environment when compared with other construction materials. Precast concrete units can entirely be re-used or recycled (almost 100% of a concrete building can be recycled, no matter how heavily reinforced).

3.2 Self-healing concrete

Self-healing concrete is used to heal the cracks formed during the process of pre-stressing. It is used in the grout.

Micro-cracks are inherently present in concrete. This causes degradation of concrete leading to ingress of deleterious substances into concrete, resulting in deterioration of structures. Due to this concrete needs to be rehabilitated. To surmount these situations self-healing techniques are adopted. By the addition of urease engendering bacteria along with calcium source results in calcite precipitation in concrete. Bio-mineralization techniques give promising results in sealing the micro-cracks in concrete. The freshly composed micro-cracks can be sealed up by perpetual hydration process in concrete. The ureolytic bacteria which include Bacillus Pasteurii, Bacillus Subtilis which can engender urea are integrated along with the calcium source to seal the freshly composed micro cracks by $CaCO_3$ precipitation. For the amelioration of pore structure in concrete, the bacterial concentrations were optimized for better results and also helps to increase the strength and durability of the structure.

4. NEO-METRIC ROADS

It insists the self-healing roads and the pervious concrete in the pavements.

In Self-healing roads, the bacteria, either *Bacillus pseudofirmus* or *Sporosarcina pasteurii*, are found naturally in highly alkaline lakes near volcanoes, and are able to survive for up to a staggering 200 years without oxygen or food. These bacteria are triggered as soon as they come in contact with water, using the calcium lactate present in water as a food source, thus producing limestone. The limestone seals up the cracks formed on the roads. The bacteria are placed in tiny biodegradable capsules before blending them in with concrete. When cracks develop in the concrete, water seeps in and comes in contact with the capsules. These capsules break, allowing the water to come in contact with the bacteria and its food source (water), thus initiating the healing process. The bacteria then feed on the calcium lactate, blending the calcium with carbonate to form limestone, fixing the crack. This technology will reduce the overall cost of maintaining the roads by about 50%.

Paved surfaces are so ubiquitous in urban areas today that most of us give little thought to the impact they have on water quality and the health of the environment. But here's the sobering reality: As more available land area in the country gets paved over, a larger amount of rainwater ends up falling on impervious surfaces such as parking lots, driveways, sidewalks, and streets rather than soaking into the soil. This creates an imbalance in the natural ecosystem and leads to a host of problems including erosion, flash floods, water table depletion, and pollution of rivers, lakes, and coastal waters as rainwater rushing across pavement surfaces picks up everything from oil and grease spills to dicing salts and chemical fertilizers.

A simple solution to avoiding these problems is to stop installing the impervious surfaces that block natural water infiltration into the soil. But few of us are ready to give up our paved roads, driveways, and parking lots. Rather than building them with conventional concrete or asphalt, more and more communities, municipalities, and businesses are switching to pervious concrete or porous pavement, a material that offers the inherent durability and low life-cycle costs of a typical concrete pavement while retaining storm water runoff and replenishing local watershed systems. Instead of preventing infiltration of water into the soil, pervious pavement assists the process by capturing rainwater in a network of voids and allowing it to percolate into the underlying soil. In many cases, pervious concrete roadways and parking lots can double as water retention structures, reducing or eliminating the need for traditional storm water management systems such as retention ponds and sewer tie-ins.

5. ENERGY EFFICIENT SYSTEMS

Paper-niture (i.e.) the furniture used in the building are of from waste newspapers so that it could be eco-friendly and to reduce the landfills and plastics. The flush box and the wash basins are sinked together for obtaining water efficient rest room systems. The pavements are made of pervious concrete to collect the rain water and increase the ground water table. The windows and roofs are insulated and an inclined parking systems is followed. Trans-per-crete (combination of translucent concrete and paper crete) is used in partition walls which is energy conservative and eco-friendly. KINETIC ROADS is used in which potential energy is converted into electrical energy.

Translucent concrete (also: light-transmitting concrete) is a concrete based building material with light-trans missive properties due to embedded light optical elements — usually optical fibers. Light is conducted through the stone from one end to the other. Therefore, the fibers have to go through the whole object. This results in a certain light pattern on the other surface, depending on the fiber structure. Shadows cast onto one side appear as silhouettes through the material. Translucent concrete is used in fine architecture as a façade material and for cladding of interior walls. Light-transmitting concrete has also been applied to various design products.

Paper-Crete is essentially a type of industrial strength paper made with paper and cardboard, sand and Portland cement. There are many varieties of Paper-Crete possible. Essentially, the constituents when mixed in different proportions result in Paper-Crete of varying properties.

Kinetic roads is used in which potential energy is converted into electrical energy. The electro-kinetic road ramp is a method of generating electricity by harnessing the kinetic energy of automobiles that drive over the ramp. With all of the effort humans put into finding and generating energy, it might come as a surprise to some folks that there is already energy all around us just going to waste. Kinetic energy is generated from movements we make every day, but it is rarely harnessed or utilized. The Pavegen System turns kinetic energy from footsteps into real electric power that can be used for a wide variety of applications.

6. PLANNING

The plan and its specifications are as given below in the following

6.1 SPECIFICATION

Site location	:	Near AVR round turner
Ground area	:	26400squ.m
Plinth area	:	20000sq.m
Number of floor	:	G+2
Number of rooms	:	38 numbers

6.2 PLAN OF THE EDIFICE

The plan of the edifice is as shown in the below figure 1

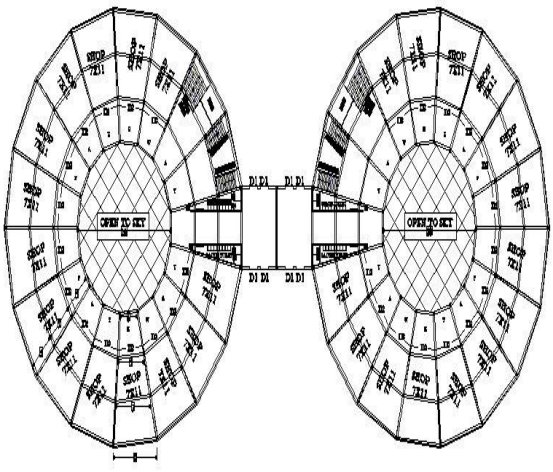

Fig -1: Plan of the edifice

7. ANALYSIS

The analysis of the Neo-metric edifice is done in the STAD-PRO software and the details are given below

7.1 Nodal structure and load diagrams

The nodal structure is as shown below in the given figure 2

Fig -2: Nodal structure

The self –weight diagram is as shown below in the given figure 2

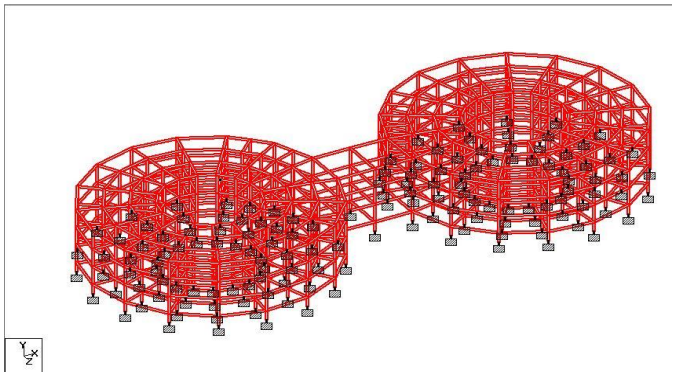

Fig -3: Self weight diagram

The live load diagram is as shown below in the given figure 3

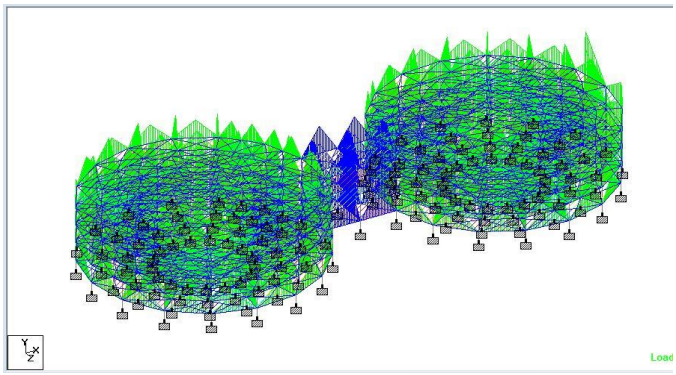

Fig -4: Live load diagram

7.2 ANALYSIS RESULT

The analysis result is as given below in the table 1

All | Summary | Envelope

	Beam	L/C	Node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
Max Fx	328	4 COMBINATI	71	**2581.573**	-15.609	-10.240	0.004	6.478	-10.218
Min Fx	1438	4 COMBINATI	575	**-64.423**	264.932	0.004	0.001	-0.017	470.208
Max Fy	1725	4 COMBINATI	655	51.639	**276.494**	-0.004	-1.162	-0.003	224.969
Min Fy	1794	4 COMBINATI	674	50.594	**-276.883**	0.146	1.175	0.361	225.792
Max Fz	394	4 COMBINATI	137	2063.615	0.040	**174.387**	0.000	-104.779	0.062
Min Fz	395	4 COMBINATI	138	2050.897	0.056	**-174.353**	0.001	105.706	0.088
Max Mx	1750	4 COMBINATI	681	-1.379	66.316	-1.558	**10.560**	2.780	81.430
Min Mx	1853	4 COMBINATI	726	-1.791	69.123	1.570	**-10.561**	-2.982	56.898
Max My	1597	4 COMBINATI	721	493.727	0.038	167.895	0.001	**397.440**	-0.084
Min My	1598	4 COMBINATI	722	489.093	0.053	-167.858	0.002	**-397.187**	-0.117
Max Mz	1438	4 COMBINATI	576	-64.423	-265.522	0.004	0.001	0.018	**472.917**
Min Mz	1532	4 COMBINATI	656	314.554	61.952	-3.508	-0.042	-7.810	**-138.812**

Table -1: Analysis result

8. CONCLUSION

In the world of great developments, construction and building has paved its way important ladder. With the growing demands of offices and real estate's location, commercial construction has become essential part of construction world especially in the developed countries. Changes are made in strategies and other development techniques of the commercial construction world and there was a thin time period of the decline in new projects. We have a great pleasure to present this project with hope that our humble effort will take to be faithful in the coming future.

Civil engineering increases economic growth of the country. Good civil engineers increases the key factor of civil engineering. We, the civil engineers, should have environment responsibility. So, all the raising buildings should be NEOMETRIC EDIFICE

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