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MULTI STORIED (G + 6) JEWELLERY SHOWROOM BUILDING, WIND LOAD MANUAL CALCULATION

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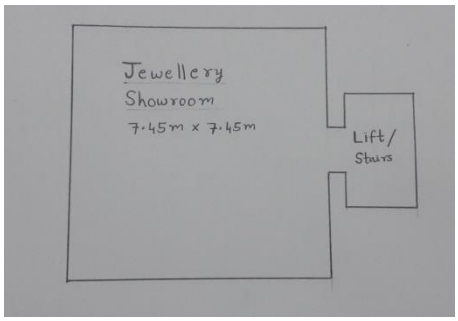
***Abstract*— Construction of multi-storied buildings are becoming necessary for modern growing cities because of deficiency of available land for construction. This problem is global. Tall buildings are susceptible to wind action. A tall building means which consists of 6 to 100 stories or more. Wind loads and its impact are the key factors for their structural design. The horizontal forces due to wind are assumed to act at each of the floor levels and they induce axial forces in the columns and bending moments in all the members of the frame.**

Keywords— ***Wind loads, Tall buildings, Design wind speed***

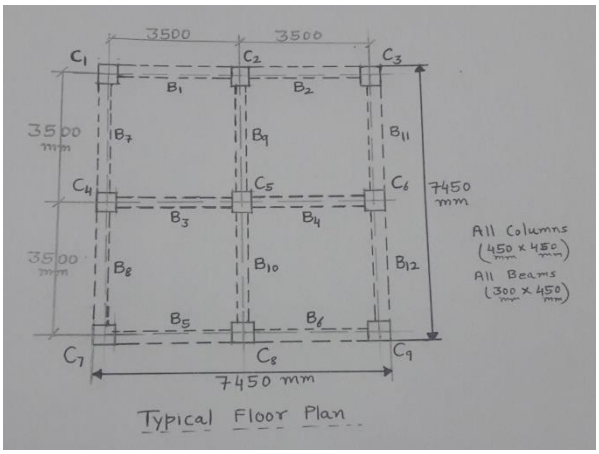
I. INTRODUCTION

Buildings are subjected to horizontal loads due to wind pressure acting on the buildings. The horizontal wind pressures act on vertical external walls and exposed area of the buildings. The infill walls act as vertical plate supported at top and bottom by floor beams, thus transferring the loads at slab levels. For simplicity, the wind loads acting on exposed surfaces of a given storey are idealized to be supported by upper and lower floors. This G + 6 jewellery showroom building is analyzed for wind load. In wind load analysis, we adopt I.S. 875 part III.

II. PLAN OF G + 6 STRUCTURE



This Showroom building consisting of two blocks, one is functional block (Show -Room) and another is service block (Lift / Stairs etc). The Lift / Stairs block is structurally independent of Show room block.



The typical floor plan of G + 6 jewellery showrooms building of area 55.50 sq. m. which is proposed in **Jodhpur** is shown above.

III. STRUCTURE ANALYSIS

Our building is situated at Jodhpur. Regional basic wind speed V_b is 47 m/sec. Design period of this building is taken 50 years, so risk coefficient factor k_1 = 1. Our proposed showroom building location is main business street of the city, so I have chosen terrain category IV. The topography factor k_3 and importance factor k_4 both are 1. As per I.S. 875 part III, section 6.1.1 wind directionality factor k_d is taken as 0.9. Also as per section 6.1.2, the area averaging factor k_a for tributary area 89.25 sq. m. is taken as 0.814. For our case combination factor is considered as 1.

Nodes are considered at the centre of beam – column joint. Any node is in-charge of half the height of upper floor and half the height of the lower floor. For simplicity and safer side, the wind pressure at the top of the node area is determined and

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will be considered over that whole area under that particular node. Force coefficient c_f for a/b =1 and h/b = 3.423 is 1.3.
For internal frame C4- C5 - C6, wind load (F) in KN is calculated at the top of node concerning area for each node and shown in the table below.

Node	Concerning region of node	V_b	k_1	k_2	k_3	k_4	V_z	P_z	k_d	k_e	C_f	P_d	A_e	F
G-G	0.0 m to 1.637 m	47	1	0.8 at 1.637 m ht.	1	1	37.6 m/s	848.256 N/m^2	0.9	0.814	1	621.432 N/m^2	1.3	6.097 m^2	4.925 KN
1-1	1.637 m to 5.025m	47	1	0.8 at 5.025 m ht.	1	1	37.6 m/s	848.256 N/m^2	0.9	0.814	1	621.432 N/m^2	1.3	13.037 m^2	10.532 KN
2-2	5.025 m to 8.525 m	47	1	0.8 at 8.525 m ht.	1	1	37.6 m/s	848.256 N/m^2	0.9	0.814	1	621.432 N/m^2	1.3	13.037 m^2	10.532 KN
3-3	8.525 m to 12.025 m	47	1	0.8 at 12.025 m ht.	1	1	37.6 m/s	848.256 N/m^2	0.9	0.814	1	621.432 N/m^2	1.3	13.037 m^2	10.532 KN
4-4	12.025 m to 15.525 m	47	1	0.8 at 15.525 m ht.	1	1	37.6 m/s	848.256 N/m^2	0.9	0.814	1	621.432 N/m^2	1.3	13.037 m^2	10.532 KN
5-5	15.525 m to 19.025 m	47	1	0.8 at 19.025 m ht.	1	1	37.6 m/s	848.256 N/m^2	0.9	0.814	1	621.432 N/m^2	1.3	13.037 m^2	10.532 KN
6-6	19.025 m to 22.525 m	47	1	0.843 at 22.525 m ht	1	1	39.621 m/s	941.894 N/m^2	0.9	0.814	1	690.031 N/m^2	1.3	13.037 m^2	11.695 KN
7-7	22.525 m to 25.50 m	47	1	0.8935 at 25.5 m ht.	1	1	41.994 m/s	1058.098 N/m^2	0.9	0.814	1	775.163 N/m^2	1.3	11.081 m^2	11.166 KN

Table 1. Showing Calculation of Wind load

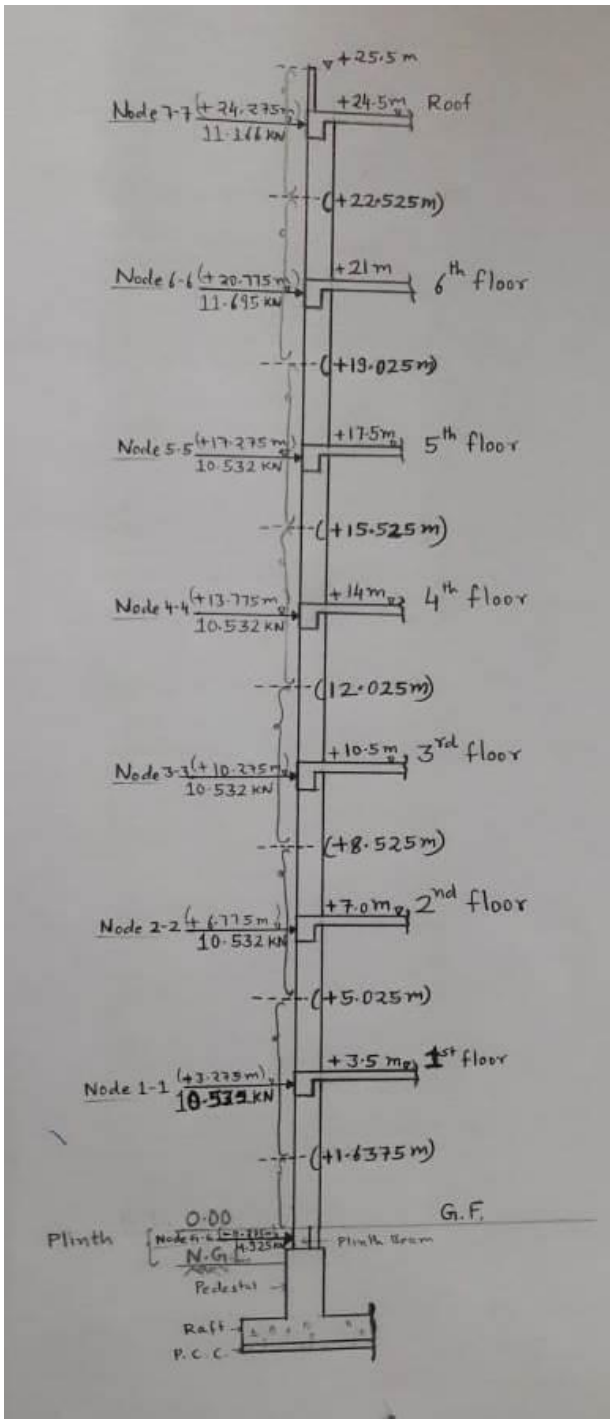

Fig. 1. Section showing levels and force acting on various node points

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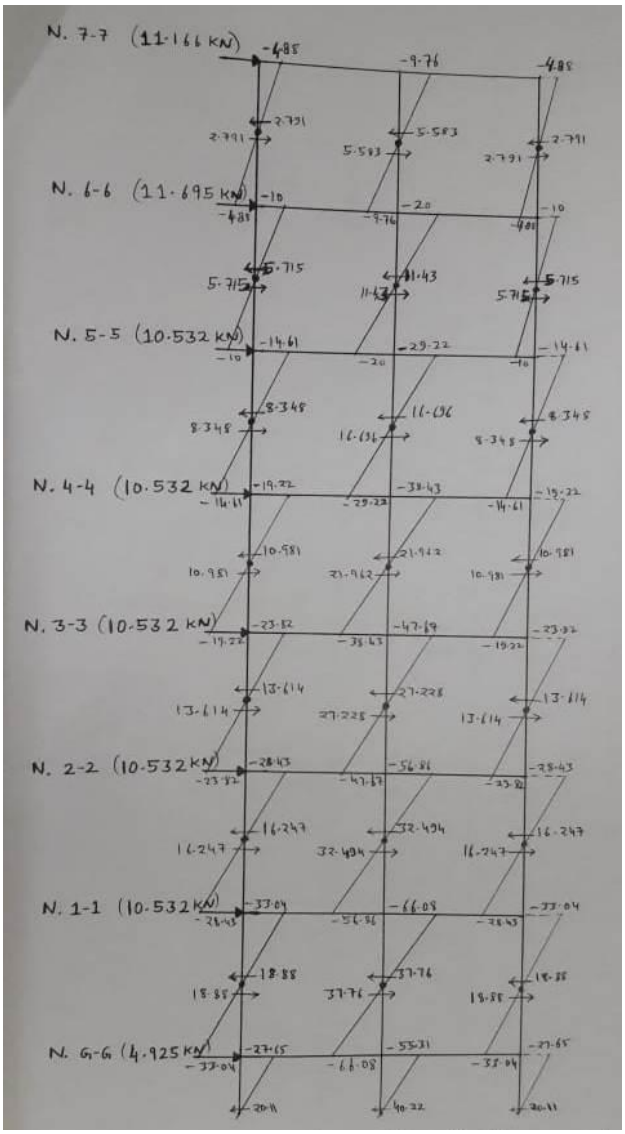

Fig. 2. Diagram showing columns shear and moment for internal frame $C_4 – C_5 - C_6$

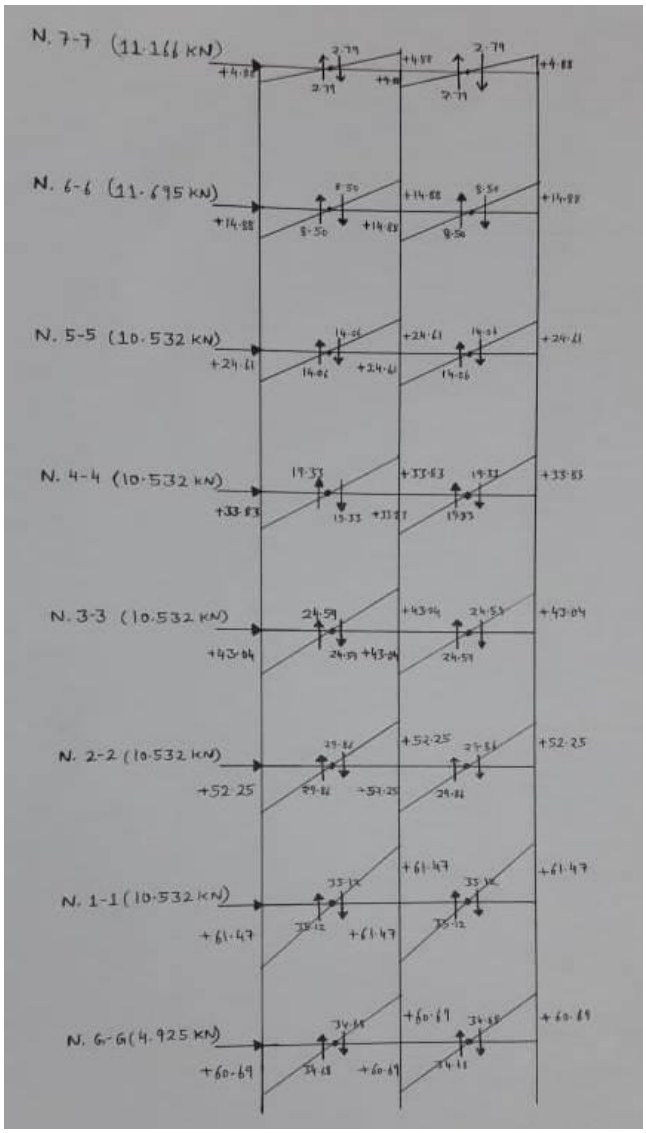

Fig. 3. Diagram showing girders moment and shear for internal frame $C_4 – C_5$-C_6

IV. CONCLUSION

As per clause 22.4.3 of Indian Standard "Plain and Reinforced Concrete – Code of Practice", I.S. Code 456: 2000, "For lateral loads, simplified methods may be used to obtain the moments and shears for structures that are symmetrical" so here I have manually calculated details about impact of wind load on this structure. By analyzing this building, we have better idea and knowledge about the wind load action. By doing manual design we have gained more knowledge than analyze using software tools and in this project, we are more

familiar with code books also. We have faced the real engineering practice in this project.

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