



TESTING / CONSULTANCY REPORT

MITS Dispatch

Detailed Structural Audit Report of Kendriya Vidyalaya No.3

With reference to the letter No.F.1106/1-2/KV-3/Gwl/Technical Audit/410 dated on 16 August, 2021, committee visited Kendriya Vidyalaya No.03 situated at Morar Cantt., Gwalior to carry out the structural audit of the structure. Details of the Structural audit are collected in the Performa. Structure is G + 1 and the type of structure is reinforced concrete framed structure. Committee has physically verified the structure and rebound hammer testing was done at least 10% of the total columns, beams & slabs available in the structure. On the basis of the observations, following is recommended.

- Dampness and spalling of concrete are observed in boy's toilet & girl's toilet of ground floor near to chemistry laboratory. It is recommended to provide adequate water proofing at the terrace. It is also observed that reinforced is visible and is corroded. Following steps are recommended:
For inspection, it is necessary to expose the corroded locations up to such an extent that these locations can be seen through naked eye. First step in treatment of rusting on reinforcement is cleaning of rust with the wire brush. After cleaning, tamp the surface with hammer having the weight at least 5 lbs. Then rub the surface with wire brush or hessian rope. In the market, many rust removing chemicals are also available. Those chemicals can be used if cleaning of rust is to be done more effectively. In important members (members that has to carry heavy load) of RC structures, sand blasting can be used for cleaning of rust. If the cleaned surface is found heavily corroded, then the surface can be coated with black ship paint (that paint is marine paint). This paint usually seals off the steel surface and prevents the further corrosion. Corroded members which are critical in the whole structure such as columns should be additionally reinforced by using hooked or anchorage connections or by using beams. Corroded slabs can be additionally reinforced by using wire mesh (which is locally said to be as Jali).
- It is observed that drinking water facility near to chemistry laboratory needs to be repaired and proper water fittings to replace so that the drinking water facility can be made available to students.



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- Mild cracks have been observed in room no. 7 near window and diagonal crack is observed in the wall of the same room. It is recommended to provide proper concrete cover and plaster repairing of the existing cracks.
- Large crack has been observed in the wall of room no. 10. It is recommended for proper filling and sealing of crack should be performed.
- Diagonal crack has been observed on inside and outside wall of the conference hall, room no. 4, room no. 27, due to seismic activity in the near past. So, proper filling and sealing of the crack has to be performed.
- Settlement of outer columns at the backside of the school structure has been observed. Footing remediation has to be performed by concrete underpinning, jet grouting, micro piles or by using expanding geopolymers.
- Horizontal cracks on the wall of biology laboratory have been observed. It is recommended to seal and fill the crack properly.
- Construction joints have been exposed and clearly visible at room no. 16, room no. 13, room no. 20, adjacent to music room. It is important to fill and cover the joints properly till the terrace so that dampness can be prevented.
- Cracks in the beam have been observed in room no. 16. It is important to assess the depth of the crack and proper retrofitting action required to be performed as it is a horizontal member.
- Reinforcement has been exposed in boy's toilet in ground floor. Dampness and spalling of concrete has also been observed. So, retrofitting action as recommended in the first point has to be performed.
- Joint between the wall and the plinth beam has been observed in room no. 23. It is recommended to assess the depth of the cracks and seal the joints effectively.
- Cracks in column in front of toilet in the ground floor have been observed. It is important to replacement and seal the crack cover concrete in the columns.
- Local settlement in the central area has been observed due to which cracking at the joints at ground floor, first floor and parapet wall has been observed. It is important to provide remediation in the settled area as mentioned in the above bullet point no. 6.
- Dampness in the staircase area moving to first floor, girls toilet near to room T-8, room no. 29, room no. 34, room no. 33, room no. 34, room no. 35, room no. 43, room no. 44, room no.

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- 45, room no. 51, room no. 53, room no. 54 & room no. 57. Water proofing has to be properly performed at the terrace level to stop the seepage and dampness in the rooms not only at first floor but at ground floor also.
- Spalling of concrete due to corrosion of reinforcement has been observed in ladies toilet near to T-11. So, similar retrofitting action has to be performed as mentioned above.
 - Construction joint has to be sealed and properly covered near to room no. 39 & room no. 46.
 - Minor cracks in beam and wall has been observed in room no. 40. Proper filling and sealing of cracks has to be performed.
 - Large cracks in the tie beam and wall has been observed in room no. 47. Proper filling and sealing of cracks has to be performed.
 - Inner and outer wall cracks have been observed near to room no. 45. Similarly, outer wall cracks have been observed in room no. 46. Proper filling and sealing of cracks has to be performed.
 - Cracks at the bottom face of the slab in the gallery near to boy's toilet (T-9). Proper filling and sealing of cracks has to be performed.
 - Damp proof course has been provided in 2015. It has been observed that in the damp proof course the joints are not properly sealed. As a result, dampness and seepage is seen in the first and ground floor level. It is recommended to seal the joints of the terrace slab and then provide adequate damp proof course with proper sealing of joints.
 - Improper drainage has been observed at the terrace. It is recommended to provide adequate drainage with properly maintaining the slopes towards the drains. Also, it has been seen that existing drainage openings are either small or clogged. It is recommended to properly unclog the drains.
 - Cracks in the plaster have been observed at the base of water tank. It is recommended to remove the cracked plaster and replace it with new plaster with epoxy coating.
 - Reinforcement of the roof slab of parking lot is corroded and concrete is continuously spalling. It is recommended to remove the cracked concrete and along with the retrofitting action of corroded concrete new rebars to be attached and welded for better serviceability and durability of the structure.



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Following is the structure audit details in the proforma:

STRUCTURAL AUDIT REPORT

Name of the Building: Kendriya Vidyalaya No.03

Description: School building.

Address: Morar Cantt., Gwalior (M.P)

Age of the Building: 27 years (Constructed on 1994).

Inspection Report Date: // INSPECTED BY: 04 October, 2021

OBSERVATIONS

S.No	Description	Locations	Remarks
1	Spalling of concrete and exposure of reinforcement	Ceiling of car parking	Exposed reinforcement and rusting
2	Exposed reinforcement	In boys toilet of ground floor	Exposed reinforcement and rusting
3	Cracking	Room No. 7	Mild cracks near window and diagonal crack at the wall
4	Cracking	Room No. 10	Large crack at the wall.
5	Cracking	Conference hall	Diagonal crack on inside and outside wall
6	Cracking	Room No. 4	
7	Cracking	Room No. 27	
8	Cracking	Biology lab	Horizontal cracks
9	Settlement	Backside of the building	Settlement of outer columns
10.	Construction joints	Room no. 16, Room no. 13, Room no. 20, Adjacent to music room	Open and exposed construction joints
11.	Open joints	Room No 23	Open joint between the wall and the plinth beam
12.	Cracking	In front of toilet in the ground floor	Cracks in column
13	Local settlement	Central area	Cracking at the joints in ground floor, first floor and parapet wall has been observed due to settlement.
14	Construction joint	Near Room No. 39 and 46	Open construction joint
15.	Cracking	Room No 40	Minor cracking
16	Cracking	Room No 47	Large cracks in the tie

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17.	Cracking	Near boys toilet T9	beam and wall Cracks at the bottom face of the slab
18.	Tear in Damp proof course (DPC)	Several spots at roof	Serious tear and break in the DPC on roof
19	Improper drainage	Roof	Improper drainage and blockage of drain at roof
20	Cracking at water tank	Water tank on roof	Cracks in the plaster of the beam support.
21	Dampness	Boys toilet	Excessive dampness
22	Dampness and spalling of concrete	Girl's toilet near chemistry lab	Excessive dampness

7. Inspection of structural component using rebound hammer

S.No	Description	Type of Member	Location	Angle of Test	Compressive Strength (MPa)
1	C1	Column	Near Chemistry Lab	90°	19.0
2	C2	Column	Near Boys Toilet of Ground Floor	90°	15.0
3	C3	Column	Near Room 10	90°	16.5
4	C4	Column	Near Channel Gate of First Floor	90°	17.0
5	C5	Column	Near Room 44	90°	17.0
6	C6	Column	Near Room 16	90°	19.5
7	C7	Column	Near Room 31	90°	16.0
9	C8	Column	Near Channel Gate	90°	21.5
10	B1	Beam	Near Room 42	90°	14.5
11	B2	Beam	Near channel gate (first floor)	90°	17.0
12	B3	Beam	Near Room 23	90°	15.0
13	B4	Beam	At Car Parking	90°	16.0
14	B5	Beam	Near Boys Toilet of First Floor	90°	15.0
15	B6	Beam	In Classroom 5A	90°	14.0
15	S1	Slab	In Room 34	90°	13.0
16	S2	Slab	At car parking	90°	14.0
17	S3	Slab	At T8 Boys toilet	90°	12.0
18	S4	Slab	At gallery first floor	90°	14.0
19	S5	Slab	Near Channel Gate of First Floor	90°	12.5
20	S6	Slab	At staircase connecting ground and first floor	90°	14.5

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Photo 1: Dampness in girl's toilet

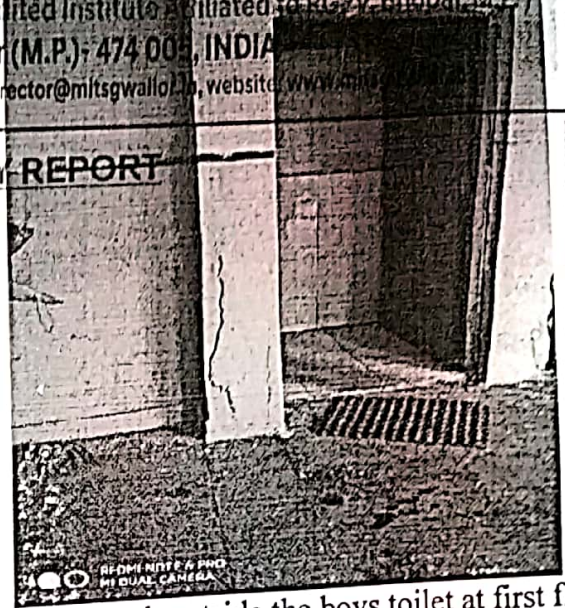


Photo 2: Crack outside the boys toilet at first floor

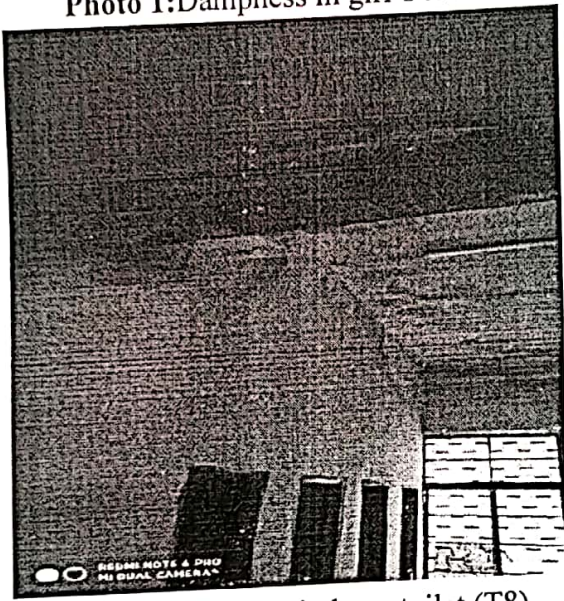


Photo 3: Dampness in boys toilet (T8)

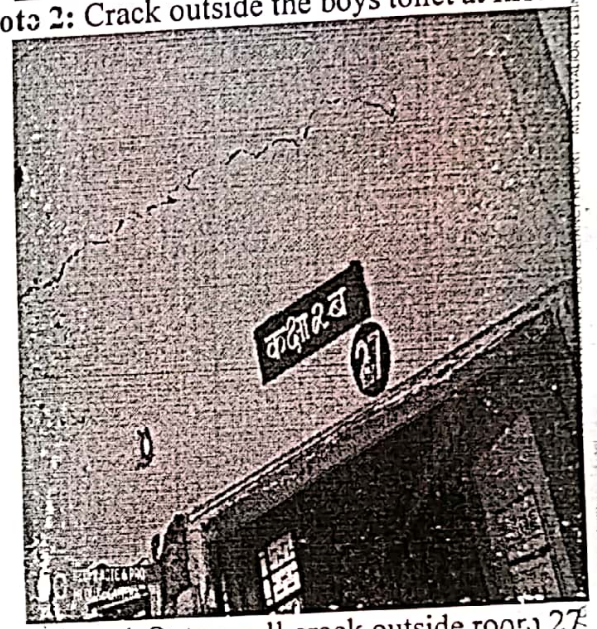


Photo 4: Outer wall crack outside room 27

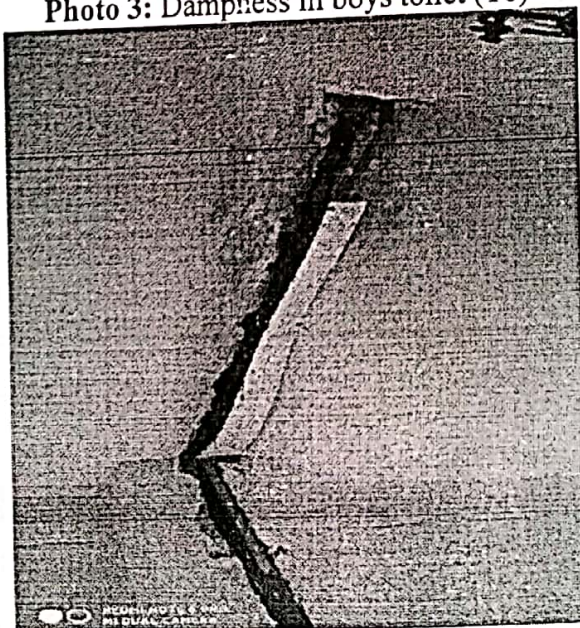


Photo 5: Open joint between wall and plinth beam near

Room 23

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Photo 6: Open joint at Ground Floor

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Photo 7: Big Wall Crack in Room 47



Photo 8: Cracking on the stage located at ground floor

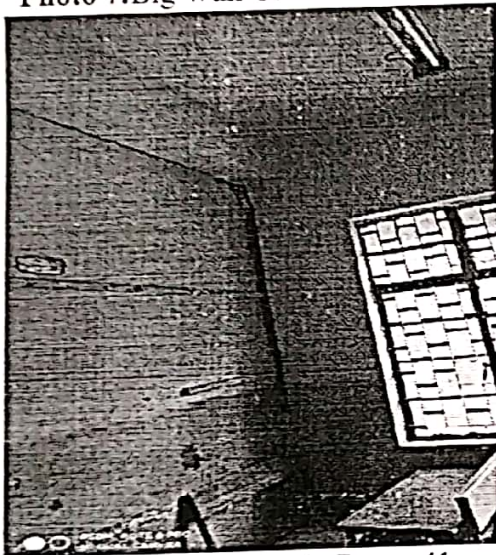


Photo 9: Open joint in Room 41

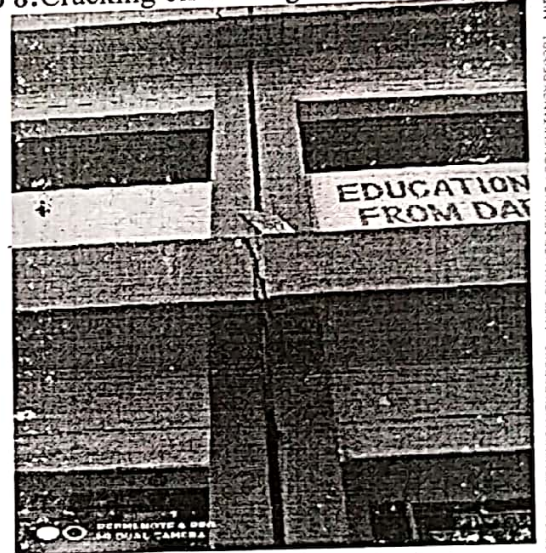
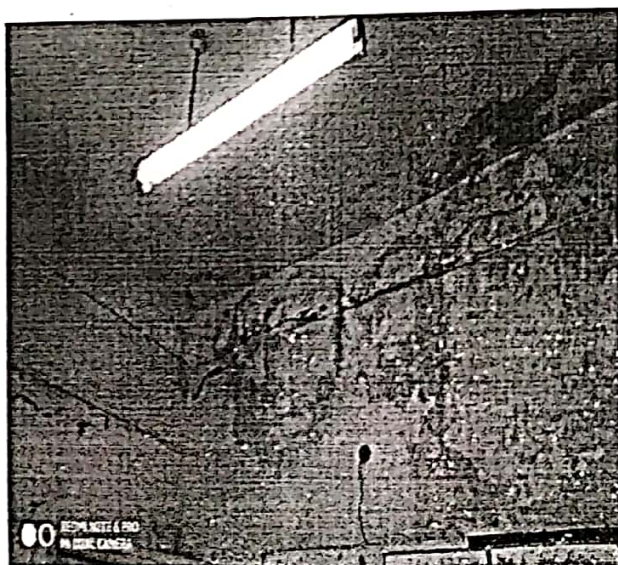
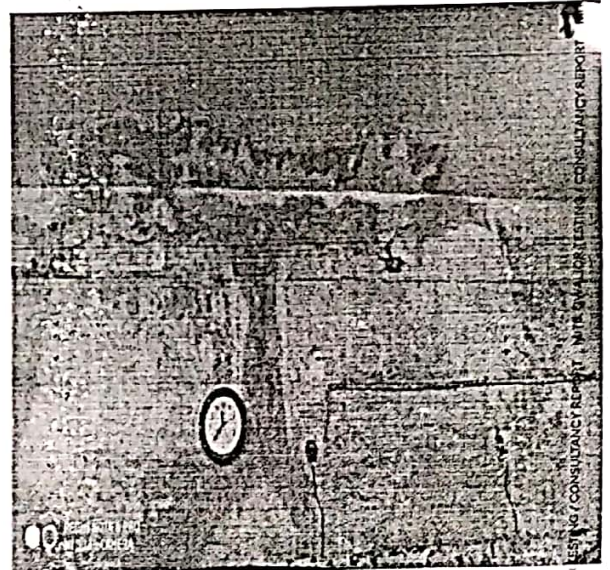


Photo 10: Open joint adjoining Room 23



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Photo 11: Excessive dampness in Room 34



Photo 12: Dampness in Room 33



Photo 13: Outer wall crack in Room 45



Photo 14: Dampness and cracking in Room 44



Photo 15: Crack on the outer wall adjoining the water tank and deterioration in the support of the water tank

Photo 16: Diagonal crack on the outer wall



Photo 17: Diagonal cracking on the classroom wall
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Photo 18: Open joint near Class 10:
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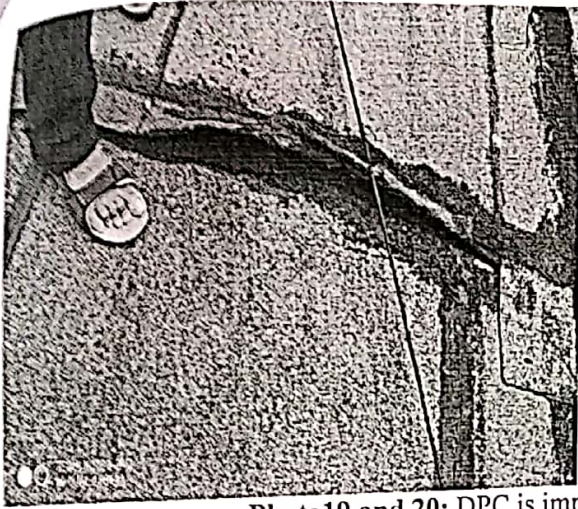


Photo19 and 20: DPC is improperly attached to the roof flooring

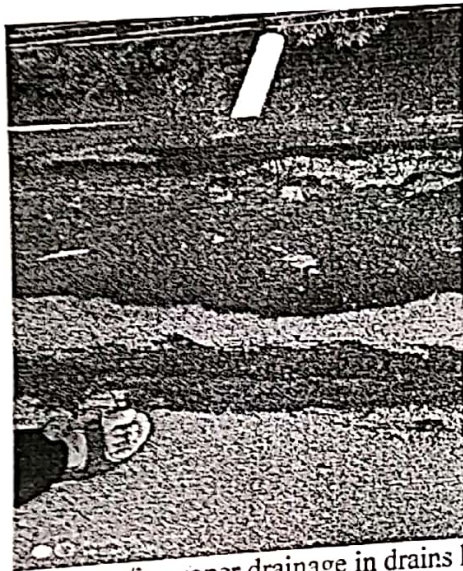


Photo 21: Blockage/improper drainage in drains located



Photo 22: Cracking in outer wall adjoining chemist lab

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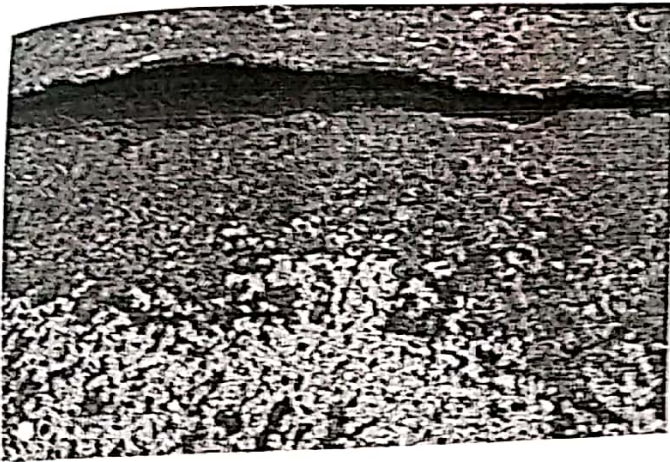


Photo 23: Break/tear in DPC on the roof

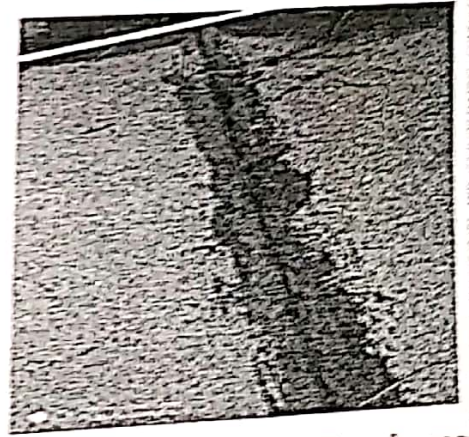


Photo 24: Break/tear in DPC on the roof



Photo 25: Dampness in the ceiling of Car Parking



Photo 26: Excessive concrete deterioration and reinforcement exposure in the ceiling of car parki

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Photo 27: Spalling of concrete in the roof slab of car parking

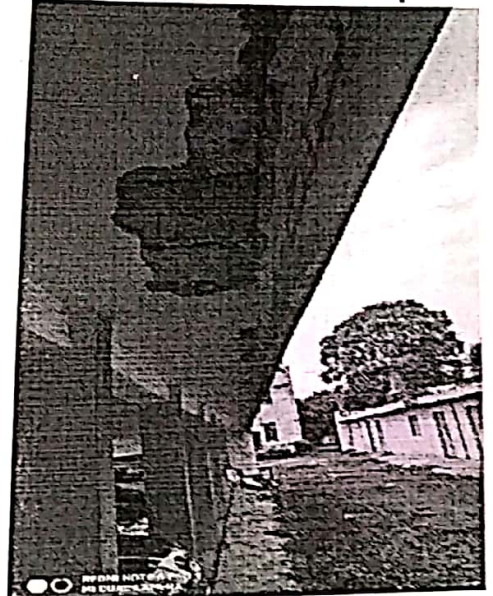



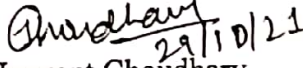
Photo 28: Spalling of concrete and exposure of reinforcement in the ceiling of car parking

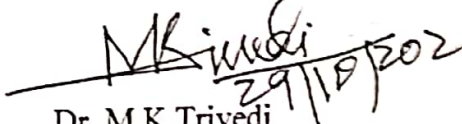
8. Recommendations:

The condition of the structure is very poor which requires major renovation as suggested above. Age of structure is 27 years, it is recommended not to extend the structure as the non destructive testing indicates that the structure should not be extended further for its safety and structural stability.

Submitted for necessary action


29/10/21
Dr. Abhilash Shukla
(Member)


29/10/21
Dr. Jayvant Choudhary
(Member)


29/10/2021
Dr. M.K Trivedi
Professor & Head

Structure Audit Committee Structure Audit Committee Civil Engineering Department