Annexure - III

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002

STATEMENT OF EXPENDITURE IN RESPECT OF MINOR RESEARCH PROJECT

1. Name of Principal Investigator **SHIRULE PRAVIN ASHOK**

2. Deptt. of PI **CIVIL ENGINEERING DEPARTMENT**

   Name of College **SSBT'S COLLEGE OF ENGINEERING & TECHNOLOGY, JALGAON**

3. UGC approval Letter No. and Date **23-456/12 (WRO) Dated 18/02/2013**

4. Title of the Research Project **Seismic response analysis of base isolated multistoried building**

5. Effective date of starting the project **26/03/2013**

6. a. Period of Expenditure: From **26/03/2013 to 31/03/2015**

b. Details of Expenditure

S.No.	Item	Amount Approved (Rs.)	Expenditure Incurred (Rs.)
i.	Books & Journals	**5000/-**	**5135/-**
ii.	Equipment SAP 2000 Software	**155000/-**	**146700/-**
iii.	Contingency including special needs (Training)	**10000/-**	**10000/-**
iv.	Field Work/Travel (Give details in the proforma).	**8000/-**	**---**
v.	Hiring Services	**---**	**----**
vi.	Chemicals & Glassware	**--**	**----**

7. If as a result of check or audit objection some irregularly is noticed at later date, action will be taken to refund, adjust or regularize the objected amounts.

8. It is certified that the grant of Rs. 156835/- (Rupees One Lakh Fifty Six Thousand Eight Hundred Thirty Five only) out of Rs. 164000/- (Rupees One Lakh Sixty Four Thousand only) received from the University Grants Commission under the scheme of support for Minor Research Project entitled **Seismic response analysis of base isolated multistoried building** vide UGC letter No. F. **23-456/12 (WRO) dated 18/02/2013** has been fully utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University Grants Commission.

SIGNATURE OF PRINCIPAL INVESTIGATOR

SIGNATURE OF CO - INVESTIGATOR

PRINCIPAL

(Seal)

Annexure - V

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002

Utilization Certificate

Certified that the grant of **Rs. 164000/- (Rupees One lakh sixty four thousand only)** received from the University Grants Commission under the scheme of support for Minor Research Project entitled **Seismic response analysis of base isolated multistoried building** vide UGC letter No. F. **23-456/12 (WRO) Dated 18/02/2013** has been fully utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University Grants Commission.

SIGNATURE OF THE PRINCIPAL INVESTIGATOR	SIGNATURE OF THE Co-INVESTIGATOR	PRINCIPAL (Seal)	STATUTORY AUDITOR (Seal)

Annexure -VI

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002.

Annual/Final Report of the work done on the Minor Research Project.
(Report to be submitted within 6 weeks after completion of each year)

1. Project report No. 1st /Final **FINAL**

2. UGC Reference No.F. **23-456/12 (WRO) Dated 18/02/2013**

3. Period of report: from **1/04/2014 to 31/03/2015**

4. Title of research project **Seismic response analysis of base isolated multistoried Building.**

5. (a) Name of the Principal Investigator **SHIRULE PRAVIN ASHOK**
   (b) Deptt. **CIVIL ENGINEERING DEPARTMENT**
   (c) College where work has progressed **SSBT'S COLLEGE OF ENGINEERING & TECHNOLOGY, JALGAON**

6. Effective date of starting of the project **26/03/2013**

7. Grant approved and expenditure incurred during the period of the report:
   a. Total amount approved **Rs. 164000/- (One Lakh Sixty Four Thousand Only)**
   b. Total expenditure **Rs. 161835/- (One Lakh Fifty Six Thousand Eight Hundred Thirty Five only)**
   c. Report of the work done:
   i Brief objective of the project
   - **Response Spectrum Analysis of fixed and base isolated multistoried building.**
   - **Non linear dynamic response analysis of isolated multistoried building with isolator at base and at different level in vertical plane.**
   - **Time history analysis of fixed and base isolated multistoried building.**

- **Response Spectrum Analysis of fixed and base isolated asymmetrical multistoried building.**
- **Time History Analysis of fixed and base isolated a asymmetrical multistoried building.**

ii Work done so far and results achieved and publications, if any, resulting from the work

1. P A Shirule, S P Shekhawat and Sayed Anwar. "Earthquake Analysis of MDOF System Using Linear Fluid." ***PRATIBHA International Journal of Scienece, Spritуallity, Business & Technology (IJSSBT) (ISSN : 2277-7261),*** **May 2014: Vol. 2 No. 2, Pp 78 - 87.**

2. P A Shirule, S P Shekhawat and Sayed Anwar. "Fluid Viscous Dampers: An Innovative Approach" ***Proceeding of International Conference on Sustainable Development"*****. Jalgaon (MS): SSBT's College of Engineering & Technology, Jalgaon, 25 & 26th Feb 2014, Pp 677-689.**

iii Has the progress been according to original plan of work and towards achieving the objective?

Yes

iv. Please enclose a summary of the findings of the study. One bound copy of the final report of work done may also be sent to the concerned Regional Office of the UGC.

Final Report Attached

v. Any other information

Nil

SIGNATURE OF PRINCIPAL INVESTIGATOR

SIGNATURE OF CO - INVESTIGATOR

PRINCIPAL

(Seal)

Annexure – VII

UNIVERSITY GRANTS COMMISSION

BAHADUR SHAH ZAFAR MARG

NEW DELHI – 110 002

PROFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING THE

FINAL REPORT OF THE WORK DONE ON THE PROJECT

1. TITLE OF THE PROJECT

Seismic response analysis of base isolated multistoried Building.

2. NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR

Shirule Pravin Ashok,
Associate Professor, Civil Engineering Department.
SSBT's College of Engineering and Technology, Bambhori, Jalgaon.

Dr Shekhawat Sanjay P.,
Professor, Mechanical Engineering Department.
SSBT's College of Engineering and Technology, Bambhori, Jalgaon.

3. NAME AND ADDRESS OF THE INSTITUTION

SSBT's College of Engineering and Technology, Bambhori, Jalgaon.
Post Box No. 94
Jalgaon 425001
Maharashtra.

4. UGC APPROVAL LETTER NO. AND DATE

23-456/12 (WRO) Dated 18/02/2013

5. DATE OF IMPLEMENTATION

26/03/2013

6. TENURE OF THE PROJECT

Two Year

7. TOTAL GRANT ALLOCATED

173000/- (One Lakh Seventy Three Thousand only)

8. TOTAL GRANT RECEIVED

164000/- (One Lakh Sixty Four Thousand Only)

9. FINAL EXPENDITURE

Rs. 161835/- (One Lakh Fifty Six Thousand Eight Hundred Thirty Five only)

10. TITLE OF THE PROJECT

Seismic response analysis of base isolated multistoried Building.

11. OBJECTIVES OF THE PROJECT

***** Response Spectrum Analysis of fixed and base isolated multistoried building.

* Non linear dynamic response analysis of isolated multistoried building with isolator at base and at different level in vertical plane.

* Time history analysis of fixed and base isolated multistoried building.

* Response Spectrum Analysis of fixed and base isolated asymmetrical multistoried building.

* Time History Analysis of fixed and base isolated asymmetrical multistoried building.

12. WHETHER OBJECTIVES WERE ACHIEVED (GIVE DETAILS)

Yes.

- Response Spectrum Analysis of a fixed and base isolated multistoried building has been done.
- Non linear dynamic response analysis of an isolated multistoried building with isolator at base and at different level in vertical plane has been done.
- Time history analysis of a fixed and base isolated multistoried building has been done.
- Response Spectrum Analysis of a fixed and base isolated asymmetrical multistoried

building has been done.

- Time History Analysis of a fixed and base isolated asymmetrical multistoried building has been done.

13. ACHIEVEMENTS FROM THE PROJECT

The core objective of the project was to learn the software SAP, and to acquire expertise in response spectrum analysis and time history analysis of buildings using the SAP. The objectives have been achieved. The faculty concerned (PI) and students have good training in the software. Publish a paper in International Journal and International Conference.

14. SUMMARY OF THE FINDINGS (IN 500 WORDS)

The principal findings of the project can be summarized as follows:

The Faculty (PI and CoPI) have undergone training for SAP through a professional agency. Hence they have learnt the functions of the software and have got a good expertise in the applications of it. The concerned faculty members have done a complete design of earth quake resistant building has been done using the software. The software has been used for time history analysis method as well as response spectrum analysis methods also. Apart from this, the software has been made accessible to the students also. The under graduate students have got good awareness about the features of the software. Students have shown interest in doing projects based upon it in future. The software has become an institutional asset. The students and faculty will have scope for future project works. The institute will be able to extend its consultancy services to its clients in future using the software and expertise.

With advances in technology, it appears that the approach to the design of earthquake resisting structures takes a new direction, which allows engineers to design structures for a desired level of seismic protection. Designing structures to behave elastically or near the elastic range during strong ground motions is not economical, and in many cases is not feasible. Therefore enabling the structure to dissipate energy by means of mechanical devices appears very attractive. A rich variety of energy dissipation devices for passive control may be found in viscous dampers seem more appropriate in the case of rehabilitation. The main advantage of viscous dampers is that the forces they produce are out of phase with the column’s forces due to displacements, and therefore, will not usually require column and foundation strengthening.

A parametric study on Reinforced Concrete structural walls and moment resisting frames building representative of structural types using response spectrum method is carried out. Here, the design spectra recommended by Indian Standard Code IS 1893-2002 (part I) and two other codes (Uniform Building Code, Euro Code 8) are considered for comparison. The objective of this study is to investigate the differences caused by the use of different codes in the dynamic analysis of multistoried RC building. To evaluate the seismic response of the buildings, elastic analysis was performed by using response spectrum method using the computer program SAP2000. It is observed from the comparative study that the base shear using IS code is higher in all the three buildings, when compared to that of with other codes which leads to overestimate of overturning moments in the building and hence heavier structural members. To experimentally verify the applicability of the proposed semi active control system to torsion ally coupled responses of an asymmetric building, use of computer software was conducted using in a G+13 storey building model with asymmetric column distribution.

The basic idea of seismic isolation is based on reduction of the earthquake induced inertia loads by shifting the fundamental period of the structure out of dangerous resonance range, and concentration of the deformation and energy dissipation demands at the isolation and energy dissipation systems, which are design for this purpose. As a numerical example, a fourteen storey structure analyzed with three different seismic protection alternatives as fixed base, rubber bearing, friction pendulum bearing. Such analysis could not provide full optimization; the main objective here is to make a comparison between the seismic isolation and fixed based building, rather than comparing the seismic isolation alternatives within themselves. In the analysis, total base shear forces, storey shear forces and relative storey drifts are compared and results are discussed.

15. CONTRIBUTION TO THE SOCIETY (GIVE DETAILS)

The expertise developed in the software use can be used for providing consultancy services to the construction industry and Government sectors. The basic objective of the institute is to do societal service with technological input. The objective is duly served by this project. The software can be especially useful for earth quake resistant buildings.

16. WHETHER ANY PH.D. ENROLLED/PRODUCED OUT OF THE PROJECT

No

17. NO. OF PUBLICATIONS OUT OF THE PROJECT

One paper in international Conference

One paper in international Journal

(Co PRINCIPAL INVESTIGATOR) **(PRINCIPAL INVESTIGATOR)**

(PRINCIPAL)

(Seal)