VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS) (Sponsored by Siddhartha Academy of General & Technical Education)
Approved by AICTE | Affiliated to JNTUK Kakinada | An ISO 9001:2015 Certified Institution
NAAC A+ GRADE
BAND EXCELLENCE

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About the College:

Velagapudi Ramakrishna Siddhartha Engineering College was established in the year 1977, as the first self-financing Engineering College in the composite state of Andhra Pradesh. The college is in Autonomous Status from 2006 onwards granted by UGC, permanently affiliated to JNTUK and approved by AICTE. The institute is accredited by NAAC with A+ grade in 2021. All the UG programs are accredited by NBA under OBE Tier-I format and 5 PG in Engineering programs are also accredited once. The institute was ranked at 178 in NIRF-2021, 156 in NIRF-2020 and 171 in NIRF-2019 by MHRD and also stood at good rankings given in various surveys by national magazines. The institute was ranked in band A' (6-25 Rank) in 'ATAL Ranking of Institutions on Innovation Achievements (ARIA) in 2020 and was ranked ‘Excellent’ band by MHRD, GOI in 2021. The college received AICTE - CII Indpact award from MHRD for best I-I-I in civil engineering and was rated platinum for four consecutive years 2017-2020. The institute is recognized as' SIRO' by DSIR, MST, GOI. This is the only private college granted with "Margadarshan Scheme " project by AICTE in the state of AP. The institute wad rated PLATINUM by AICTE-CII survey for the last four years. The college has 20+ collaborative labs & COE's supported by Siemens, Dassault, IBM, DST, NI. Oracle, Apple, CISCO etc., The college is offering consultancy services in A.P. and earned more than Rs.12 crores during the last 5 years. The institute received R&D projects worth more than Rs.5.0 crores for the last 6 years funded by UGC, AICTE, DST, DRDO etc. The college has a worthy placement record, competent faculty with more than 135 PhDs. The strong presence of Alumni was felt across the Globe as Entrepreneurs, CEOs, Academic leaders etc. Six departments of the institute were recognized as Research centres by JNTUK, Kakinada. The institute has more than 60 MOUs with industry partners and more than 1000 publications by faculty for the last 3 years in National, International Journals and Conferences. Industry relevant curriculum is offered involving MOOCs Industry based courses, Internship Skill development, and Personality Development & Student practice courses. The college has NSS & NCC units in the campus recognized by State and Central Governments. There are quite a good number of visiting and adjunct faculties from foreign universities and industry. The

Laboratories in the Civil Engineering department are also accredited by NABL which is rare in academic institutions.

About the Department :

The Department of Civil engineering of Velagapudi Ramakrishna Siddhartha Engineering College was established in 1977 at the inception of the college. The under graduation program was started with an intake of 60 later increased to 120 in 2007 and further increased to 180 in 2011. The Department started offering Postgraduate courses Structural Engineering from 1999 and Geotechnical Engineering from 2016 with an annual intake of 18 each. The department has state of the art advanced laboratories to cater the needs of students, research and consultancy. The department has total faculty of over forty-five, with fifteen doctorates and seventeen more pursuing PhD. The department takes pride in its highly experienced faculty specialized in all major specializations of Civil Engineering.

Department Vision :

To impart teaching, research and develop consultancy that serves the society and to strive continuously for excellence in education.

Department Mission :

To provide quality education for successful career and higher studies in Civil Engineering that emphasizes academic and technical competence in profession and research, effective communication, team work and leadership to meet the challenges of the society.

Table of Contents

1. PAPER PUBLICATIONS OF THE FACULTY

i) Strength and durability of fiber reinforced concrete with partial replacement of cement by Ground Granulated Blast Furnace Slag

Concrete is a widely used construction material all over the world, with approximately six billion tons has been delivered every year. In the production of cement clinker, approximately one ton of CO2 has been released for one ton of cement. Cement use must be reduced by using substitute products to minimise CO2 emissions. To reduce the pollution and economy of construction industry cement is replaced by by-products to enhance its strength parameters. Our research work deals with the study of mechanical and durability properties of concrete. To assess the efficiency of Ground Granulated Blast Furnace Slag (GGBS) as a partial substitute for cement and to improve the tensile and flexural strengths and serviceability of concrete, all tests are carried out according to Indian standard codes. Various concrete mixes were planned with partial replacement of cement by GGBS in different proportions (0%, 20%, 40%, 60% and 80%) for a cement content of 400 kg/m3, with W/B ratio of 0.5, and steel fibers having an aspect ratio of 60 with three volume fractions (0.5%, 1% and 1.5%) .At the ages of 28, 90, and 180 days, concrete specimens were cast and investigations were carried out to determine the strength variations of concrete with and without fibers. Durability studies like water absorption, sorptivity, Rapid Chloride ion Penetration Test (RCPT) were done on GGBS concrete without fibers at 28 and 180 days. By replacing of cement with GGBS in concrete upto 40% increases the compressive strength of concrete by about 5–20%. Steel fibres increase the split tensile and flexural strength of concrete by considerable amount. A significant increase of split tensile flexural strengths of Steel Fiber Reinforced Concrete (SFRC) which ranged from 19 to 65% and 18–74% respectively, increase in strength was compared with conventional concrete without fibers of 28 to 180 days. A remarkable reduction has been observed in RCPT, sorptivity, and water absorption values when the cement was partially replaced by GGBS at 80% than conventional concrete.

https://doi.org/10.1016/j.matpr.2021.06.267

ii) Effects Of Elevated Temperature On Geopolymer Mortar

The discovery of inorganic polymers in the form of geopolymers is a breakthrough which provides cleaner and eco-friendlier alternatives to Ordinary Portland cement. Published literature shows that using process of alkaline activation, materials rich in alumina and silica, can be transformed into a cement to function as geopolymeric material (which is basically an alumino-silicate amorphous system) to act as a binder in a way very similar to OPC. This aspect was taken up for study in the present experimental investigation and with specific aim of filling the current knowledge gap in assessing the behaviour of geopolymers under elevated temperatures. The geopolymeric mortar mixes with GGBS & fly ash as Geopolymeric Source Material (GSM) and river sand as inert filler material and with and without Zirconium dioxide (ZrO2) as ceramic additive were prepared to examine the refractory properties of geopolymer binders. Alkali Activator Solution (AAS) was made from a mixture of sodium hydroxide solution (having molarity of 5) and sodium silicate solution (with molar ratio SiO2/Na2O being 2.1). Parameters like weight loss and compressive strength were studied after the specimens were subjected to different temperatures i.e. 200^{o}C, 400^{o}C, 600^{o}C and 800^{o}C.

iii) Dynamic response of underreamed batter piles subjected to vertical vibration

This paper presents the dynamic vertical response of a vertical and two batter piles with an underreamed bulb. Batter angles (i.e. inclination to the vertical) of 10 and 20 degrees have been considered. The dynamic vertical tests were conducted using a mechanical oscillator-motor assembly by varying the intensity of exciting force level with a change in eccentricity setting of the oscillator. The dynamic response was recorded in terms of operating frequency and acceleration response. The test data were analysed to estimate the dynamic vertical responses of the piles in terms of resonant frequency, fy'; peak vertical displacement amplitude, dy' and axial strain εy, and they were compared. For all three piles, with an increase in intensity of exciting force level, the resonant frequency decreased, whereas the peak vertical displacement and axial strain increased.

iv) Web-flange interaction on local buckling of I-sections-a study in relation to IS800-2007

The structural steel design code IS 800:20071 gives the limiting values for the width to thickness ratio of the structural steel elements under compression so that the local buckling of the member is avoided. One of the main assumptions made in the Table 2 of IS 800:2007 is, for any dimension combination of web to flange, the value of k is same, i.e., it says that the degree of interaction between flange and web is constant and does not depend on dimensions of web and flange. But in real, elements do provide restraint to each other depending on the dimensional configurations. Also sections made up of high strength steel increases their tendency for local buckling. Considering above reasons, more accurate (b/t) limits are to be developed in which web to flange interactions also get reflected.

Research on local buckling of plates having various boundary conditions is carried out neglecting the element interaction in individual sections2-4. Johnson investigated effect of web-flange interaction by conducting experiments on beams subjected to uniform moment, observed the effect of (b/t) of web on local buckling of flange5-11. The results of this work gave the basis for expression given in the AISCcode12 for the effect of web and flange interaction. Seif and Schafer given an analytical expression for the elastic critical buckling stress and buckling coefficient (k) using Finite Strip Analysis (FSA) for all the sections present in AISCdata base, by considering the effect of interaction13-15. Their investigation shows element interaction in cross-section has a significant effect on local buckling of the member which can't be ignored16-18.

Similar study by Seif and Schafer is carried out taking I-sections from IS data base and efforts are made to suggest an analytical expression for buckling coefficient (k) considering the effect of element interaction in the cross section. FSAis used to calculate the buckling stress and these buckling stresses are converted to plate buckling coefficient (k). Using the above data expression for buckling coefficient (k) is suggested.

v) Numerical investigation of the structural response of a conduit buried within soil slope

Buried conduits are commonly used for utility transportation around the world. Accordingly, to ensure the safe design and installation of conduits, it is important to understand soil-conduit interaction. This research paper presents a numerical investigation of the structural response of a conduit buried within a soil slope in response to applied surface pressure. Numerically simulated and analytically calculated soil-conduit interaction results have been employed in the study to analyze the effect of crest distance and burial depth of a conduit on: its deflection, shape deformation, developed sectional normal stress and bending moment. The structural response of the conduit buried within the soil slope was also compared to that of conduit buried under level ground. The results show that conduit buried within a soil slope experiences more structural deflection and sectional forces than conduit buried under level ground, unless crest distance and burial depth of the conduit exceed approximately 5Bc and 3Bc, respectively; where Bc represents the outer diameter of the conduit. By using the graphical illustrations, explained mechanisms and developed correlations presented in this paper, practicing engineers can ensure the efficient design and installation of conduits buried within soil slopes.

2. CONFERENCES ATTENDED BY FACULTY

i) Stimulations study on composite reinforced concrete beams

Fiber-reinforced polymer (FRP) reinforcements have seen a significant rise in usage in concrete buildings over the past ten years, thanks to their superior corrosion resistance, high tensile strength, and non-magnetization characteristics. However, due to the low modulus of elasticity of the FRP materials and their non-yielding properties, significant deflection and broad fractures are seen in the FRP reinforced concrete components under consideration. As a result, the design of such members may be influenced by serviceability needs in many instances. Flexural stresses are applied to FRP reinforced concrete members in this study, which results in the deflection of the members. The current study focuses on the behaviour of concrete beams reinforced with glass fiber reinforced polymer (GFRP) and carbon fibre reinforced polymer (CFRP) bars of various surface geometries with different reinforcement ratios using nonlinear finite element analysis in ABAQUS. Three different cross-sections of CFRP and GFRP bars were scrutinized. From the finite element modeling it was observed that increasing reinforcement ratio of CFRP bars compared to steel and GFRP reinforced beams. Because of low modulus of elasticity causes GFRP reinforced concrete members to deflect more than steel or CFRP reinforced concrete members. It is observed that load bearing capacity of FRP reinforced beam is higher that steel reinforced beams.

ii) Linear static progressive collapse analysis of RC structures

When there is a sudden loss of load carrying element in a structure, the structure will choose alternate load paths until equilibrium is reached. In this process, elements overloaded in the alternate load paths fails, leading to a large damage disproportionate to the initial event which is referred to as Progressive Collapse (PC). Fire, gas explosions, terrorist attacks, car crashes, and improper design and construction are all common causes of progressive collapse. As a result, it is important to research and examine the effects of this phenomena on structures, as well as to reconstruct the structure to be resistant to it. Government buildings, hotels, offices and residential buildings require different spacings and

may require large spans. Though lot of research work has done on PC resistance of Reinforced Concrete (RC) structures to explore that research, in this study, RC buildings with 4 m, 6 m and 8 m clear span between columns have taken and linear static analysis (LSA) has done for different column removal conditions. PC resistance is measured in terms of vertical joint displacement (VJD), chord rotation (CR) and demand capacity ratio (DCR). The VJD and CR results are discussed and compared with each other. The calculated CR values and DCR values are compared with the limiting value as mentioned in GSA and DoD. The tendency to PC is more for 8 m span model is more than the other models with 6 m and 4 m.

iii) Soil stabilization with ortho phosphoric acid and micro steel fiber

In this paper chemical stabilization of black soil is focused since the stabilization of soil mainly depends on chemical reactions between stabilizer and soil minerals compared to the physical process of soils properties. The phosphoric acid stabilization of soils is a relatively new method of chemical stabilization. In this paper chemical stabilization process using California Bearing Ration (CBR) tests are conducted on the black soil with the three percentages say 2%, 5% and 7% of soil weight by adding 85% ortho-phosphoric acid. One of the research and development materials namely micro steel fibers are adopted in increasing percentages of 0.4%, 2%, 4%, 6%, 8%, 10% and 12% to the best soil proportion after determined from previous step to further increase the CBR value. The purpose of this investigation is to determine the effect of 85% ortho phosphoric acid and micro steel fiber treatments on the stability of cohesive soils and determine the best proportion of admixture soil properties among various.

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iv) Amelioration of fat clays with reusable wastes

This study provides how waste materials can be used to stabilize the soft soil. Utilization of three different waste materials in stabilizing the soft soils is focused in this paper. In this analysis, various by products of different industries such as bagasse ash from sugar cane industries, ground granulated blast furnace slag (GGBS) from manufacture of iron and ceramic

tile dust from construction waste are used as chemical agents to increase the strength and durability of the soils. First the baggase ash and ceramic tile dust are mixed with soil and tested with three different proportions of same each as 4%, 6% and 8%. The best among those proportions is determined by the test results of Maximum dry density (MDD), Optimum moisture content (OMC), and California bearing ratio (CBR). Secondly with the optimum content of 15% of GGBS and ceramic tile dust of four percentages as 10%, 20%, 30% and 40% are added to the soil and tests are conducted with that different proportions. Finally from the results obtained the best proportion which provides good stabilization with more feasibility in most economic way is determined.

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v) An Experimental Study on heave and Uplift Behaviour of Granular Pile Anchor Foundation System

Several innovative ground improvement techniques were presented by various researchers throughout the globe for modification of the existing poor soils. Granular Pile-Anchors (GPA) were found to be more promising in resisting the heave behavior of the expansive soils in recent times. The engineering behavior of the soil can be improved by this technique apart from resting the swell. This technique is a modification on the existing granular pile technique with an anchor plate beneath the granular pile that is connected to the foundation by means of an anchor rod or cable. Numerous scale model tests were discussed in this paper to understand the heave and pull-out behavior of Granular Pile-Anchor Foundation (GPAF) system. The effect of spacing was studied by using two granular piles at varied spacing. It was observed that the swell potential was reduced to about 68.09% for 50mm dia GPA, compared to the virgin expansive soil. The swell potential was found to be further reduced at twice the diameter of the pile spacing. The pull-out capacity was found to be increased by about 393% by providing a 50mm diameter GPA in the expansive soil.

vi) Water Demand Analysis for Selected Rural Regions in Visakhapatnam District

To analyse the water demand for rural regions is very important to distribute the public water demand and agricultural water demand. In this contest, rural areas under three reservoir command areas namely Konam, Raiwada and Thandava Reservoir command areas located in Visakhapatnam district are selected. Different methods are used for population forecasting and the results are compared with the available actual population in 2011. Decreasing rate method gives satisfactory results and this method is used to determine the present population in the selected rural regions. Total demand for all three regions is obtained and agricultural demand is about 94 to 96%, domestic water demand is about 2.5 to 3.5 %, water losses is about 1 to 1.5 %, fire and public use demand is around 0.5 %, and industrial and commercial demand is less than 0.5% of the total water demand. Per capita total water demand various from 1415 to 1817 cubic meters for selected regions.

vii) Structural Performance of Pre-Engineered Buildings: A Comparative study

Technological advancements have greatly aided in improving quality of life through variety of new products and services. Pre Engineered Building (PEB) is among such technological advancement in the structural engineering. PEB concept provides optimum design, good aesthetic view, fast rate of construction and reduction in erection time. PEB satisfies a broad range of custom design needs and applications. This methodology is adaptable not only because of its high quality pre-designing and prefabrication, but also of its flexibility. In the current study, the comparison has been made on the structural performance of multiple bay system with different wind zones [Locations: Vijayawada and Hyderabad]. Analysis and design have been carried out using STAAD. Pro software. The structural performance of pre-engineered building has been assessed through the shear force (SF) and bending moment (BM) magnitudes. Based on the output of SF and BM of pre-engineered components through Staad. Pro analysis, the geometrical properties of pre-engineered sections have been decided. Results concludes structure weight located in Vijayawada is 11.04% higher than that of the structure in Hyderabad.

viii) Influence of Geotechnical Parameters on Construction Aspects of Highway Projects

Transportation infrastructure development is considered as a key indicator to assess the growth of any country. Highways are one of the major elements of transportation infrastructure, whose construction may get delayed by various factors. Among the all, geotechnical characteristics plays a vital role in project construction. Negligence/over view of assessment in geotechnical parameters leads to cost, schedule, and time overruns of a project. Improper geotechnical investigation leads to cost, schedule, and time overruns of transportation infrastructure projects. The main objective of the present study is to evaluate the causes of construction delays, cost overruns accompanied with geotechnical rea-sons for highway projects. In addition to that, the study also emphasizes on geotechnical-related problems in highway projects and their preventive measures. The primary data was collected by means of organized questionnaires which were distributed to the different experts, consultants, and professionals. The data related to various geotechnical-related issues were obtained through the survey. The results of descriptive statistical analysis indicated that lack of boring locations, misclassified soil, high ground water table than expected and seepage problems are the critical geotechnical parameters with negative impacts on cost, schedule and cost overruns of bridge and highway project. The authors believe that detailed geotechnical investigation followed by provision of accurate number of boring locations and design of foundations accounting all the existing com-plications in the subsoil can avoid the aforesaid issues effectively. Furthermore, complete awareness about geotechnical information of project site, development and implementation of minimum standards for subsurface investigation is pre-requisite for the designer. The results of present work should be beneficial to construction professionals, policymakers, and researchers in the field of construction management.

ix) Soil Liquefaction Susceptibility in Coastal Region of Andhra Pradesh

The phenomena in which loose particles of soil get disturbed and lose shear strength resulting in the soil behaving as a viscous liquid rather than solid. The study given below is to evaluate the potentiality of liquefaction in the coastal region of AP. The selected

study area falls under zone-3 in India which is of moderate seismic risk and the regional area has multiple layers of sand, silty sands, clay mixed with organic matter. As a part of the study, 217 bore-holes were drilled and SPT was performed on the samples for identification of geotechnical properties and also to determine liquefaction susceptibility. A simplified approach method by seed and Idriss has been used to determine the liquefaction susceptibility. The LPI values were obtained from Iwasaki et.al. The spatial analyses results of liquefaction potential were mapped by using QGIS. The QGIS maps could be effectively used by geotechnical engineers and researchers for further land development and urbanization.

3. BOOK CHAPTERS BY FACULTY

i) Thermal Comfort Studies of Residential Building Models in Vijayawada

Brick masonry wall is the more common walling system being used in residential buildings. As the demand for housing is increasing, new construction materials are coming up in the market and being utilized in the construction. Solid concrete blocks (SCB) and autoclave aerated concrete (AAC) blocks are the two materials which are most commonly used in most of the construction sites apart from the clay bricks (CB). The thermal behaviour of the buildings with these materials needs to be studied. It is also necessary to reduce the heat inside the building to improve the human comfort. Effect of coating material over roof also needs to be studied. Living comfort inside any building mainly depends on the "thermal comfort". Thermal comfort mainly involves the interior conditions of the rooms, i.e. mainly temperature and humidity, maintaining and distributing it evenly, and the quality of air (purity, humidity rate, healthiness). By providing a thermal insulation to all the surfaces combined with seasonal adoption of ventilation, thermal comfort can be achieved in different climate conditions. By keeping these points in a view, a thorough study was conducted to know the thermal variations in various house models by varying the wall type. Results indicated the superior thermal performance of the model with AAC block in comparison with the models made with solid concrete block and clay brick.

ii) Effect of Bio-cementation on Concrete using Different Calcium Sources

Nowadays, in the various engineering applications, a new technology known as microbially induced calcium carbonate precipitation (MICCP) or bio-cementation is used widely. A large number of soil micro-organisms exhibit urease producing ability. Urease (enzyme) catalyses hydrolysis of urea to produce ammonia (NH_3) and carbon dioxide (CO_2). This reaction can be used to generate calcium carbonate ($CaCO_3$) in the existence of calcium ions. The $CaCO_3$ gets precipitated and can be used to enhance the mechanical strength of

construction materials. In the present research study, influence of bio-cementation on concrete was studied using bacterial solution. An attempt has been made to investigate the influence of different types of calcium sources like calcium chloride ($CaCl_2$) and calcium sulphate ($CaSO_4$) on biocementation. The bacterial concrete specimens were subjected to bio-cementation using these two calcium sources and it was found that among the calcium sources, calcium sulphate showed more promising results exhibiting considerable enhancement in compressive strength and decrement in water absorption capacity.

iii) Geotechnical characteristics of soils and rocks of India

The major soils found in the state of Andhra Pradesh are alluvial soils, marine soils, black cotton soils and red soils. This chapter provides details of the geotechnical investigations performed to study the subsoil profile and to select a proper foundation system in the state of Andhra Pradesh. This chapter illustrates the significance of soil explorations to avoid failure of structures being built. One case study has been presented about the importance of appropriate practice consideration in the construction of under-reamed pile foundations. Furthermore, one more case study is presented on strengthening of soft ground by driving the casuarina ballies.

iv) Effect of Curing Conditions on Properties of Slag Cement Concrete Partially Replaced with Recycled Aggregates

Concrete is used in tremendous volume and plays a major role in a nation's economic growth. The augmentation in pace of industrialization and urbanization because of the concurrent growth in economy and populace utilizing concrete as the most primary construction material led to is expending the greatest measure of regular assets. Every year approximately 20 billion tons of raw materials are required for making concrete. Due to the vital scarcity of aggregates, the provision of demolished concrete to be used as recycled concrete is increasing. Re-utilizing is one way to deal with minimizing waste and gives

different advantages including—limit transportation and age cost of imperatives, utilize waste that would be lost to neighborhood landfills, protect land territories in likely metropolitan turnarounds, support the general nature status and present countless garbage removals. A great number of researches have been performed to understand the nature of recycled coarse aggregates (RCA) and their effect on the strength, durability of Recycled aggregate concrete (RAC). This investigation presents a test work on Recycled aggregate concrete by using Ordinary Portland (OPC) and Portland Slag Cement (PSC) with and without Nano-silica (NS) by partially replacing Natural Crushed aggregate with recycled coarse aggregate about 30% by weight. Concrete specimens of M20, M25, M30, M35 grades with NCA partially replaced with recycled coarse aggregate were tested for compressive, tensile, and flexural strengths at 7 and 28 days by varying water contents. The curing conditions were also varied by water curing.

v) Effect of Strength Parameters Upon Partial Replacement of Moderately Burnt and Completely Burnt Sugarcane Bagasse Ash

Manufacturing of cement becomes expensive and harmful for the environment; hence the need arises to utilize alternate cementitious materials. Sugar producing industries produce bagasse ash as waste material and the difficulty in disposal gives direction to this research. Recently, bagasse ash is widely utilized in the construction industry either as a filling material, pavement concrete or partially as binding material. Bagasse ash is utilized in the construction industry due to the presence of pozzolanic properties in huge quantities. Sugarcane bagasse is a waste product produced by the sugar manufacturing industry. The ash produced from bagasse is usually burnt at 400–500 °C, a commonly used replacement temperature, which is usually dark grey in colour. The impact of sugarcane bagasse ash (SCBA) partially burnt and burnt at 1000 °C was studied in this work, although the optimum percentage replacement of bagasse ash was established at 10% for compressive, flexure and split tensile, and the bagasse ash burnt at 1000 °C displays exorbitant replacement percentage, in terms of compressive, flexure, split tensile and RCPT test. The study was conducted to evaluate mechanical and durability properties by casting cubes, cylinders and prisms with various percentages of SCBA burnt at 400°–500 °C and SCBA burnt at 1000 °C, each was

compared to one another and optimum replacement was found to be 25%, which is 15% increase when compared to conventional replacement procedure followed. From durability studies, it was observed that the SCBA2 can be replaced up to 20% due to the existence of unstructured silica in huge amounts compared to the concrete with SCBA1 and control mix.

4. PATENT BY FACULTY

BINDERLESS INTERLOCKING CONNECTOR FOR FLEXURAL AND COMPRESSION STRUCTURAL MEMBERS OF A PRECAST SINGLE BAY FRAME

Exemplary embodiments of the present disclosure are directed towards a binder-less interlocking connector for flexural and compression structural members of a precast single bay frame. The connector comprising: at least one first protrusion101 extending from a bottom surface configured to interlock with a top surface of a vertical compression structural member514a, whereby the top surface of the vertical compression structural member comprising at least one first interlocking provision101™to enable interlocking; at least one second protrusion103 extending from an adjacent surface configured to interlock with an adjacent surface of a horizontal flexural member, whereby the top surface of a horizontal flexural member comprising at least one second interlocking provision103™ to enable interlocking; and at least a plurality of sleeves102a™-102d™,108a™-108d™present one or more side surfaces provide the continuous reinforcement of horizontal flexural structural512a and vertical compression structural members514a for the force transfer with a corresponding structural elements.

The Patent is directed towards a binder-less interconnector which is a load bearing structural component to develop fixity between the horizontal flexural member (flexural crossbar) and vertical compression member (pillar). It is directed to establish uniform continuous force transfer between beams and columns, to reduce the effect of lateral forces on interconnect junction and on the whole frame. A binder-less connector comprises of sleeves for the continuity of reinforcement to the next corresponding structural members.

Claims:

1) A binder-less interlocking connector 100, comprising:
   a plurality rebar continuity of sleeves 102a'-102d', 108a'-108d'present one or

more side surfaces provide the continuous reinforcement of horizontal flexural structural member 512a and a plurality of vertical compression structural members 514a for the force transfer with corresponding structural elements, the plurality rebar continuity sleeves 102a'-102d' between the at least one or more vertical compression members 514a of immediate floors, the plurality rebar continuity reinforcement sleeves108a'-108d' between the horizontal flexural structural member 512a characterized in that:

at least one first protrusion 101 extending from a bottom surface configured to interlock with a top surface of a vertical compression structural member 514a, whereby the top surface of the vertical compression structural member 514a comprising at least one first interlocking provision 101'for enabling the interlocking action between binder-less interlocking connector and vertical structural compression member 514a to resist sliding, slipping, and resist lateral force effects, the at least one first protrusion 101 on the bottom surface mates with the at least one first interlocking provision 101' on the top surface of the vertical compression structural member 514a; and

at least one second protrusion 103 extending from adjacent surface configured to interlock with an adjacent surface of a horizontal flexural member, whereby the adjacent surface of a horizontal flexural structural member 512a comprising at least one second interlocking provision 103' for enabling the interlocking action between binder-less interlocking connector and horizontal flexural structural member 512a resist sliding, slipping, and resist lateral force effects, the at least one second protrusion 103 on the adjacent surface mates with the at least one second interlocking provision 103' on the adjacent surface of a horizontal flexural member 512a.

2) The binder-less interlocking connector 100 as claimed in claim 1, a material of the binder-less interlocking connector is selected from any or combination of concrete,10

self-consolidating concrete, glass fiber reinforced concrete, Cementitious materials or their admixtures.

3) The binder-less interlocking connector 100 as claimed in claim 1, wherein a placement of the interlocking building connector is multidirectional.