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Automatic Control System using Speech Recognition and Synthesis Mechanism

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Abstract: With the rapid increase in the number of users of Internet over the past decade has made Internet a part and parcel of life, and Internet of Things is the latest and emerging Internet technology. Internet of Things (IOT) is an ecosystem of connected physical objects that are accessible through the Internet. Applications are being developed on IOT that are useful to us on various ways. Another upcoming technology is Natural language processing which enable us to command and control things with our voice. Combining all of these, our project is an IOT based automation over the cloud which is a micro-controller based voice controlled automation device using server. This device will enable users to have control over every appliances in his/her room with their voice and he / she will get replied through voice. It is just like an interaction with home, hotel room, research center, control room of any company or any organization, etc. where you implement this device and also can control it from anywhere around the world. The sensors are used to gather more real time information which will enhance our analysis over environment.

Keyword: IOT, Voice, Bitvoicer, Server, Command, Automation, Sensor.

1. INTRODUCTION

The foremost aim of technology has been to increase efficiency and decrease effort. With the advent of 'Internet of Things' in the last decade, we have been pushing for ubiquitous computing in all spheres of life. It thus is of extreme importance to simplify human interfacing with technology.

Generally, room automation research targeted many needs; some applications fulfill the sophisticated and luxury requirements; other focuses the special needs like elderly and the disabled etc. In such applications voice recognition technology is used.

The primitive man realized that an effective way to communicate with one another is through voice. With minimum effort, ideas could be narrated with relative ease. Using this effective yet ingrained form of communication we would humanize technology to a great extent.

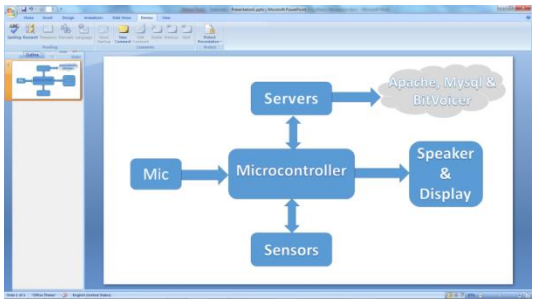
This paper mainly focuses on the Automation and security of a room when the user is in or

away from the place (house, office, etc.). IOT based automation over the cloud leverages the power of Arduino to provide a holistic voice controlled automation system using bitvoicer server. It is a microcontroller based voice controlled automation device using server.

2. SYSTEM DESIGN

2.1 System Components

In our system, we use BitVoicer server for Speech Recognition and Synthesis purpose and ArduinoMega (ATMEGA 2560) as a microcontroller.



The key components of this system are:

- BitVoicer Server
- ATMEGA 2560
- Sensors
- Relay Boards

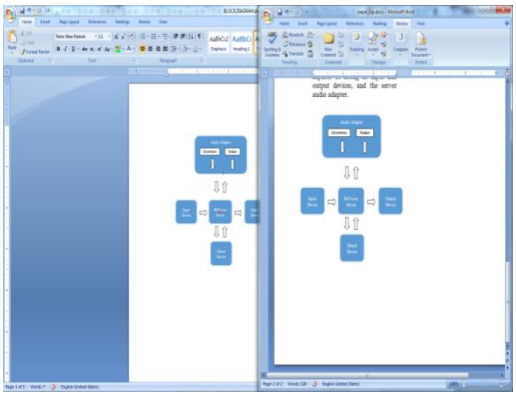
2.1.1 BitVoicer Server

BitVoicer Server is a speech recognition and synthesis server for speech automation. It was developed to enable simple devices, with low processing power, to become voice-operated.

In general, the architecture of a BitVoicer Server automation solution is comprised of the server, input devices and output devices.

Input devices are responsible for capturing, digitalizing and sending audio streams to the server. The server, in turn, processes these audio streams, recognizes the sentences present in the stream and maps them to commands that will be sent to output devices.

In addition to input and output devices, BitVoicer Server can also serve mixed devices, which are capable of acting as input and output devices, and the server audio adapter.



First, we have to set up BitVoicer Server t work with the Arduino. BitVoicer Server has four major solution objects: Locations, Devices, BinaryData and Voice Schemas.

- Locations represent the physical location where a device is installed.
- Devices are the BitVoicer Server clients.
- BinaryData is a type of command BitVoicer Server can send to client devices. They are actually byte arrays
- you can link to commands. When BitVoicer Server recognizes speech related to that command, it sends the byte array to the target device.
- Voice Schemas are where everything comes together. They define what sentences should be recognized and what commands to run. For each sentence, you can define as many commands as you need and the order they will be executed. You can also define delays between commands.

We can reproduce audio using the server audio adapter. The reproduced audio can be synthesized speech or a .wav file. So that user gets acknowledgment through voice.

2.1.2 ATMEGA2560

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller.

The Arduino Mega 2560 can be powered via the USB connection or with an external power supply. The power source is selected automatically. The board can operate on an external supply of 6 to 20 volts.

2.1.3 Sensors

- Sensors used in the System Infrared (IR) sensors are used to detect the intruder. They are used at doors and at windows. The IR pair that is IR transmitter and IR receiver detects the obstacle within the range of 5-6 feet.
- The LM35 is used as temperature sensor whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. It gives linear output 10.0 mV/0 C as scale factor.
- Light Dependent Resistor (LDR) is used as a light sensor to sense the light intensity in the room. LDR gives the output voltage corresponding to the light intensity.
- Gas Sensor (MQ2) module is useful for gas leakage detecting (in home and industry). It can detect H2, LPG, CH4, CO, Alcohol, Smoke, and Propane. Based on its fast response time. Measurements can be taken as soon as possible. Also the sensitivity can be adjusted by the potentiometer.
- Rain sensor module used for rain detection.

2.1.4 Relay Boards

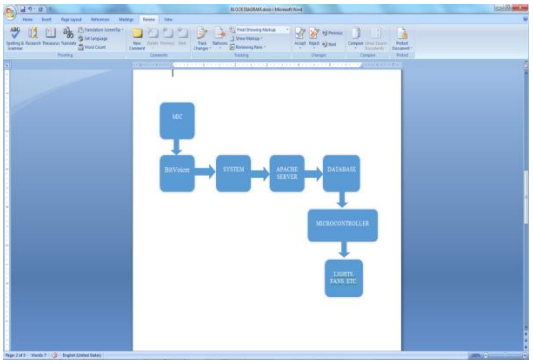
A relay is an electromagnetic switch. In other words it is activated when a current is applied to it. Normally a relay is used in a circuit as a type of switch (as shown below). There are different types of relays and they operate at different voltages. When a circuit is built the voltage that will trigger it has to be considered. In this project the relay circuit is used to turn the appliances on/off. The high/low signal is supplied from the Arduino Uno microcontroller. When a low voltage is given to the relay of an appliance it is turned off and when a high voltage is given it is turned on. The number of appliances can be modified according to the user's requirements.

3. IMPLEMENTATION

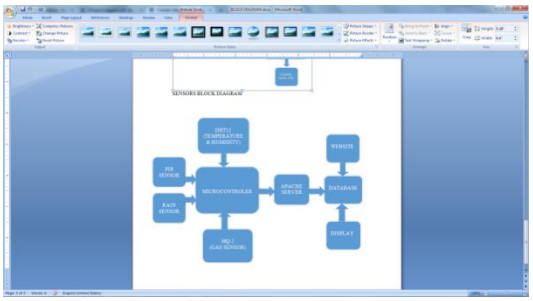
Using the above mentioned components we implement our system on a breadboard. The microcontroller device with the relay circuit needs to be attached with the switch board. After that we have to start the bitvoicer server and enable the ArduinoMega device in the BitVoicer Server Manager. When BitVoicer Server identifies an Input Device, it assigns one exclusive Speech Recognition Engine (SRE) to that device. SREs constantly analyze all audio streams sent to the server and when a predefined sentence is identified, BitVoicer Server performs the actions specified by the user. These actions are called commands and can be used to start other applications, synthesize speech, play audio files or send data (commands) to Output and Mixed Devices. The user can define one or more commands for each sentence. The user can also define the order in which the commands will be executed, the time interval between them, and which Output or Mixed Devices are the targets of the commands. We can follow the recognition results in the Server Monitor tool available in the BitVoicer Server Manager.

For example, if we have to turn on/off the light, here the command will be to start bat file (i.e. by using run executable command), by which we are updating the light status in database using system function. The function system() will invoke the command processor to execute a command. The ArduinoMega device will

continuously check and maintain the status of light in database.



We can also see and control the status of electrical appliances from anywhere around the world. It also collects information from the sensors, makes a decision and sends a corresponding some signal by using a server and database. If it finds any interruption in its sensors (for example IR sensor) then micro-controller will send a voice signal to the home owner. In the same way if the temperature is increased above certain point or gas sensor sensors is turn ON, a alarm will be sent to the home owner 'Fire at home' giving the indication of fire. The LDR (Light Dependent Resistor) is used to sense the light in a room and accordingly lights will be turn ON or OFF.



4. CONCLUSION

The project will enable us to bring every appliance at every corner of our home under our control from a single point without having to get up and manually switch on or off the appliance.

This system, though primarily aimed to reduce human effort, will be of much importance to old aged people and physically handicapped people. It will enable them to control their home devices with ease, without going through much pressure or stress of moving about.

In addition, there have been many advertisements broad casted by the Government of India promoting awareness to switch off household appliances when not in use and thus save electricity. Hence, such a project would assist the initiatives taken by the government, as most people forget to switch off home appliances and are too lazy to return and switch it off.

5. REFERENCES

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ABSTRACT

In India concrete is very popular material of construction especially in case of medium and low rise buildings. And in case of high rise buildings steel is generally used and the composite construction is not such popular but it is possible that composite construction can be more beneficial in case of medium and high rise buildings. Steel concrete composite construction can be built in place of RCC structures to get maximum advantage of steel and concrete and to produce efficient and economic structures.Use of composite material is of particular interest, due to its significant potential in improving the overall performance through rather modest changes in manufacturing and constructional technologies. Steel-concrete composite construction means steel section encased in concrete for columns & the concrete slab or profiled deck slab is connected to the steel beam with the help of mechanical shear connectors so that they act as a single unit. It is the decision of contractor or owner that which type ofProperties they require in the field and according to those properties the type of material can be chosen.

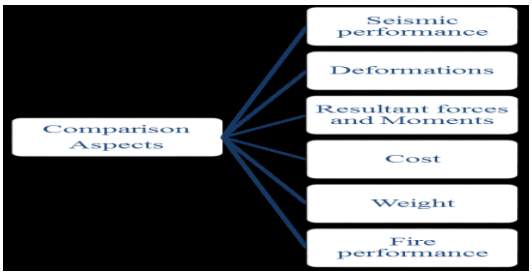
Keywords: beneficial, shear connector, deck slab, potential, steel-concrete.

1. INTRODUCTION

Low rise buildings were generally selected in India as common option but now a day in India population is rapidly increasing and due to that the requirement of construction of medium and high rise buildings is also increasing. Reinforced concrete members are mostly used in framing system because this system is most convenient and economical for low rise buildings. As compared to other developing countries the use of steel for construction purpose is very less in India. Steel Structural members are prone to local and lateral buckling. Concrete structural members are generally thick and less likely to buckle but they are subjected to creep and shrinkage with time. Steel is more ductile material and so it can absorb more shocks and impact loadings. Steel-concrete composite systems have become quite popular in recent times because of their advantages against conventional construction. Composite construction combines the better properties of the both i.e. concrete in compression and steel in tension, they have almost the same thermal expansion and results in speedy construction.Structures are designed to resist moderate and frequently occurring earthquakes & wind must have sufficient stiffness and strength to control displacement and to prevent any possible damage. However, it is inappropriate to design a structure to remain in the elastic region, under severe earthquakes & wind lateral forces, because of the economic constraints. The inherent damping of yielding structural elements can advantageously be utilized to lower the strength requirement, leading to a more economical design. This yielding usually provides the ductility or toughness of the structure against the sudden brittle type structural failure. A building must have a complete structural system capable of carrying all gravity loads to its foundation in life span of building. While dealing with lateral forces, there is a natural trend to manage these forces with same methods used for gravity loads.

2. LITERATURE REVIEW

There is a considerable research work has been done in the direction of comparative study of steel, RCC and composite structures. It can be seen from the studied research work that to judge the suitability of construction material, it is very necessary to compare the steel, RCC, and composite buildings for the following aspects. After this comparison, one can be able to come to a decision that which structure should be constructed under various respective conditions.



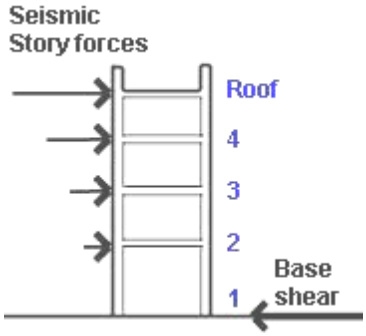
.2.1 Seismic Performance

A large amount of the research work has been done in the direction of Seismic behavior under dynamic performance. Critical issues related with seismic behavior are story's drift, Base shear and Mass irregularity**.** Structural engineer have to deal will all these critical issues for making the structure safe under the seismic effect.

2.1.1 Storey Drift

Rahul Pandey has submitted his thesis "Comparative seismic analysis of RCC, Steel and Steel-concrete composite frame**" [10]** in which he had compared the performance of a (G+7) storey RCC, Steel, and Composite building framesituated in earthquake zone 5 using SAP2000 software. And the results were compared and the conclusion about thestorey drift was made that storey drift in X-direction was more for steel frame as compared to composite and RCCframe. And RCC frame has the lowest value of storey drift because of its high stiffness, which

indicates that as the value of stiffness increases, storey drift values decreases with it. Base shear is an estimate of the maximum expected lateral force that will occur due to seismic ground motion at the base of a structure, which is shown in the figure.



In research paper "Comparative Study of Analysis and Design of R.C. and Steel Structures" [6] it is concluded that base shear in steel structure is less than the R.C. structure because of the less seismic weight which gives better seismic response during earthquake. In this paper for the frame analysis a 3-D model was prepared in ETABS for the earthquake zone 5.

3. ELEMENTS OF COMPOSITE CONSTRUCTION

The primary structural components use in composite construction consists of the following elements.

3.1 Composite slab

3.2 Composite beam

3.3 Composite column

3.4 Shear connector

3.1 Composite slab

Traditional steel-concrete floors consist of rolled or built-up structural steel beams and cast in-situ concrete floors connected together using shear connectors in such a manner that they would act monolithically .The principal merit of steel-concrete composite construction lies in the utilization of the compressive strength of concrete slabs in conjunction with steel beams, in order to enhance the strength and stiffness of the steel girder. More recently, composite floors using profiled sheet decking have become very popular in the West for high rise office buildings. Composite deck slabs are particularly competitive where the concrete floor has to be completed quickly and where medium level of fire protection to steel work is sufficient. However, composite slabs with profiled decking are unsuitable when there is heavy concentrated loading or dynamic loading in structures such as bridges. The alternative composite floor in such cases consists of reinforced or pre-stressed slab over steel beams connected together to act monolithically. Advantages of using composite floors with profiled steel decking are

- Savings in steel weight are typically 30% to 50% over non-composite construction.
- Greater Stiffness of composite beams results in shallower depths for the same span. Hence lower storeys heights are adequate resulting in savings in cladding costs, reduction in wind loading and savings in foundation costs.
- Fasterrate of construction.

3.2 Composite Beams

A steel concrete composite beam consists of a steel beam, over which a reinforced concrete slab is cast with shear connectors. In conventional composite construction, concrete slabs rest over steel beams and are supported by them. Under load these two components act independently and a relative slip occurs at the interface if there is no connection between them. With the help of a deliberate and appropriate connection provided between them can be eliminated.

2.3 Composite column

A steel concrete composite column is a compression member, comprising either of a concrete encased hot rolled steel section or a concrete filled hollow section of hot rolledsteel. It is generally used as a load bearing member in a composite framed structure. Composite columns with fully and partially concrete encased steel sections concrete filled tubular section are generally used in composite construction.

3.4 Shear Connectors

The total shear force at the interface between concrete slab and steel beam is approximately eight times the total load carried by the beam. Therefore, mechanical shear connectors are required at the steel-concrete interface. These connectors are designed to (a) transmit longitudinal shear along the interface, and (b) Prevent separation of steel beam and concrete slab at the interface. Following are the commonly used types of shear connectors as per IS: 11384-1985

- Rigid shear connectors,
- Flexible shear connectors
- Anchorage shear connectors

4. COMPOSITE CONSTRUCTION

In the past, for the design of a building, the choice was normally between a concrete structure and a masonry structure. But the failure of many multi-storied and low-rise R.C.C. and masonry buildings due to earthquake has forced the structural engineers to look for the alternative method of construction. Use of composite or hybrid material is of particular interest, due to its significant potential in improving the overall performance through rather modest changes in manufacturing and constructionaltechnologies. In India, many consulting engineers are reluctant to accept the use of composite steel-concrete structure because of its unfamiliarity and complexity in its analysis and design. But literature says that if properly configured, then composite steel-concrete system can provide extremely economical structural systems with high durability, rapid erection and superior seismic performance characteristics. A need to study the composite design of the multi-story buildings keeping in view of the rapid development in this field.

4.1 Composite beam, slab & shear connector

A steel concrete composite beam consists of a steel beam, over which a reinforced concrete slab is cast with shear connectors. The composite action reduces the beam depth. Rolled steel sections themselves are found adequate frequently for buildings and built up girders are generally unnecessary. The composite beam can also be constructed with profiled sheeting with concrete topping or with cast in place or precast reinforced concrete slab.

4.2 Composite Column

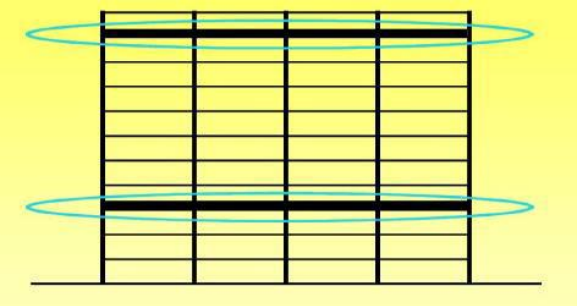
A steel – concrete composite column is conventionally a compression member in which the steel element is a structural steel section. There are three types of composite columns used in practice which are Concrete Encased, Concrete filled, Battered Section.

4.3.Building Details

The building considered here is an office building having G+15 storied located in seismic zone 4 & wind velocity 39 m/s. the plan of building is shown in fig. 1 the building is planned to facilitate the basic requirements of an office building. The plan of building is kept symmetric about both the axes. Separate provisions are made for car parking, lift, staircase, security room, pump house and other utilities; however they are excluded from scope of work.

4.4 Mass Irregularity

Prof. Swapnil B. Cholekar and Basavalingappa S.M. had described that the Mass Irregularity can affect all the parameters of storey drift, base shear, dead weight, shear force and joint displacement during earthquake. They were compared for RCC and composite structures in this paper. For the stability of the structure and less damage of the structure it is very important to have uniform mass, stiffness, simple-regular configuration. [1] Mass irregularity is given in the figure. Mass irregularity is an important factor which is to be considered while designing multistorey building. It is formed due to uneven distribution of mass, strength, and stiffness. Seismicperformances of this type of irregular structures become very important. Mass irregularity should be considered to exist where the seismic weight of storey is more than 200% of that of its adjacent storey. With increase in the difference of mass between two stories ,mass irregularity also increases.



Mass irregularity results from this research paper can be summarized as below [1]

- Under mass irregularity composite structure shows reduction of storey drift values in both X- and Y- direction.
- Under mass irregularity composite structure shows reduction of base shear.
- Under mass irregularity dead weight of composite structure is less.
- Under mass irregularity shear force in composite structure is also less.
- Under mass irregularity joint displacement values are less in composite structure.

Following are the graphical comparisons of their results, which show us that under mass irregularity due to greater weight of RCC frame its base shear will also be more as compared to composite frame and that result will be same for both X and Y direction earthquakes.

4.5 Displacements

Under the application of various loads the displacement of nodes can occur. Less nodal displacement indicates safe structure. **Shashikala Koppad** and **Dr. S.V. Itti** had published "**Comparative study of RCC and Composite Multi StoriedBuildings**" [3] in which they took a 3-D model in seismic zone 3 and analyzed it in STAAD.Pro V8i software. In this research paper they had concluded that node displacement in composite structure is more as compared to RCC structure. This is because the composite structure is more flexible as compared to RCC structure. The results are shown in graph and the table. It is shown that values of nodal displacements of composite frame are higher than RCC frame. The observations are the same for plinth, 3rd, 7th, 11th and 15th floors According to these results.

TYPE OF FlOOR	COMPOSITE STRUCTURE (mm)	RCC STRUCTURE (mm)
Plinth	1.2	1.1
3rd	37.82	24.775
7th	76.2	52.571
11th	110.15	76.989
15th	156.177	93.937

4.6 Resultant Forces and Moments

D.R. Panchal and P.M. Marathe had published "Comparative study of R.C.C, Steel and Composite (G+30 storey)building" [5]

 Shear forces in the secondary beams are increased in steel structure and reduced in composite structure as compared to RCC. In main beams, shear forces are increased in steel structure and reduced in composite structure up to large extent as compared to RCC framed structure. Bending moments in secondary beams are increased in steel structure and reduced in composite structure as compared to RCC structures. In main beams bending moments are increased in steel and composite both of the structures up to large extent as compared to RCC structure.

4.7 Cost

Cost is a major aspect of comparison of steel, RCC and composite buildings. Because costly structures are generally neglected in construction if another cheaper option is available in front of it. Research work in case of cost comparison of buildings has been done in the direction of RCC and Composite buildings. Cost results from various research papers can be summarized as below.

For multistory buildings,

 Cost of composite beams is less than RCC beams because composite beams do not require any formwork.[3]

 as axial forces and reactions are less in composite columns as compared to RCC columns, so cost of Composite columns are less. [3]

4.7 Weight.

Weight of various types of structures is very important to know because it will affect the cost of foundation as well as the cost of ground improvement.

Weight results from various research papers can be summarized as below.

 Weight of the composite structure is quite low as compared to RCC structure, which helps in reducing Foundation cost. [3]

 Dead load of composite is less than RCC and more than steel, which is shown in graph given below. [11]

4.8 Fire performance

Fire performance of the building is considered more seriously when building is Industrial. In case of an industrial building to construct a steel structure can be risky. So in place of steel structure, composite or RCC structure is preferred. Fire performance is the ability of a particular structural element (as opposed to any particular building material) to fulfill its designed function for a period of time in the event of a fire. Because of concrete's inherent material properties, it can be used to minimize fire risk for the lowest initial cost while requiring the least in terms of ongoing maintenance. In most cases, concrete does not require any additional fire protection because of its built-in resistance to fire.

5. ANALYSIS OF RESULTS AND DISCUSSION

After analyzing the two alternative structures located in seismic zone III by equivalent static lateral force method conforming to IS 1893:2002 using Etabs, the results are extracted and compared in terms of critical earthquake response parameters such as base shear, maximum storey drifts, roof displacements, storey overturning moments.

5.1 Design Seismic Base Shear:

Seismic forces accumulate downward in a building. Seismic forces in the building are greatest at the base of the building. The seismic force at base of the building is called the *base shear*. Earthquakes often damage buildings at this level. In a multi-storey building all vibration modes of the building contribute to the base. when compared to steel (5.5 MN) columns, the composite columns are found to experience the least magnitude of base shear (4.3 MN) and 22% reduction in base shear can be attributed to the reduction in mass of the composite columns, which in turn reduces the mass of the structure.

5.2 Storey overturning moment:

Storey overturning moments are calculated by multiplying seismic lateral forces with the storey height. In the present case, a considerable reduction of overturning moments is noticed for composite columns, where the columns are short. when compared to steel (220 MN-m) columns, the composite columns, especially the in filled columns are found to experience the least magnitude of overturning moment (171 MN-m). The 22% reduction in overturning moment is observed with respect to steel columns. This variation apparently shows that the structure with composite short columns has greater stability against buckling as well as overturning at base level and thus providing continuous load path for the upcoming forces to the foundation.

5.3 Storey Drift:

Storey drift is generally defined as the lateral displacement of one floor relative to the floor below. The inter-storey drift criterion is the global collapse parameter that is utilized to evaluate the force reduction factors reflecting the average margin of safety exhibited by each frame under the effect of ground motions. Total building drift is the absolute displacement of any point relative to the base. Building separations or joints must be provided to permit adjoining buildings to respond independently to earthquake ground motion. For seismic loads, the maximum story drift is found from ETABS and is compared to the allowable story drift given in IS 1893:2002. It was determined that all floor levels met the serviceability requirements for seismic forces. when compared steel (3.44 mm) columns, the composite columns, especially the in filled columns are found to experience the least magnitude of storey drifts (2.58 mm). The storey drift of 25 % reduction in case of infilled column is observed when compared with the steel columns, which has highest magnitude of storey drift (3.23 to 3.44 mm). The reduction in storey drift is due to reduction in base shear and increase in stiffness of the composite columns.

5.4 Roof Displacements:

Earthquake-induced motions, even when they are more violent than those induced by wind (as cited by Taranath (2005). evoke a totally different human response—first, because earthquakes occur much less frequently than windstorms, and second, because the duration of motion caused by an earthquake is generally short. Displacements, the extent to which a structural element moves or bends under pressure is the main serviceability concern in the structures. Lateral displacements that occur during earthquakes should be limited to prevent distress in structural members and architectural components.
The value of maximum roof displacement is a direct and efficient measure used to quantify the overall displacement response of a building. However, the value of roof displacement provides no direct information about localized deformation within a structure. If the value of the inter-story displacement for each story is the same as the value of the roof displacement divided by the number of stories, the structure is said to deform uniformly. The least roof displacement occurs in case of in filled columns (98 to 105 mm) compared to steel (143 mm) columns. Roof displacement has been reduced by **26.6%** in case of in filled column when compared with the steel. These variations show that the frame with composite columns have higher lateral stiffness than the steel columns.

6. CONCLUSIONS

The advantage of superior performance of composite columns under gravity loads have been brought out in several studies. However, the lateral load resistance of composite columns especially against seismic loads has not been investigated so extensively. The present study makes an attempt to bring out the advantages of composite columns against conventional Steel columns in multistorey structures. For this purpose, a typical (G+12) framed multi-storey building with two alternative column schemes vis a vis. Steel and Concrete Filled Steel Tube (CFST) located in seismically active moderate zones III is taken up for evaluation and equivalent static lateral load analysis is carried out using Etabs software. The following conclusions are drawn in respect of various performance parameters.

6.1Lateral Load Resistance:
The seismic performance of the selected multi-storey structure is assessed through various structural response parameters such as base shear, storey overturning moment, storey drift and roof displacement.

6.1.1Seismic Forces under Lateral Loads:
Base shear and storey overturning moment induced by the seismic forces are reduced by **22 to 28%** for composite columns. These variations indicate that the composite columns have reduced mass/weight thus reducing the entire mass of structure in respect of reduction in base shear and the composite columns have higher global stability and resistance to buckling in respect of reduction in overturning moments.

6.1.2 Displacement characteristics:

Lateral deformations such as storey drifts and roof displacements have been checked at various storey levels of all structures with two alternative columns located in zone III.

6.1.3 Storey drifts:

When Zone III is considered, the storey drifts are the highest in case of steel, which is well within the permissible limit of 0.004h = 18 mm (as per IS 1893:2002). The composite columns undergo about 25 to 28.5% reduction of lower storey drifts when compared with the steel columns.

7. FUTURE SCOPES

1. The research needs in regards to composite structures using precast concrete and even pre-stressed concrete in certain applications and steel, should also have good market potential due to the economy that can be achieved by these components in saving time, labor and money.

2. The research needs in regard to composite structures for different soil conditions, different zones, effect of fire, different column orientations and different utility of buildings.

3. Idealizing the condition of joints here as rigid joints one can do research on non-linear joint response considering rotational stiffness, moment of resistance and rotational capacity.

4. Different shapes of high-rise buildings can be compared for R.C.C., Steel and Composite options for better guidelines of selection of system.

5. Indian standard is very silent about design of composite column; one can conclude such guidelines and format a proper design method for different types of composite columns. In this review paper it is shown that Steel, RCC and Composite structures can be compared in various aspects under
Various conditions. But soil conditions can be changed other than hard soil and can be compared for worst conditions. And in India generally these aspects are not considered fully. But practical applications of this comparison can make structure safer and more economical. And more accurate comparison processes and aspects can be developed.

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