

STRUCTURAL AUDIT REPORT
FOR
“VISHAL SAHYADRI CO – OP HSG. SOC. LTD”,
“B6 – WING”
SITUATED AT
SAHYADRI NAGAR, CHARKOP,
KANDIVALI (W) MUMBAI – 400 067



PREPARED BY
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978/B6/LSS/2021

JULY 19, 2021

INTRODUCTION:

"Vishal Sahyadri Co – Operative Housing Soc. Ltd", B6 – Wing Regi. No. BOM/HSG/5697/1979 Situated at Sahyadri Nagar, Charkop, Kandivali (W) Mumbai – 400 067 had requested to **Latesh S. Sanklecha, Consulting Structural Engineer** to inspect the structures.

WHEN IS CONSIDERED THERE IS WATER SEEPAGE / LEAKAGE?

When one of the following signs or the combination of the following signs in your building which causes water to seep inside the structure:-

- Improper workmanship.
- Deficiencies in construction.
- Cracks in the RCC member.
- Cracks in the Plaster.
- Blistering of external paint.
- Moisture, wetness or signs of capillary dampness on wall.
- Water marks or stains marks on the wall, ceiling. or roof of the building.
- Growth of vegetation on the exteriors roof & walls.



SCOPE OF SURVEY:

In order to analyze the condition of the structure & give a comprehensive report.

The said site visit was mainly to find out the general condition of the structure, nature & extent of the damage. Structural Members & their effect on the stability of the structure.

Assessment of Non – Structural work such as external plaster, plumbing/ Drainage work, waterproofing of R.C.C. cantilever chajjas, Terrace waterproofing, overhead water tanks and assessing the optimal repair required.

Visual inspection of the building & individual units with respect to the stability of structure, the damages noticed in Structural Members.

Following is our detailed report incorporating of our observations and interpretation & photographs of distresses & emerging recommendations.

Specific documentation of the existing structural provision was not available & also architectural drawing of the structure was not available for our reference.



DESCRIPTION OF THE STRUCTURE:

"**Vishal Sahyadri Co – Op Housing Society Ltd.**" Regi. No. BOM/HSG/5697/1979 consists of 63 wings known as "B1 to B17, A1, A2, C1 to C22, D2A to D2L" and D3A to D3L. Total 2,154 flats are in "**Vishal Sahyadri Co – Op Housing Society Ltd.**"

B6 – wing consists of Ground plus Upper Four floors.

B6 – wing consists of Total 30 flats.

The building is provided with regular sufficient opening and in staircase mid landing opening is provided for ventilation.

Building is constructed with beam column frame structure the load of slab is transfer on beam & from beam it is transferred on column.

YEAR OF CONSTRUCTION:

The building was constructed in 1980 as reported.

HISTORY OF THE REPAIRS:

No Repair work has been carried out recently.



METHOD OF INVESTIGATION:

The structure was surveyed internally & externally, floor wise & unit wise to assess the condition of structural deterioration due to the following environmental stresses.

- i. Effects of corrosion on the structural members due to weather condition.
- ii. Faults in construction.
- iii. Seepage of water.
- iv. Ageing / fatigue of structure.
- v. Plumbing line condition.

At the time of detail field survey, we have noticed major distress in the plumbing work and at some portion structural member's i.e. in column, beams & slabs the status surveyed can be summarized.



INTERPRETATION OF NON DESTRUCTIVE TEST RESULTS

Non Destructive evaluation carried out on the selected RCC structural member.

Total 12 locations were tested for NDT.

REBOUND HAMMER TEST

Total 4 locations were selected for Rebound Hammer Test.

Rebound Hammer was tested for compressive strength at surface by Schmidt rebound hammer. Results indicate the compressive strength at surface of all the RCC columns is ranging between 13.70 MPa to 21.80 MPa.

UPV TEST

Total 4 locations were selected for UPV tests, on columns.

The UPV values are ranging between 2.0 Km/Sec to 3.50 Km/Sec.

Out of 4 locations 2 locations was below 3.0 Km/Sec means concrete quality is poor and 2 locations ranging between 3.0 to 3.75 Km/Sec means concrete quality is doubtful.

This indicates there are progressive internal cracks in the RCC members due to corrosion of reinforced steel. These members are under distress condition.

Overall, condition of concrete is good, but distressed RCC member's needs immediate repair with suitable repair system.

RCC elements indicating UPV values less than 3 Km/sec needs immediate attention.



HALF CELL POTENTIAL TEST

Half Cell Potential tested for corrosion activity by half – cell potential tests. Values are taken on Column. The result on tested column is – 320 mV.

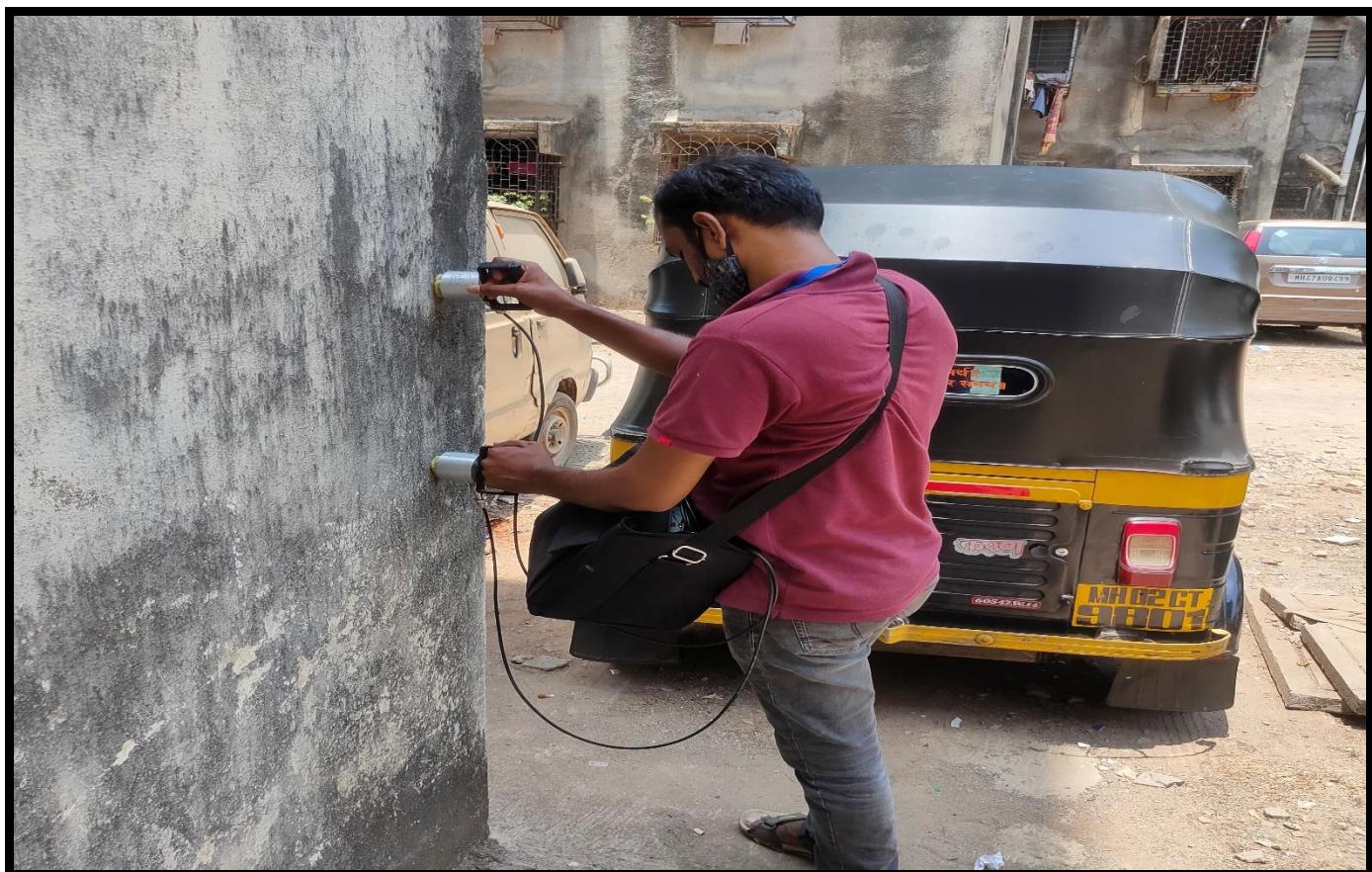
This indicates the probability of corrosion is 50% on tested column steel reinforcement.

CARBONATION TESTS

Carbonation tests are conducted to assess the passivity of concrete cover above the reinforcement bars. If the carbonation depth is reached to the reinforced steel bars, it initiates corrosion activity in the steel.

Carbonation test was conducted to assess carbonation depth. Readings are taken on Column. Result indicates the carbonation penetration depth is 40.00 mm. Carbonation depths have reached to the reinforcement level in all of the RCC elements. It is essential to give a suitable anti-corrosion treatment to all the RCC members to stop further carbonation and corrosion of concrete.

NON -DESTRUCTIVE TEST PHOTO





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CONSULTING STRUCTURAL ENGINEER "VISHAL SAHYADRI CO – OP HSG. SOC. LTD" B6 – WING

PROFORMA - B

| | | |
|---|---|--|
| | Sub: Structural Audit | |
| | Name Of The Consultant : Latesh S. Sanklecha, Consulting Structural Engineer | |
| 1 | Name Of The Structure: | "Vishal Sahyadri Co – Operative Housing Soc. Ltd.", B6 – Wing Situated at Sahyadri Nagar, Charkop, Kandivali (W) Mumbai – 400 067. |
| 2 | CTS No./Ward | - |
| 3 | No Of Storey | Ground plus upper four storeys. |
| 4 | Year Of Construction | 1980 |
| 5 | User Department | Residential Building. |
| 6 | Mode Of Construction Of Existing | |
| | a) Foundation | Not Shown |
| | b) Floors | R.C.C. slab |
| | c) Walls | Brick Masonry |
| | 4) Beams | R.C.C. Beam |
| | 5) Columns | R.C.C. Beam |
| | 6) Roof | R. C. C. Flat Roof. |
| 7 | History Of Repairs Done Year Wise | |
| | a) Slab Recasting | No |
| | b) Column Jacketing | No |
| | 1) Structural Repair | No |
| | 2) Tenantable Repairs | Yes |
| | 3) Roof/Plumbing | No |
| | 4) Addition/Alteration If Any | Yes |
| 8 | Date Of Inspection By Consultant | July 17, 2021 |
| 9 | Condition Of :- | |
| | 1) Internal Plaster | Major cracks and leakage marks observed |
| | 2) External Plaster | Major crack observed. |
| | 3) Plumbing | Leakage found. |
| | 4) Drains/Chambers | Not shown |



| | | |
|----|---|---|
| 10 | Observation:- | |
| | a) Doors And Windows Don't Close | None |
| | b) Columns And steel Exposed | Ceiling & beam concrete get damaged & Steel exposed & corroded observed at a few locations internally. |
| | c) Settlement uneven flooring gaps between and skirting & floor | None |
| | d) Foundation settlement | Foundation not shown. |
| | e) Deflections of slab at some places. | Deflection not found but plaster debonded. |
| | f) Major cracks in column / beams | Cracks of varying depth and lengths are observed in column and beam at different location, steel corrosion on reinforcement bars observed inside flats. |
| | g) Seepages / Leakages s | Marks of seepage from external face area observed on inside of walls at various locations. |
| | h) Staircase area / column condition | Leakage marks and major cracks observed at several places. Repair required immediately. |
| | i) Lift walls | None |
| | j) U. G. Tank | Not seen. |
| | k) Deflection / Sagging OHT / Column condition | Cracks & leakage observed on OHT wall. |
| | l) Parapet at terrace | Major cracks observed. |
| | m) Chajjas | Damaged Concrete observed & steel was corroded. |
| | n) Common areas | Distress found and marked in report. |
| | o) Toilet blocks | Leakage marks observed. |
| | p) Terrace / Water proofing | At few locations hollow sound & cracks observed on terrace surface & parapet wall. |
| 11 | Test carried out on structural / observations Findings Range as per IS Code therefore: Non Destructive Test (NDT) | |
| | a) Ultrasonic pulse velocity Test | The UPV values are ranging between 2.0 Km/Sec to 3.50 Km/Sec. |



| | | | |
|-----|---|--|-------------------|
| | b) Rebound Hammer Test | Results indicate the compressive strength at surface of the entire RCC member is ranging between 13.70 MPa to 21.80 MPa. | |
| | c) Half Cell Potential Test | The result is on column is lies between - 200 mV to - 350 mV. | |
| | d) Carbonation Depth Test | Result indicates the carbonation penetration depth on column is 40.00 mm. | |
| | e) Compressive Test (Core Test) | 13.76 Mpa | |
| | f) Concrete Chemical Test | pH – 8.5, Chloride – 0.401 Kg / M ³ Sulphate So3 – 2.90% | |
| 12 | Distress Mapping Plan & photographs with caption below about description of structural members and its location | Mention in report | |
| 13 | Brief Description of repairs to be done | | |
| | a) Water Proofing | Please Refer Report | |
| | b) External Plaster | Please Refer Report | |
| | c) Structural Repairs | | |
| | i. Column Jacketing | Please Refer Report | |
| | ii. Slab recasting | Please Refer Report | |
| | iii. RCC cover to be replaced | Please Refer Report | |
| | iv. Beam recasting | Please Refer Report | |
| | d) Partial Evacuation during repairs needed | No | |
| | e) Propping | No | |
| 14 | CONCLUSIONS OF CONSULTANTS | OBSERVATIONS | KEY REASON |
| i | Whether structure is livable / or whether it is to be evacuated / pulled down | Yes / No / No | - |
| ii | Whether structure requires tenantable Repairs / Major structural repairs & its time Frame. | Structural Repairs required. | - |
| iii | Whether structure can be allowed to occupy during course of repairs | Yes | - |
| iv | Nature / Methodology of repairs | Refer Report | - |
| v | Whether structure requires immediate propping. If so, its propping plan Methodology given | No | - |



| | | | | |
|------|--|-----------------|--|---|
| vi | Whether other immediate safety Measures required – what is specific recommendation? | | - | |
| vii | Enhancement in life of structure after repairs / frequency of repairs required in extended life period. | | Repairs will stop further deterioration but could not give additional strength to the structure. | - |
| viii | Projected repair cost / sq. ft. Rs 140 – Rs 180 | | - | - |
| ix | Projected reconstruction cost / sq. ft. Rs 2500 - Rs 3000 | | - | |
| x | Specific remarks whether building needs to be vacated / demolished / repairable | | Nothing. | |
| xi | Whether structure in extremely critical condition | | No | |
| 15 | CRITICAL OBSERVATION – Repair & strengthening of structural member required externally as well as internally on immediate basis so to maintain the health of structure, so distress could not increase in the structural & Non – structural member of the building | | None | |
| 16 | CLASSIFICATION OF BLDG | CATEGORY | AUDITORS FINAL CONCLUSIONS | |
| | Comes Under this Category | C1 | To be evacuated Demolition immediately | |
| | | C2 – A | To be evacuated and or Partial demolition Requiring major Structural Repairs | |
| | | C2 – B | No eviction only structural repairs | |
| | | C3 | No eviction needs minor Repairs only | |



CONCLUSION

On the basis of above reports, it shows that over all condition of the structure from internal & external portion is not good and several cracks and leakage issues are present in most of the internal non – structural members. (Refer Report & Photographs).

Considering the internal part of the structure, there are several damages observed on many places in the flat. Most of the flats having leakage issue mostly during monsoon season this leakage leading to corrosion of reinforcement deteriorating their strength (Refer Reports and Photographs) and damaged concrete of structural member also noted with exposed & corroded steel with hollowness has also been noted in some non – structural member and damaged concrete of structural member also noted with exposed & corroded steel.

Externally distressed observed on the external portion of the structure. We observed internal leakage of lavatory area (Refer Photographs in external observation) and several cracks & vegetation growth observed on the external portion which tends to leakage to the internal flat of the structure.

Externally – We extract core concrete from external façade of the structure and core compressive strength obtain after testing was 13.76 Mpa and ultra – sonic pulse velocity test result was also not satisfactory result is poor and doubtful quality.



Periodic repair & maintenance were not done to maintain the health of the structure internally and externally, so distressed increased in the Structural & Non – Structural member of the building. Major leakage marks and colour peelings are noted at several places in flats and have started the corrosion in reinforcement. The corrosion damaged is in accelerated stages & it would continue to accelerate.

Since the Structure is almost 41 years old, structural & non – structural member loses its strength and also even after carrying out the structural repairs, the life anticipation of the structure will not be guaranteed.

On the basis of N.D.T results and visual inspection, Building comes under **C1 category**; stating to be evacuated Demolition immediately



JULY 19, 2021

CERTIFICATE

In Accordance with Section 28(6) of the Building Control Act (the "Act") and Regulations 4 and 5 of the Building Control (Inspection of Buildings) Regulations (the "Regulations"), I **Mr. Latesh S. Sanklecha**, Consulting Structural Engineer appointed by the Buildings under section 28(3) of the Act have personally visited and inspected the condition of the structure of the building and hereby submit the report of results of our Inspection. I, **Mr. Latesh S. Sanklecha**, certify that the inspection was carried out and report was checked by me and is valid till next six months.

LATESH S. SANKLECHA

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CONSULTING STRUCTURAL ENGINEER

REGISTRATION NO.

MCGM – STR/S/272, TMC – 1012, NMMC – NMMC/TPO/S.E./126



POINTS TO BE NOTED DURING REPAIR

We would like to bring kind attention a few very important points pertaining g to the civil & plumbing repairs.

- I. It is not possible to remove all the construction faults during rehabilitation because the building can't be vacated. Members find it difficult to adjust to the hazards of cement & dust.
- II. The scaffolding support & ties will be required to be anchored on balconies, windows, jambs, Pipes etc. do not loosen or untie any support since this weaken the supports to the scaffolding and in turn endangers the live s of the men working on the scaffolding.
- III. The work will involve a lot of dust and noise during hammering, chiseling & removing the old plaster & concrete. Also there will be a lot of noise & dust during plastering & structural steel strengthening.
- IV. Due to chiseling of plaster, cracks may appear in the inner walls, lintels etc. of the premises adjacent to where work is being carried out & also loose plaster may fall off.
- V. During braking of external plaster & replacement of it with new plaster, the windows & door openings have to be covered by ply boards. The inmates feel suffocated & dark inside, but the window panels have to be protected as it is very expensive to replace them, Moreover it is essential to protect the inmates themselves from falling debris & dust.
- VI. Aluminum window which are fixed on the edge of the plaster are liable to get misaligned / jammed as the plaster on which it is supported is to be replaced.
- VII. If the bottom of beam has to be restored / strengthen or plastered, windows will have to be removed & re fixed. On the re – fixing the size of the opening might be reduced by few inches.



SALIENT FEATURES FOR REGULAR MAINTENANCE –

Every building / Structure must have specific maintenance with proper rules for alterations & renovations.

The following steps would help in proper maintenance of the structure.

- ❖ Attend to seepage / leakage problems immediately i.e. proper filling the flooring joints, window sill joints & all internal leakages problem etc.
- ❖ Vegetation growth, seepage propagation area & visible cracks should be investigated & attended according to the diagnosis of the technical expertise.
- ❖ Periodic checking of entire plumbing system & drainage line should be conducted.
- ❖ During interiors a technical advice should be taken in the benefit of the common structure.
- ❖ Cleaning, Supervising & checking of common areas like water tanks, staircase, and pump room should be conducted.
- ❖ External inspection & painting to be done as it not adds to the aesthetic appearance of the building but it also function as protective coating to concrete & plaster.



OBSERVATION: -

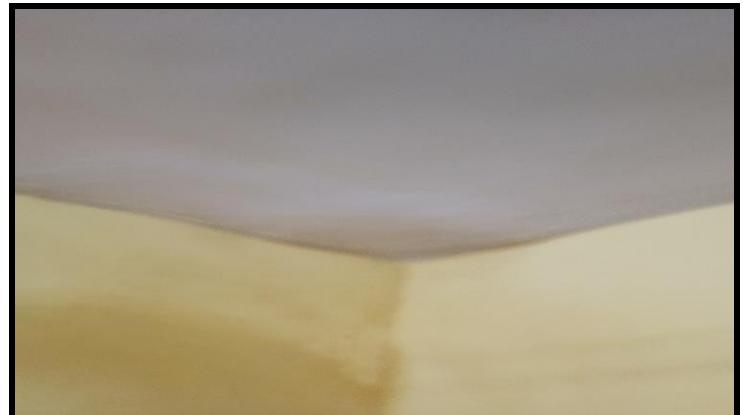
During the said detailed visual inspection; following critical observations noted.

INTERNAL OBSERVATION

GROUND FLOOR

FLAT NO – 01

- ❖ **HALL** – Leakage mark observed on wall.
 - Leakage mark observed on ceiling.
 - Hallow sound observed on wall.
- ❖ **KITCHEN** – Seepage mark observed on ceiling.
- ❖ **PASSAGE** – Plaster gets removed and steel gets exposed. (It may fall)
- ❖ **TOILET & BATH ROOM** – Dampness observed on wall.
 - Peeling of paint observed on ceiling.





FLAT NO – 04

- ❖ **HALL** – Structural crack observed on wall.
 - Peeling of paint observed on wall.
- ❖ **KITCHEN** – Crack observed on chajjas.
- ❖ **PASSAGE** – Patch work observed on wall.
- ❖ **TOILET & BATH ROOM** – Dampness observed on wall.



FIRST FLOOR

FLAT NO – 10

- ❖ **HALL** – Patch work observed on wall.
 - Peeling of paint observed on wall.
 - Hallow sound observed on wall after tapping.
- ❖ **KITCHEN** – Patch work observed on ceiling.
 - Ceiling gets damages.
- ❖ **PASSAGE** – Dampness observed on wall.
- ❖ **TOILET & BATH ROOM** – Seepage mark observed on ceiling.



FLAT NO – 11

❖ **HALL** – Structural crack observed on wall.

- Hallow sound observed on wall after tapping. (**It may fall**)
- Ceiling gets damages.
- Hallow sound observed on beam after tapping. (**It may fall**)

❖ **KITCHEN** – Hallow sound observed on wall after tapping. (**It may fall**)

- Ceiling gets damages.
- Hallow sound observed on beam after tapping. (**It may fall**)
- Peeling of paint observed on wall.

❖ **PASSAGE** – Structural crack observed on ceiling.

- Hallow sound observed on beam after tapping. (**It may fall**)

❖ **TOILET & BATH ROOM** – Seepage mark observed on ceiling.





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SECOND FLOOR

FLAT NO – 16

- ❖ **HALL** – O.K.
- ❖ **KITCHEN** – O.K.
- ❖ **PASSAGE** – O.K.
- ❖ **TOILET & BATH ROOM** – O.K.

FLAT NO – 18

- ❖ **HALL** – O.K.
- ❖ **KITCHEN** – O.K.
- ❖ **PASSAGE** – O.K.
- ❖ **TOILET & BATH ROOM** – O.K.

THIRD FLOOR

FLAT NO – 21

- ❖ **HALL** – O.K.
- ❖ **KITCHEN** – O.K.
- ❖ **PASSAGE** – O.K.
- ❖ **TOILET & BATH ROOM** – O.K.

FLAT NO – 23

- ❖ **HALL** – Hallow sound observed on wall after tapping. (**It may fall**)
 - Ceiling gets damages.
- ❖ **KITCHEN** – Ceiling gets damages.
- ❖ **PASSAGE** – O.K.
- ❖ **TOILET & BATH ROOM** – O.K.





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FOURTH FLOOR

FLAT NO – 28

- ❖ **HALL** – O.K.
- ❖ **KITCHEN** – O.K.
- ❖ **PASSAGE** – O.K.
- ❖ **TOILET & BATH ROOM** – O.K.

FLAT NO – 29

- ❖ **HALL** – Hallow sound observed on beam after tapping.
 - Ceiling gets damages.
 - Peeling of paint observed on wall.
 - Dampness observed on wall.
- ❖ **KITCHEN** – Ceiling gets damages
- ❖ **PASSAGE** – Dampness observed on wall.
- ❖ **TOILET & BATH ROOM** – Dampness observed on wall.
 - Peeling of paint observed on ceiling.





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SATAIRCASE

Terrace to fourth floor:-

- ❖ Structural crack observed on wall.
- ❖ Structural crack observed on beam.
- ❖ Hallow sound observed on wall.
- ❖ Hallow sound observed on beam.
- ❖ Plaster gets removed and steel gets exposed. (**It may fall**)





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Fourth floor to third floor:-

- ❖ Peeling of paint observed on wall.
- ❖ Algae formation observed on ceiling.
- ❖ Major structural crack observed on wall.
- ❖ Hallow sound observed on wall.





Third floor to Second floor:-

- ❖ Peeling of paint observed on wall.
- ❖ Hallow sound observed on ceiling.
- ❖ Ceiling gets damage.



Second floor to First floor:-

- ❖ Peeling of paint observed on wall.
- ❖ Hallow sound observed on ceiling.
- ❖ Ceiling gets damage.
- ❖ Algae formation observed on ceiling.

- ❖ Major structural crack observed on wall.





First floor to ground floor:-

- ❖ Peeling of paint observed on wall.
- ❖ Hallow sound observed on ceiling.
- ❖ Major structural crack observed on wall.





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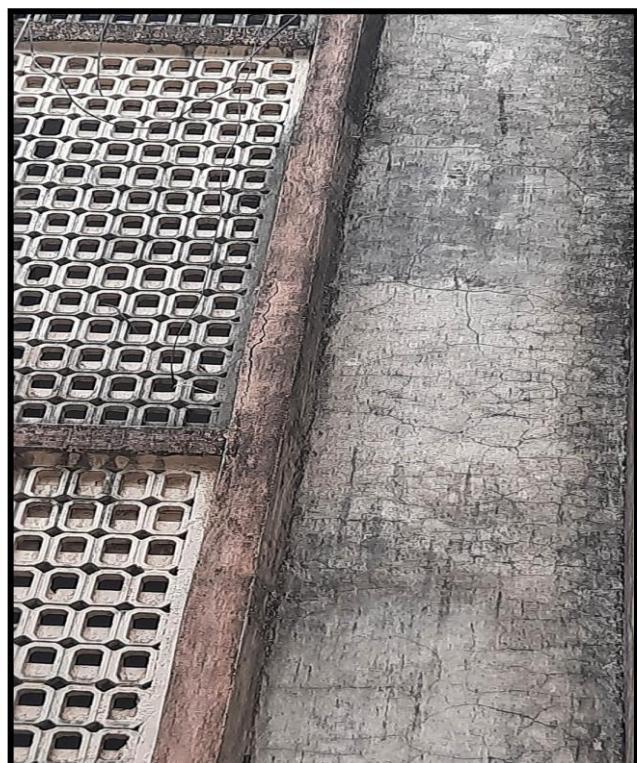
EXTERNAL OBSERVATION

B – 6

GROUND FLOOR

FRONT SIDE

- ❖ Structural crack observed at several places on column.
- ❖ Major crack observed at several places on wall.
- ❖ Vegetation growth observed at several places on wall.



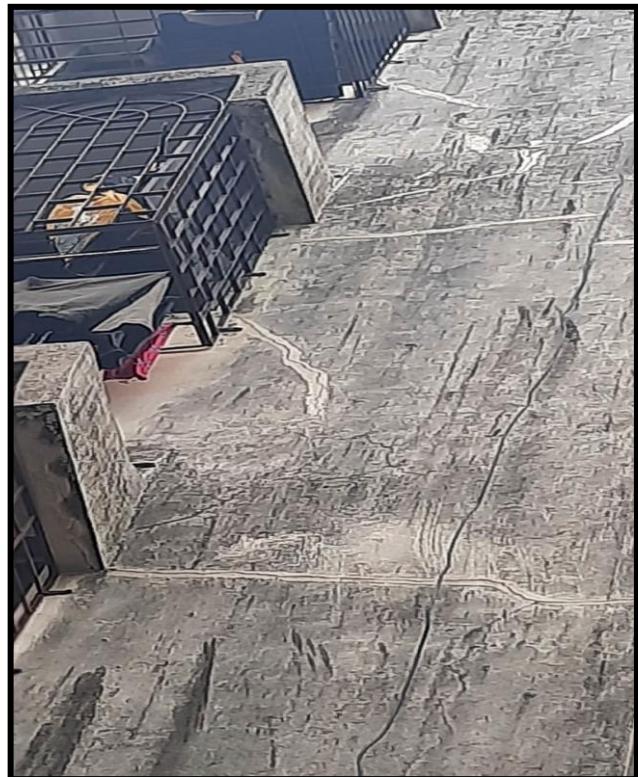


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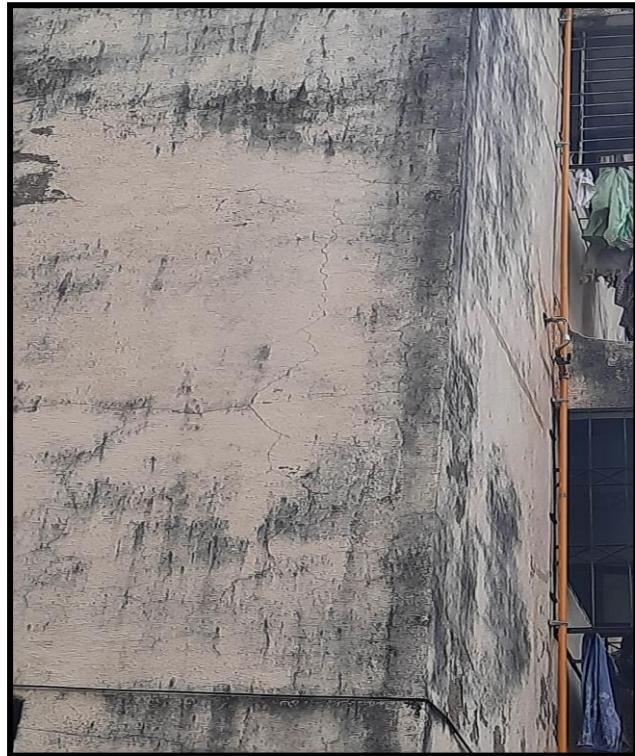
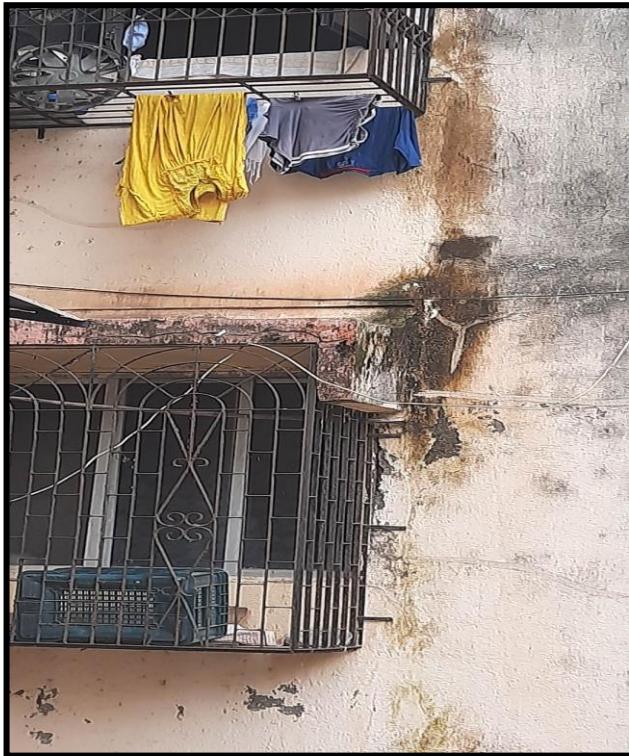
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CONSULTING STRUCTURAL ENGINEER "VISHAL SAHYADRI CO – OP HSG. SOC. LTD" B6 – WING



BACK SIDE

- ❖ Structural crack observed at several places on column.
- ❖ Major crack observed at several places on wall.
- ❖ Vegetation growth observed at several places on wall.



NORTH SIDE

- ❖ O.K.

SOUTH SIDE

- ❖ Structural crack observed at several places on column.
- ❖ Major crack observed at several places on wall.
- ❖ Vegetation growth observed at several places on wall.



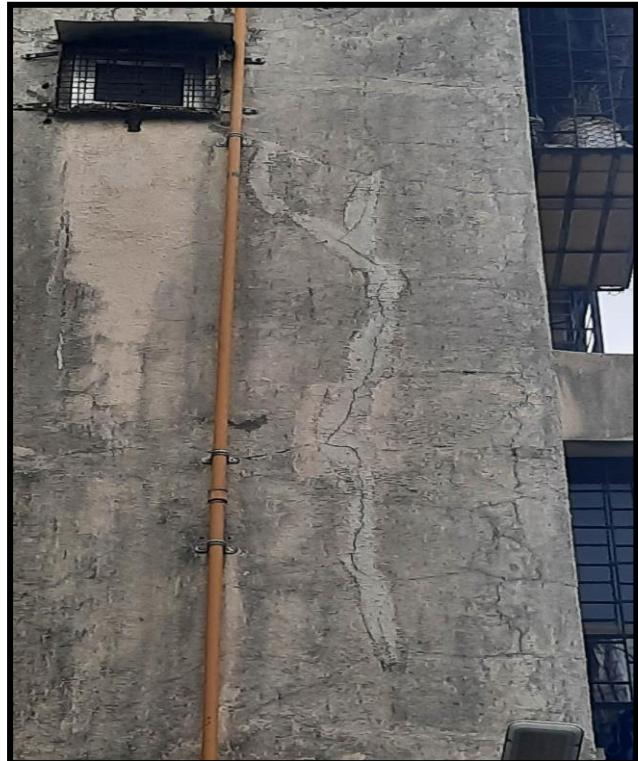


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SUMMARY OF DEFECTS

STRUCTURAL DAMAGES

The structural component of a R.C.C. building consists of the beams, Columns & the Slabs.

Please note that the Chajja & stair case though structural items, independently have been considered as “Non – Structural Items” in the context of their direct impact on the overall structural health of the building.

We would like to mention here that at some locations there are ‘False Ceiling’ presents, such provisions conceal the structural elements & do not permit the required inspection. However in many places distresses / leakages have been observed in ceiling, which indicates probability of having leakage & also the possibility of cracks in the slab above these ‘False ceilings’.

During the survey, some of the R.C.C. Slabs, beams & Columns have been found damages / cracked. These distresses clearly indicate that some amount of corrosion to reinforcement bars has taken place inside the concrete. It may further damage the structure if not controlled at this stage.

The continuous corrosion of reinforcing bars, after reaching a certain stage, loosens the bond with concrete ultimately causing cracks in the concrete cover. As the concrete cover cracks, more corrosion results. Corrosion of reinforcement bar causes reduction in effective diameter of bar & subsequently the bars / the structural members loses strength to a great extent. This produces further cracking in structural members. As seen, concrete cover has given away & exposing the main reinforcement of the structural members. The corrosion process is basically an Electro Chemical Phenomenon.

In reinforced concrete, corrosion produces the rust several times in volume over the original metal causing the reinforcement bar to expand. Due to this they push the concrete from inside subjecting it to tension. Concrete being weak in tension cracks, subsequently the cover concrete cracks. This reduces the effective cross – Section of the reinforcement & concrete, thereby reduces its load carrying capacity. Due to such cracking of concrete, more quantity of water & salts penetrate into the



concrete section expediting the corrosion phenomenon. Hence once the corrosion process initiates, it accelerates progressively till that element of the structure collapses. Hence this damage cycle should be immediately controlled by repairs to avoid accelerated damage to the structure.

This corrosion damages indicates reduction in the strength & load carrying capacity of the structure. These damages are medium to major & noted in the survey details. However, these structural damages need to be attended urgently internally & coated with external surface protection treatment to avoid sudden falling of deteriorated portion & resultant possible damages to life & property.

Further, for foundation of the structure are not available for inspection as the ground floor is occupied, hence we cannot comment on their stability, however, visual inspection of superstructure did not reveal any symptoms regarding foundation related damages.

NON – STRUCTURAL DAMAGES

The non – structural components of a R.C.C. building consists of items such as partition wall, external wall, plastering, painting, plumbing / drainage line & terrace water proofing. The non-structural cracks are mainly separation cracks are mainly on brick masonry walls.

Our observation for these items is as follows –

1. Walls –

The walls shows cracks that in the internal plaster in the form of cracking at few places & walls shows sign of dampness at some places.

2. Leakage Through Pipe Connections –

The water supply line & the drainage pipe are comparatively in fair condition.

3. Bath Room & Toilets –

We identified leakage patches & peeling of paint on some walls & ceilings of Bath Room & Toilets.

4. Stair Case –

We identified some minor cracks and colour peeling on stair case.



PROCEDURE FOR THE STRUCTURAL REPAIRS IN GENERAL (REMEDIAL MEASURES)

- Remove old & crack loose concrete.
- Clean the exposed reinforcement.
- Apply Anti-rusting coat to the reinforcement
- Apply bonding coat to the old concrete.
- Replace the removed concrete with polymer base mortar under the strict supervision of a Consulting Engineer.

STEPS FOR REPAIR/ STRENGTHENING METHODOLOGY FOR COLUMNS, BEAMS ON STILT FLOOR

➤ CHIPPING

Chip off loose and carbonated concrete from surface of existing structural elements with help of chisel and hammer till sound concrete is encountered. Descale the surface of exposed reinforcement with help of brush to remove the rust scales. Carbonated concrete if left in structure shall initiate deterioration process.

➤ MAKING UP OF LOST STEEL AREA

Connect the buckled steel bars by welding additional steel rebar's or by inserting new bars by Hilti to make up for the lost area of steel and providing adequate lap length in the column. The new bars inserted shall be grouted properly by chemical grouting and shall be taken from the footing if required. Also tie the new bars with the old one by providing column links at spacing given in the respective drawing. As far as possible bend the buckled portion flush to the additional reinforcement and avoid cutting of steel in buckled area.

➤ CORROSION TREATMENT

Carry out application of alkaline rust converting primer FEOVERT on corroded steel surface. It has property to attack anode as well as cathode, which is purely alkaline in nature (pH-9.5), so it has no carcinogen activity with concrete.

Follow with application of two coats of **IPNet- RB** anticorrosive epoxy coating for bar protection against future corrosion. Coating is for old as well as newly provided steel. This system (Interpenetrating polymer network system for rebars : IPNet-



RB) once applied on steel shall provide extended protection against future carbonation and chloride attack.

➤ **BONDING COAT**

Bond between new and old concrete is important aspect for effective participation of total cross sectional area of concrete. Selection of type of bond coat is based on, type of stresses bond strata is expected to go and prevailing area where application is to be carried.

Here application of high pot life epoxy bond coat of EPIBOND 21 is suitable. This bond coat is effective in transferring stresses from old to new concrete surface and has the setting time of two which offers sufficient time for fixing of form work and casting of new concrete.

MAKING UP LOST STRENGTH OF CORE OF CONCRETE BY JACKETING THE DAMAGED PORTION BY MICRO-CONCRETE.

Micro-concrete is supplied as a ready to use dry powder. Only specified amount of water is to be added to produce a free – flow non-shrink concrete. The material is a blend of specially processed cement, pre – graded fillers and additives which impart:

- Good early and final strengths due to very low water requirement.
- Controlled expansion to retain the original volume filled even after setting.
- Free flow characteristics without any segregation and bleeding.

After carry out the required form work in damaged areas the micro concrete can be simply pour in the form work. It is fast setting material and offers very good early strength. The form can be removed within the 24 hours.

STEPS FOR EXTERNAL PLASTER

Remove complete external plaster & redo the same with bonding coat & 2 coats of sand faced plaster along with a water proofing chemicals. It is advisable to put a fiber mesh along the junction of RCC beam & bricks work also along the junction of RCC columns & brick work.

STEPS FOR WATER PROOFING



Remove the complete existing brick bat coba. Clean the surface of chajja /slab. Apply one coat of waterproofing chemical. Put the brick bat with proper slope. Finish the surface with waterproofing chemicals.

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CONSOLIDATED NDT TEST RESULTS (UPV / Rebound Hammer / HCP / Carbonation)

| | | | |
|--------------|---|---------------|------------------------------------|
| Customer | Latesh Sanklecha | Building Name | Vishal Sahyadri CHSI, Bldg. No.B06 |
| Site Address | Vishal Sahyadri CHSI, Sahyadri Nagar, Charkop, Kandivali , Mumbai | Report Date | 17-May-21 |
| Project No. | | Building Age | |

NDT Results

| UPV Test Results | | | | RH Test Results | | | | |
|------------------|---------|--------|--|-----------------|---------|--------|------------------------|---------------------------------------|
| Sr. No. | Id Mark | | Corrected Velocity as per probing mode, (km/s) | Remark | Id Mark | | Average Rebound Number | Equiv Cube Strength N/mm ² |
| | Floor | Member | | | Floor | Member | | |
| 1 | Ground | C1 | 2 | Poor | Ground | C1 | → | 13.7 |
| 2 | Ground | C2 | 3.3 | Doubtful | Ground | C2 | → | 20.3 |
| 3 | Ground | C3 | 3.5 | Doubtful | Ground | C3 | → | 21.8 |
| 4 | Ground | B1 | 2 | Poor | Ground | B1 | → | 14.9 |
| | | | | Average | 26 | | 18 | |

| Half-cell Potential Results | | | | Carbonation Test Results | | |
|-----------------------------|---------|--------|--------------------------|--------------------------|------------|------------------------|
| Sr. No. | ID Mark | | Half-cell Potential (mV) | Change in Colour (Y/N) | Carbonated | Carbonation Depth (mm) |
| | Floor | Member | | | | |
| 1 | Ground | C3 | -320 | N | Yes | 40 |

| UPV READING MAX =3.5, MIN =2 | | |
|------------------------------|------------------|-----------------|
| UPV Results Summary | | |
| Criteria | Concrete Quality | No. of readings |
| Above 4.40km/s | Excellent | 0 |
| 3.75 to 4.40 km/s | Good | 0 |
| 3.0 to 3.75 km/s | Doubtful | 2 |
| Below 3.0 km/s | Poor | 2 |

| HCP Results Summary | | |
|---------------------|--------------------------|-----------------|
| Criteria | Probability of corrosion | No. of Readings |
| Less than -200 mV | 10% | 0 |
| -200 mV to -350 mV | 50% | 1 |
| More than -350 mV | 90% | 0 |

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Test Report (Concrete Core)

Date: 01.06.2021

Test Certificate No.

1. Name of Customer
2. Site Name/ Address

3. Sample

a) Description

b) Quantity

c) Type of Test

d) Condition

4. Test method follow if any

5. Date of Testing

: SSLPL/21060106

: Latesh Sanklecha

: Vishal Sahyadri CHSI, Bldg. No. B06, Charkop, Kandivali,
Mumbai.

: Concrete Core

: 01 nos. Sample at each location

: Compressive Strength

: Acceptable

: As per IS: 516-1959 (Reaff.1999), SP-24 Clause 16.3.2

: 01.06.2021

| Sr. No. | Core ID Mark | Date of Coring | Dia in (mm) | Actual Height of Core from Site, mm | Height in (mm) | Area Sq. (mm) | H/D Ratio | Correction Factor as per IS : 516- 1959 | Crushing Load, (kN) | Core Strength (N/mm ²) | Equivalent Cube Strength (N/mm ²) |
|---------|--------------|----------------|-------------|-------------------------------------|----------------|---------------|-----------|---|---------------------|------------------------------------|---|
| 01 | Column No. 3 | 25/05/21 | 68.70 | 129.30 | 120 | 3706 | 1.74 | 0.96 | 42.50 | 11 | 13.76 |

Chemical Parameter:

| Test Parameter | Observed Result | Required value as per IS 456:2000 |
|---|-----------------|---|
| Sulphate as SO ₃ in concrete mix (%) | 2.9 | Less than 4 percent by mass of the cement in the concrete mix |
| Total Acid Soluble Chloride Content Kg/M^3 for Reinforced Concrete Work | 0.401 | Maximum 0.6 Kg/M^3 of concrete |
| pH | 8.5 | |

For SS Laboratory Pvt. Ltd.

Tested by

Authorised Signatory