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"STUDYING THE BEHAVIOR OF RCC CHIMNEY UNDER DYNAMIC LOADS, SUCH AS WIND, SEISMIC ACTIVITY, OR VIBRATIONS."

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ABSTRACT
A chimney is a structure that provides ventilation for hot fluegases or smoke from a boiler, stove, furnace or fireplace to the outside atmosphere. Chimneys are typically vertical, or as near as possible to vertical, to ensure that the gasesflow smoothly, drawing air into the combustion. The height of a chimney influences itstability to transfer flue gases to the external environment via stack effect. Additionally, thedispersion of pollutants at higher altitudes can reduce their impact on the immediate surroundings. Industrial Chimneys are tall and slender structures with circular cross-sections. The project based on the analysis and design concepts of chimneys as per Indian codes provisions incorporation was also made through finite element analysis. Different typesof steel chimney models are made by varying its height, diameter and geometry. All the models are prepared in the Ansys Software. The main objective of this study is to perform vibration analysis of steel chimney for dynamic wind loads using differentcritical velocity. Natural frequency and time period has been found out using analysis inAnsys.

Keywords:
RCC Chimney, ANSYS

1. Introduction
1.1General
Over the most recent 60 years, among different building structures, fireplaces have been a critical application in the Romanian development industry. Over 200 such industrial chimneys, with heights ranging between 60 and 350 m, are nowadays in operation. The paper is centered on the dynamic instrumental examination of existing fortified cement mechanical fireplaces. An industrial chimney is an essential part of any factory. Reinforced concrete chimneys are used to help to disperse combustion by-products, such as nitrogen oxides, sulphur dioxide, carbon monoxide and other particulate matter produced during the combustion of fossil fuels and other industrial processes. The basic purpose to build a chimney in a factory is to protect the health of people in the immediate vicinity and to increase the height at which pollutants are discharged to help proper dispersion without affecting the air quality in general. The benefits of industrial chimneys are widely known. The long term behaviour of reinforced concrete chimneys in Romania has been influenced by a great number of factors, among the most important being: the seismicity of the Romanian territory, corrosion of RC shell, as a result of condensation of the high acidic flue gases which escape into the annular space between the brick masonry liner and the chimney, the level of knowledge at the time of design, the design and completion quality etc. For heights exceeding 100 m, RC chimneys were favoured because their inherent stiffness for earthquake and wind resistance. These structures were found to be vulnerable to damage during strong earthquakes, despite the fact that none of them collapsed, experiencing, in turn, extensive cracking along the casting joints. The behaviour of RC industrial chimneys in Romania has been, and still is, largely influenced by the thermal and chemical impact of the exhaust gases, influencing their normal operation and increasing the seismic risk in case of future strong earthquakes.
In conclusion, the main causes for the inadequate behaviour under thermal and chemical action were the use of poor quality materials for heat insulation and corrosion protection, the abusive operation

with exhaust gas temperatures exceeding the design ones, the absence of maintenance actions, to which can be added certain inaccurate assumptions concerning the stiffness of the structure during the various stages of concrete ageing and consequently an underestimation of the stresses which resulted from temperature variations. The above causes induced damage such as vertical cracks in the RC shell, the size of which impedes operation under normal conditions, the deterioration of heat insulation and of anti-acid bricks and the initiation of chemicalsulphate attack in the structureof concrete. As a consequence, design companies (such as the Institute for Studies and Power Engineering - ISPE), academic and individual experts have performed extensive technical assessments in order to establish the actual behaviour of the most important RC chimneys and, in some cases, have initiated retrofit projects for the improvement of the thermal and corrosion protection. The authors of the paper were involved in many such technical assessments, from which ten examples will be considered. It must be specified that the paper is focused mainly on the full scale dynamic investigations of the eigen characteristics of such structures.

1.2 Objective

1) To identify geometry variation parameter such as height to base diameter ratio, tapering of the structure.
2) To carry out computerized analysis on different types of models using ANSYS.
3) To study the effect of variation in geometry of cantilever RCC chimney.
4) To determine the bending stress, lateral displacement and lateral forces for the Cantilever RCC chimney by analyzing the models for static and dynamic forces.

2. Literature Review

[1] Dhanaraj M. Patil, Keshav K. Sangle. Structural Engineering Department, VJTI, Mumbai 400019,India —In this study, the behaviour of different bracing systems in high rise 2-D steel buildings under the application of dynamic wind load is investigated. For this purpose, a two dimensional dynamic wind analysis were carried out to on different braced high rise 2- D steel building frames of 10, 15, 20, 25, 30, and 35 storeys to capture the structural response. This research is carried out using five structural configurations of braced frames: moment resisting frames (MRF), chevron braced frames (CBF), V-braced frames (VBF), Xbraced frames (XBF), and zipper braced frames (ZBF). Dynamic wind analysis is carried on total 30 high rise 2-D steel buildings using gust factor method. It is instructive to note that significant changes in structural behaviour of MRF high rise 2-D steel buildings is observed when compared with braced high rise 2-D steel buildings. Parameters such as the type of bracing and height of buildings significantly affect the structural performance of high rise buildings. In this study structural performance of different structural systems is compared on the basis of the fundamental time period, storey displacement, top storey displacement, and inter-storey drift ratio. It is observed that the CBF and ZBF are observed to be more efficient than other structural systems in high rise 2-D steel buildings

[2]Sina Kazemzadeh Azad, CemTopkaya ⁎ Department of Civil Engineering, Middle East Technical University, Ankara, Turkey This paper reviews the research conducted on steel eccentrically braced frames (EBFs). Both component level and system level responses for such braced frames are treated and discussed. For the component level response, a thorough review of the investigations on links, which are the primary sources of energy dissipation in EBFs, has been presented. The results of experimental and numerical studies on strength, rotation capacity, and over strength of links are discussed. Furthermore, studies on the effects of axial force, the presence of a concrete slab, the loading history, compactness, link detailing, and the lateral bracing on link behavior are summarized. Relevant available research on link-to-column connections is revisited. Different approaches for the numerical modeling of links are also given. For the system level response, characteristics of EBF systems are discussed in light of the capacity design …

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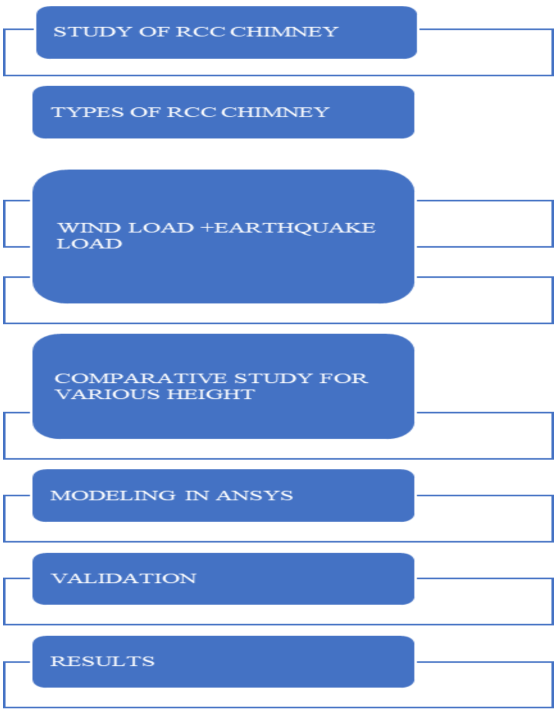
[3]G. Brandonisio a, M. Toreno a, E. Grande b, E. Mele a, A. De Luca a Department of Structural Engineering, University of Naples, Italy Department of Civil and Mechanical Engineering, University of Cassino and Southern Lazio, Italy The stock of existing buildings across most of the European earthquake-prone countries has been built before the enforcement of modern seismic design codes. In order to assure uniform levels of safety and reduce the social and economic impact of medium to high earthquakes costly seismic intervention plans have been proposed. But their application, in order to define which building should primarily be retrofitted, requires adequate vulnerability assessment methodologies, able to model the effective non-linear response and to identify the relevant failure modes of the structure. In the case of reinforced concrete (RC) buildings, due to the lack of application of capacity design principles and the aging effects due to exposition to an aggressive environment, existing structures can exhibit premature failures with a reduction of available strength and ductility. In the last couple of decades some state-of-the-art simplified models aiming at capturing the complex interaction between shear and flexural damage mechanisms as well as behavior of rebar corrosion have been proposed in specialized literature and, in some cases, implemented in regulatory building codes and guidelines. The present paper presents how those phenomena that have a significant impact in reducing the element capacity in term of strength and energy dissipation can be implemented in the assessment of the structures.
[4]Yang Ding a, Min Wua,c, Long-He Xu b, Hai-Tao Zhu a,⇑, Zhong-Xian Li a a School of Civil Engineering, Tianjin University/Key Laboratory of Coast Civil Structure Safety (Tianjin University), Ministry of Education, Tianjin 300072, China In this paper time history analysis is performed for off shore steel structures for El-centro data for 31sec.the effect of slope (different angle 0 degree,20 degree and 30 degree) is studied for various loading condition and the effect bracings (single bracings,knee bracings, cross bracings) for different loading are also studied. For FEA analysis SAP 2000 is used which observed very effective for analysis.

3. Methodology

3.1 Introduction

Following methodology is adopted for this research. It includes modelling in ANSYS, Study of code for wind zone and earthquake zone, validation and results



3.2 Wind load

For self-supporting steel chimney, wind is considered as major source of loads. This load can be divided into two components respectively such as,
I) Along-wind effect
ii) Across -wind effect
The wind load exerted at any point on a chimney can be considered as the sum of quasi-static and a dynamic-load component. The static-load component is that force which wind will exert if It blows at a mean (time-average) steady speed and which will tend to produce a steady Displacement in structure. The dynamic segment, which can cause motions of a structure, is produced because of the accompanying reasons:
I) Gusts
ii) Vortex shedding
iii) Buffeting

3.3 Along Wind Effects
Along wind effects are happened by the drag component of the wind force on the chimney. When wind flows on the face of the structure, a direct buffeting action is produced. To estimate such type of loads it is required to model the chimney as a cantilever, fixed to the ground. In this model the wind load is acting on the exposed face of the chimney to create predominant moments. But there is a problem that wind does not blow at a fixed rate always. So the corresponding loads should be dynamic in nature. For evaluation of along wind loads the chimney is modeled as bluff body with turbulent wind flow In numerous codes including IS: 6533: 1989, proportional static technique is utilized for evaluating these heaps. In this procedure the wind pressure is determined which acts on the face of the chimney as a static wind load. Then it is amplified using gust factor to calculate the dynamic effects.

3.4 Problem Statement
It is located at a height 35m to 45m from ground. Considering K2 factor in this height range as per table 2, IS-875 (Part-3):1987, lateral wind force.Based on literature review, most of the chimneys designed are based on IS 4998:1992 but in this paper response of chimney was evaluated based on draft Code CED 38(7892):2013 [third revision of IS 4998(Part 1):1992]
Details of the chimney as follows:-
1. Height of the chimney – 250m, 200m, 150m
2. Outer diameter of chimney at bottom – 5.455m
3. Outer diameter of chimney at top – 3.273m
4. Thickness of shell at bottom –0.15m
5. Thickness of shell at top – 0.15m
6. Thickness of air gap – 0.08m
7. Thickness of fire brick lining – 0.1m
8. Grade of concrete – M25
9. Height to base diameter ratio – 11
10. Top diameter to base diameter ratio – 0.6
11. Basic wind speed – 55m/s
12. Foundation type – RCC circular mat
Description of loading:-
Density of various materials considered for design
Concrete – 25kN/m3
Insulation – 1kN/m3
Structural steel – 78.5kN/m3
Live load – 5kN/m2
Wind load:
The following wind parameters are followed in accessing the wind loads on the structure:-

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Basic wind speed – 55m/s
Terrain category -2
Class of structure – c
Risk coefficient k1 – 1
Topography factor k3– 1
K2 factor taken from Draft Code CED 38(7892):2013 (third revision of IS 4998(part 1):1992)
Earthquake force data:
Earthquake load for the chimney has been calculated as per IS 1893(par 4): 2005
Zone factor – 0.16
Seismic zone – III
Importance factor (I) – 1.5, Reduction factor (R) – 3

4. Theoretical Content
The analysis and design of tall cantilever chimneys to resist earthquakes or wind-induced vibrations requires knowledge of the mode shapes and natural frequencies of vibrations. The same information is needed for the evaluation of seismic vulnerability of very flexible structures, such as high-rise chimneys, aspect which represents a challenging aspect in earthquake engineering. The present paper is mainly devoted to experimental programs within which the response to ambient vibrations of the most representative chimneys, from the point of view of their heights, was recorded. The dynamic investigations performed on real chimneys showed that information gathered from ambient vibration measurements provide reliable and efficient data ofreal interest for a clear understanding of the behaviour of the investigated chimneys. Based on the obtained results, a formula for the direct determination of the natural Eigenperiod of vibration of tall reinforced concrete chimneys is considered.

4.1 Selected Chimney Configurations
Six different chimney heights, corresponding to ten industrial chimneys located in particular seismic areaswere selected for this paper. These heights are 80 m, 106 m, 120 m, 160 m, 200 m, 250 m and cover the practical range for existing RC industrial chimneys built in Romania. In Fig.4.1 a schematic drawing showing the ten investigated chimneys is presented and in Fig 4.2 general views of some of them.

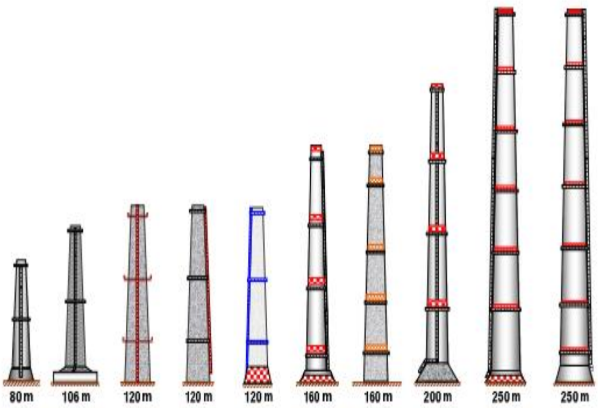

Fig. 4.1: Schematics configuration of thechimneys

5. Result and Conclusion
The main focus of this project is analysis of RCC chimney with variation in geometry parameter in **Ansys** software.
1) For 250m height (Static)

TOTAL DEFORMATION

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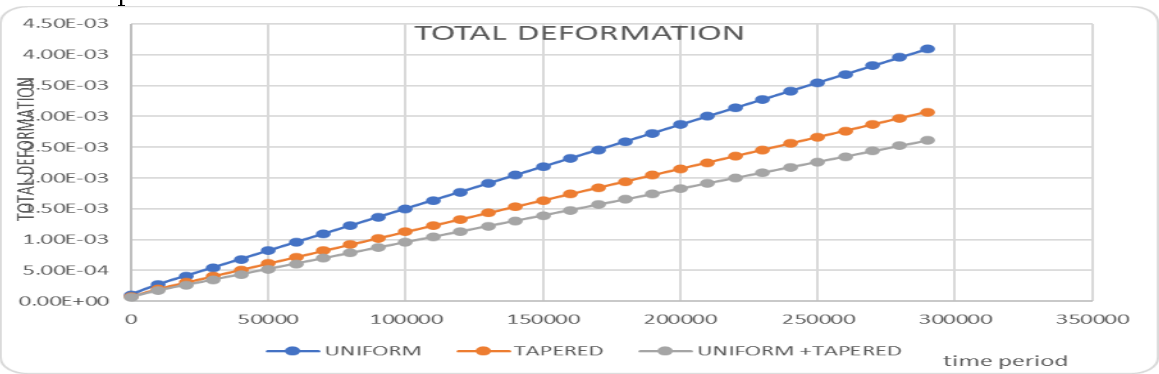
LOAD IN KN	UNIFORM	TAPERED	UNIFORM +TAPERED
0	1.02E-04	7.67E-05	6.52E-05
10000	2.73E-04	2.05E-04	1.74E-04
20000	4.09E-04	3.07E-04	2.61E-04
30000	5.46E-04	4.09E-04	3.48E-04
40000	6.82E-04	5.12E-04	4.35E-04
50000	8.18E-04	6.14E-04	5.22E-04
60000	9.55E-04	7.16E-04	6.09E-04
70000	1.09E-03	8.18E-04	6.96E-04
80000	1.23E-03	9.21E-04	7.83E-04
90000	1.36E-03	1.02E-03	8.70E-04
100000	1.50E-03	1.13E-03	9.57E-04
110000	1.64E-03	1.23E-03	1.04E-03
120000	1.77E-03	1.33E-03	1.13E-03
130000	1.91E-03	1.43E-03	1.22E-03
140000	2.05E-03	1.53E-03	1.30E-03
150000	2.18E-03	1.64E-03	1.39E-03
160000	2.32E-03	1.74E-03	1.48E-03
170000	2.46E-03	1.84E-03	1.57E-03
180000	2.59E-03	1.94E-03	1.65E-03
190000	2.73E-03	2.05E-03	1.74E-03
200000	2.86E-03	2.15E-03	1.83E-03
210000	3.00E-03	2.25E-03	1.91E-03
220000	3.14E-03	2.35E-03	2.00E-03
230000	3.27E-03	2.46E-03	2.09E-03
240000	3.41E-03	2.56E-03	2.17E-03
250000	3.55E-03	2.66E-03	2.26E-03
260000	3.68E-03	2.76E-03	2.35E-03
270000	3.82E-03	2.86E-03	2.43E-03
280000	3.96E-03	2.97E-03	2.52E-03
290000	4.09E-03	3.07E-03	2.61E-03

Table 5.1: Total deformation

In this graph 5.1 maximum total deformation is 4.20E-03 in uniform. The difference between uniform and tapered is 15%.



Graph 5.1: Total deformation

2) For 250m height (Dynamic)

TOTAL DEFORMATION			
TIME	UNIFORM	TAPERED	UNIFORM +TAPERED
1	5.70E-05	4.84E-05	4.12E-05

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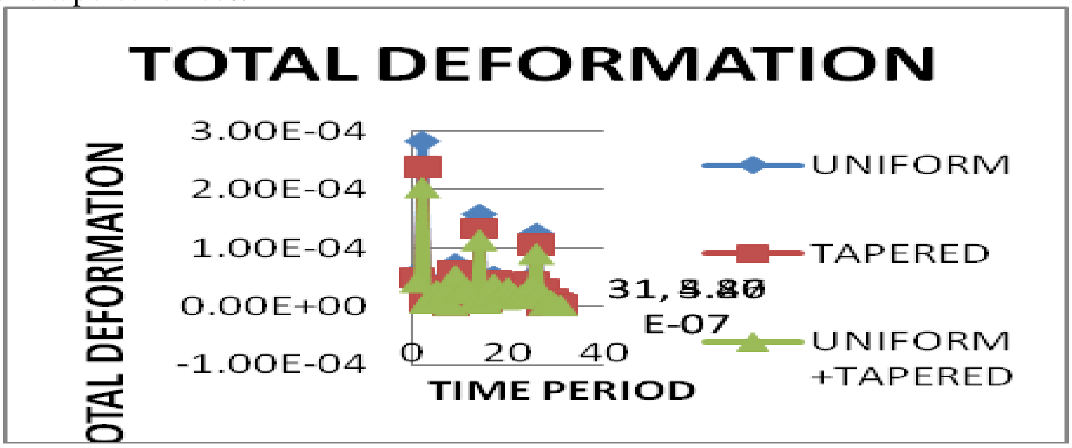
2	2.82E-04	2.40E-04	2.04E-04
3	7.95E-06	6.75E-06	5.74E-06
4	2.35E-05	2.00E-05	1.70E-05
5	3.58E-05	3.04E-05	2.59E-05
6	1.87E-05	1.59E-05	1.35E-05
7	3.89E-05	3.31E-05	2.81E-05
8	1.43E-06	1.22E-06	1.03E-06
9	7.19E-05	6.11E-05	5.20E-05
10	3.12E-05	2.65E-05	2.25E-05
11	3.67E-05	3.12E-05	2.65E-05
12	3.48E-05	2.96E-05	2.52E-05
13	1.08E-05	9.21E-06	7.83E-06
14	1.57E-04	1.33E-04	1.13E-04
15	8.05E-06	6.84E-06	5.82E-06
16	2.50E-05	2.13E-05	1.81E-05
17	5.10E-05	4.33E-05	3.68E-05
18	2.01E-05	1.71E-05	1.45E-05
19	1.62E-05	1.38E-05	1.17E-05
20	4.26E-05	3.62E-05	3.08E-05
21	2.91E-05	2.47E-05	2.10E-05
22	1.82E-05	1.55E-05	1.31E-05
23	2.65E-05	2.26E-05	1.92E-05
24	2.35E-05	2.00E-05	1.70E-05
25	4.84E-05	4.11E-05	3.50E-05
26	1.24E-04	1.06E-04	8.97E-05
27	3.25E-05	2.76E-05	2.35E-05
28	1.82E-06	1.55E-06	1.32E-06
29	1.27E-05	1.08E-05	9.19E-06
30	3.79E-06	3.22E-06	2.74E-06
31	5.26E-07	4.47E-07	3.80E-07

Table 5.2: Total deformation

In this graph 5.2 maximum total deformation is 2.75E-04 in uniform. The difference between uniform and tapered is 10%.



Graph 5.2: Total deformation

3) For 200m height (Static)

TOTAL DEFORMATION

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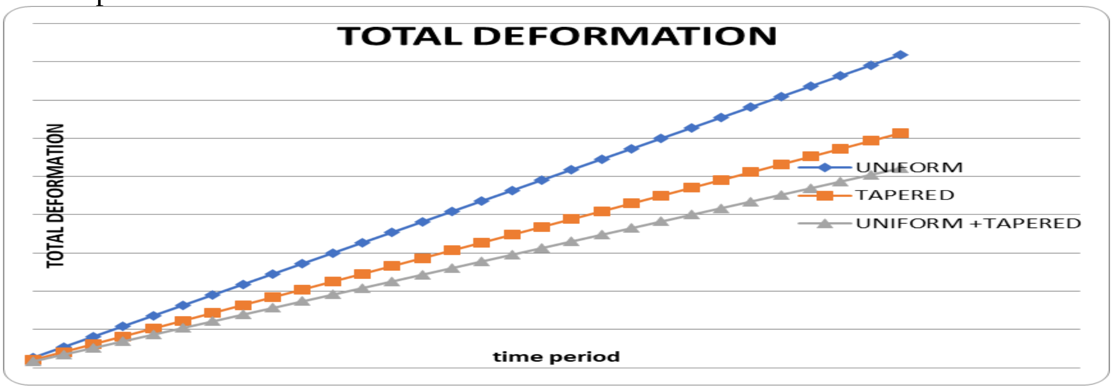
LOAD	UNIFORM	TAPERED	UNIFORM +TAPERED
0	1.36E-04	1.02E-04	8.70E-05
10000	2.73E-04	2.05E-04	1.74E-04
20000	4.09E-04	3.07E-04	2.61E-04
30000	5.46E-04	4.09E-04	3.48E-04
40000	6.82E-04	5.12E-04	4.35E-04
50000	8.18E-04	6.14E-04	5.22E-04
60000	9.55E-04	7.16E-04	6.09E-04
70000	1.09E-03	8.18E-04	6.96E-04
80000	1.23E-03	9.21E-04	7.83E-04
90000	1.36E-03	1.02E-03	8.70E-04
100000	1.50E-03	1.13E-03	9.57E-04
110000	1.64E-03	1.23E-03	1.04E-03
120000	1.77E-03	1.33E-03	1.13E-03
130000	1.91E-03	1.43E-03	1.22E-03
140000	2.05E-03	1.53E-03	1.30E-03
150000	2.18E-03	1.64E-03	1.39E-03
160000	2.32E-03	1.74E-03	1.48E-03
170000	2.46E-03	1.84E-03	1.57E-03
180000	2.59E-03	1.94E-03	1.65E-03
190000	2.73E-03	2.05E-03	1.74E-03
200000	2.86E-03	2.15E-03	1.83E-03
210000	3.00E-03	2.25E-03	1.91E-03
220000	3.14E-03	2.35E-03	2.00E-03
230000	3.27E-03	2.46E-03	2.09E-03
240000	3.41E-03	2.56E-03	2.17E-03
250000	3.55E-03	2.66E-03	2.26E-03
260000	3.68E-03	2.76E-03	2.35E-03
270000	3.82E-03	2.86E-03	2.43E-03
280000	3.96E-03	2.97E-03	2.52E-03
290000	4.09E-03	3.07E-03	2.61E-03

Table 5.3: Total deformation

In this graph 5.3 maximum total deformation is 4.25E-03 in uniform. The difference between uniform and tapered is 20%.



Graph 5.3: Total deformation

4) For 200m height (Dynamic)

TOTAL DEFORMATION			
TIME	UNIFORM	TAPERED	UNIFORM +TAPERED
1	3.66E-05	3.26E-05	2.77E-05
2	1.81E-04	1.61E-04	1.37E-04
3	5.10E-06	4.54E-06	3.86E-06
4	1.51E-05	1.34E-05	1.14E-05
5	2.30E-05	2.05E-05	1.74E-05
6	1.20E-05	1.07E-05	9.11E-06
7	2.50E-05	2.23E-05	1.89E-05
8	9.20E-07	8.19E-07	6.96E-07
9	4.62E-05	4.11E-05	3.50E-05
10	2.00E-05	1.78E-05	1.51E-05
11	2.36E-05	2.10E-05	1.79E-05
12	2.24E-05	1.99E-05	1.69E-05
13	6.96E-06	6.19E-06	5.26E-06
14	1.01E-04	8.98E-05	7.63E-05
15	5.17E-06	4.60E-06	3.91E-06
16	1.61E-05	1.43E-05	1.22E-05
17	3.28E-05	2.92E-05	2.48E-05
18	1.29E-05	1.15E-05	9.78E-06
19	1.04E-05	9.29E-06	7.89E-06
20	2.74E-05	2.44E-05	2.07E-05
21	1.87E-05	1.66E-05	1.41E-05
22	1.17E-05	1.04E-05	8.84E-06
23	1.71E-05	1.52E-05	1.29E-05
24	1.51E-05	1.34E-05	1.14E-05
25	3.11E-05	2.77E-05	2.35E-05
26	7.98E-05	7.10E-05	6.03E-05
27	2.09E-05	1.86E-05	1.58E-05
28	1.17E-06	1.04E-06	8.87E-07
29	8.17E-06	7.27E-06	6.18E-06
30	2.44E-06	2.17E-06	1.84E-06
31	3.38E-07	3.01E-07	2.55E-07

Table 5.4: Total deformation

5) For 150m height (static)

TOTAL DEFORMATION			
LOAD	UNIFORM	TAPERED	UNIFORM +TAPERED
0	1.36E-04	1.02E-04	8.70E-05
10000	2.73E-04	2.05E-04	1.74E-04
20000	4.09E-04	3.07E-04	2.61E-04
30000	5.46E-04	4.09E-04	3.48E-04
40000	6.82E-04	5.12E-04	4.35E-04
50000	8.18E-04	6.14E-04	5.22E-04
60000	9.55E-04	7.16E-04	6.09E-04
70000	1.09E-03	8.18E-04	6.96E-04

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80000	1.23E-03	9.21E-04	7.83E-04
90000	1.36E-03	1.02E-03	8.70E-04
100000	1.50E-03	1.13E-03	9.57E-04
110000	1.64E-03	1.23E-03	1.04E-03
120000	1.77E-03	1.33E-03	1.13E-03
130000	1.91E-03	1.43E-03	1.22E-03
140000	2.05E-03	1.53E-03	1.30E-03
150000	2.18E-03	1.64E-03	1.39E-03
160000	2.32E-03	1.74E-03	1.48E-03
170000	2.46E-03	1.84E-03	1.57E-03
180000	2.59E-03	1.94E-03	1.65E-03
190000	2.73E-03	2.05E-03	1.74E-03
200000	2.86E-03	2.15E-03	1.83E-03
210000	3.00E-03	2.25E-03	1.91E-03
220000	3.14E-03	2.35E-03	2.00E-03
230000	3.27E-03	2.46E-03	2.09E-03
240000	3.41E-03	2.56E-03	2.17E-03
250000	3.55E-03	2.66E-03	2.26E-03
260000	3.68E-03	2.76E-03	2.35E-03
270000	3.82E-03	2.86E-03	2.43E-03
280000	3.96E-03	2.97E-03	2.52E-03
290000	4.09E-03	3.07E-03	2.61E-03

Table 5.5: Total deformation

Graph 5.5: Total deformation

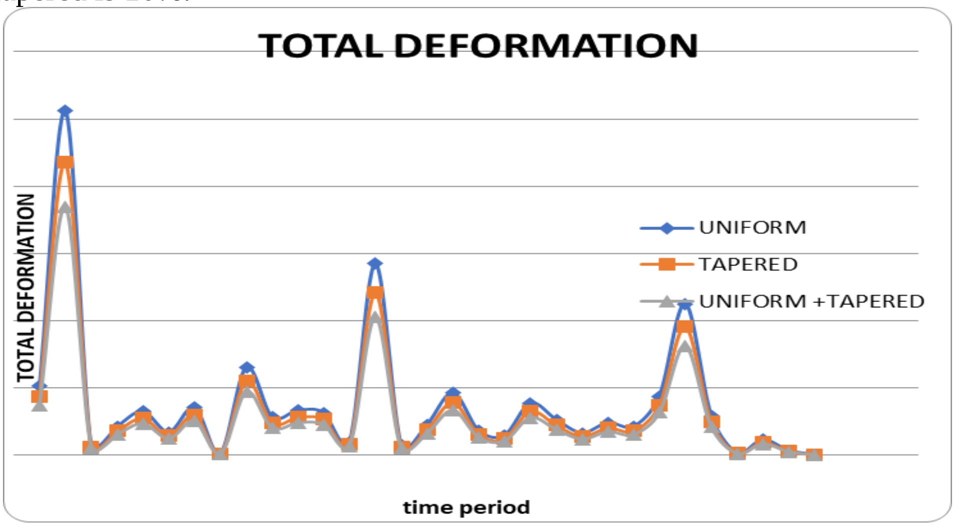
6) For 150m height (Dynamic)

TOTAL DEFORMATION			
TIME	UNIFORM	TAPERED	UNIFORM +TAPERED
1	2.07E-05	1.76E-05	1.49E-05
2	1.02E-04	8.70E-05	7.40E-05
3	2.88E-06	2.45E-06	2.08E-06
4	8.53E-06	7.25E-06	6.16E-06

5	1.30E-05	1.10E-05	9.38E-06
6	6.80E-06	5.78E-06	4.92E-06
7	1.41E-05	1.20E-05	1.02E-05
8	5.20E-07	4.42E-07	3.76E-07
9	2.61E-05	2.22E-05	1.89E-05
10	1.13E-05	9.61E-06	8.17E-06
11	1.33E-05	1.13E-05	9.63E-06
12	1.26E-05	1.07E-05	9.13E-06
13	3.93E-06	3.34E-06	2.84E-06
14	5.70E-05	4.84E-05	4.12E-05
15	2.92E-06	2.48E-06	2.11E-06
16	9.08E-06	7.72E-06	6.56E-06
17	1.85E-05	1.57E-05	1.34E-05
18	7.30E-06	6.21E-06	5.28E-06
19	5.89E-06	5.01E-06	4.26E-06
20	1.55E-05	1.31E-05	1.12E-05
21	1.06E-05	8.98E-06	7.63E-06
22	6.60E-06	5.61E-06	4.77E-06
23	9.63E-06	8.19E-06	6.96E-06
24	8.53E-06	7.25E-06	6.16E-06
25	1.76E-05	1.49E-05	1.27E-05
26	4.51E-05	3.83E-05	3.26E-05
27	1.18E-05	1.00E-05	8.52E-06
28	6.62E-07	5.63E-07	4.78E-07
29	4.62E-06	3.92E-06	3.33E-06
30	1.38E-06	1.17E-06	9.94E-07
31	1.91E-07	1.62E-07	1.38E-07

Table 5.6: Total Deformation

In this graph 5.6 maximum total deformation is 1.15E-04 in uniform. The difference between uniform and tapered is 10%.



Graph 5.6: Total Deformation

6.Conclusion

Most commonreasons observed that-

1. It is found that for various height of RCC chimney more displacement is observed in uniform section as compared to tapered section. This statement suggests that when comparing RCC chimneys with different sections (uniform vs. tapered), more displacement is observed in chimneys with a uniform section. This could imply that tapered sections offer better resistance to displacement, possibly due to their distribution of structural loads
2. As height of chimney increased the total displacement, principal stresses are also increased. Here, it's indicated that there is a direct relationship between the height of the chimney and both the total displacement and principal stresses experienced by the structure. As the chimney gets taller, it experiences more displacement and higher stresses, which is understandable given the increased load and leverage
3. For stability of tall chimney above 300m base isolation should be provided. This statement recommends the implementation of base isolation techniques for tall chimneys exceeding 300 meters in height to ensure their stability. Base isolation involves decoupling the structure from the ground motion using various damping systems, which can mitigate the effects of seismic activity and other dynamic forces on tall structures

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