Inspection Report of Structural Stability Assessment of Kendriya Vidyalaya- No. 1 Neemuch

By

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July 2021

1. **About Project:**

The Kendriya Vidyalaya building was constructed in the year 1980 (approx 40 years old) situated in Neemuch Madhya Pradesh. The building is maintained by the Central Public Works Department, Government of India. The scope of the project is to investigate the structural stability of the existing Kendriya Vidyalaya buildings. The complete Vidyalaya has two buildings i.e. old school building (Block A & B) and the Primary department (Block C).

Figure 1: Front Elevation of the KV- 1 old building Neemuch

Figure 2: Front Elevation of the KV-1 backside old uilding Neemuch

Figure 3: Front Elevation of the KV-1 block C (primary department) building Neemuch

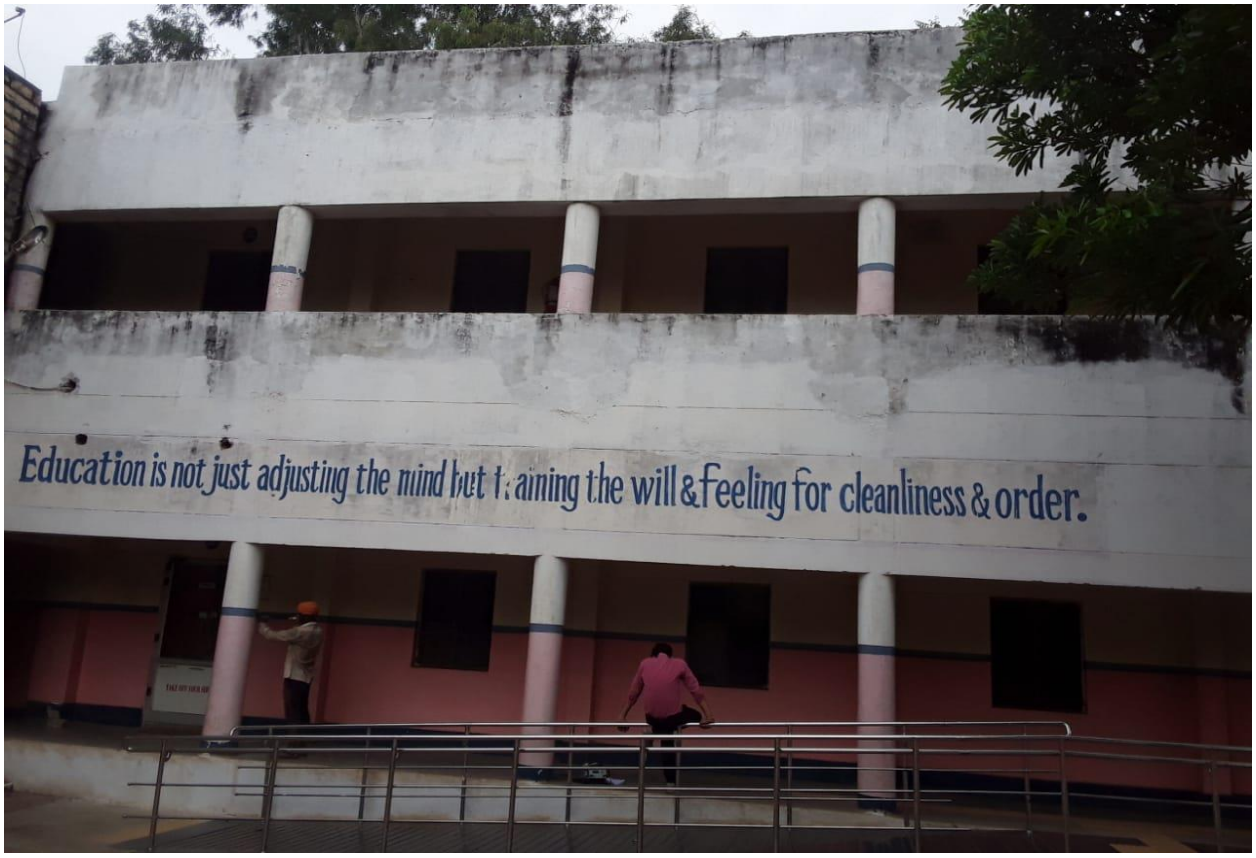


Figure 4: Front Elevation of the KV-1 block C (primary department) building Neemuch

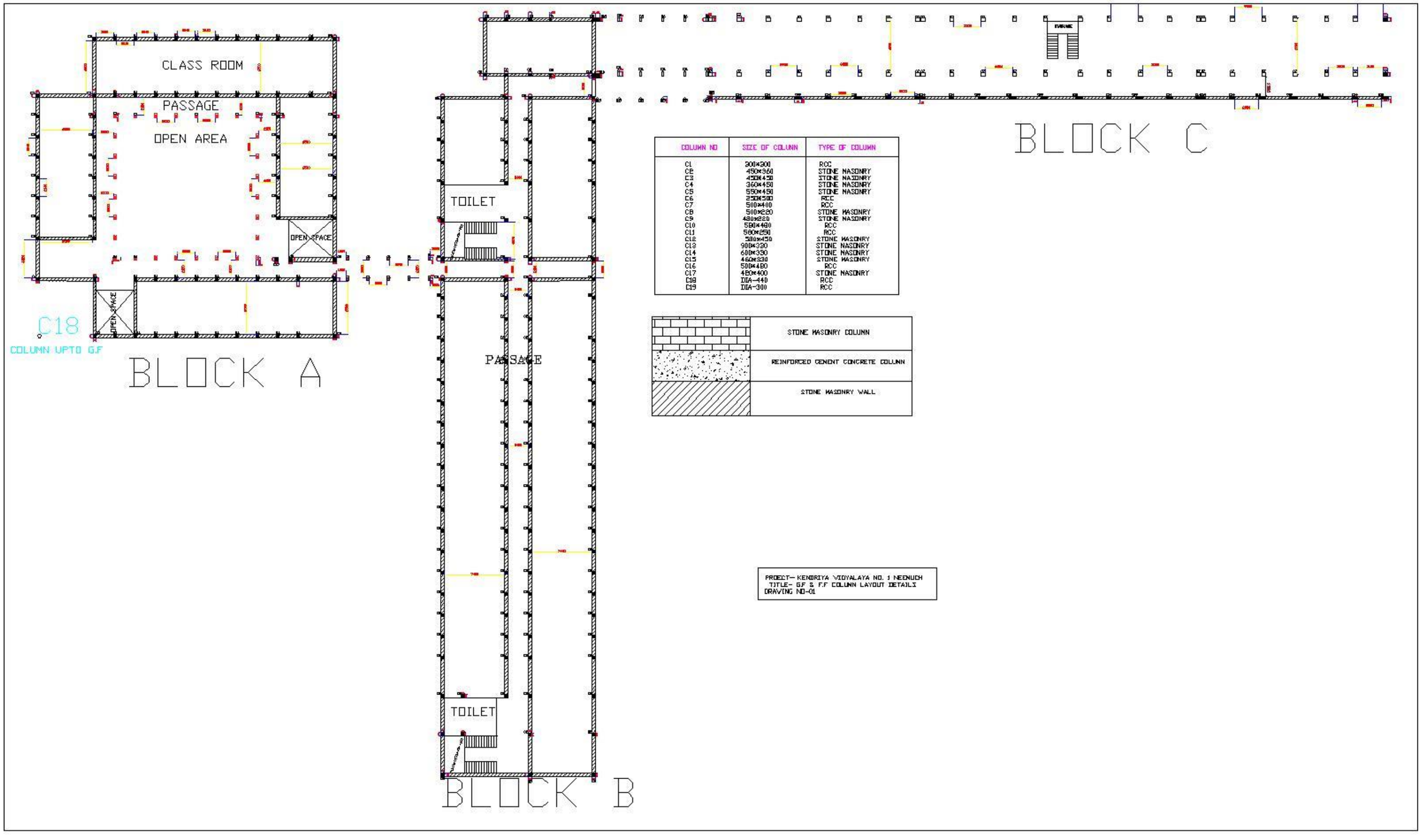
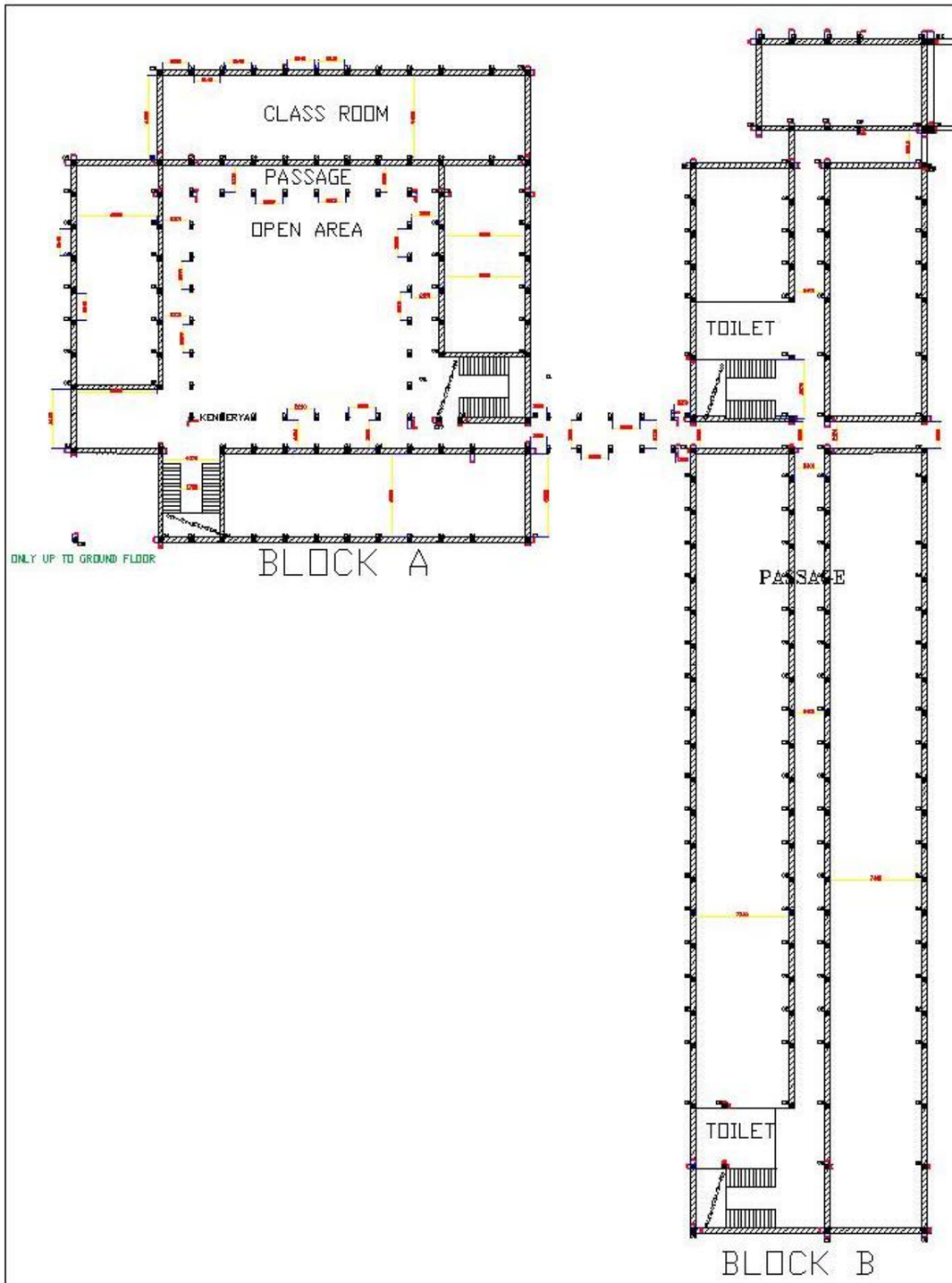
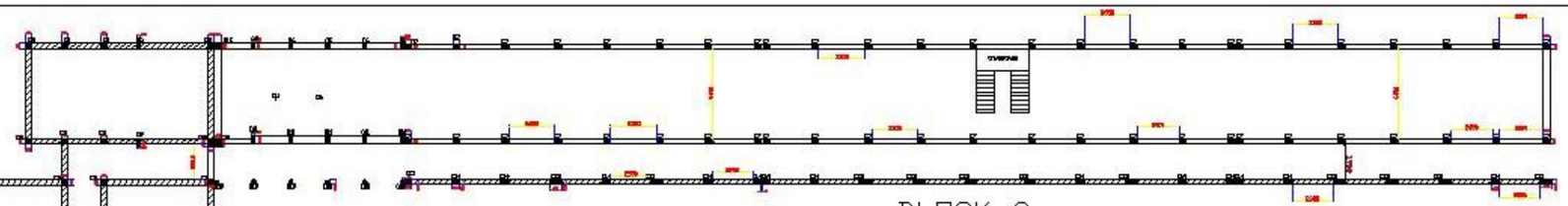
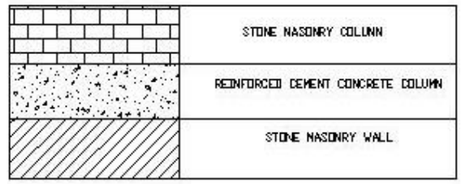


Figure 5: Column layout details of old school building





COLUMN NO	SIZE OF COLUMN	TYPE OF COLUMN
C1	300*300	RCC
C2	450*360	STONE MASONRY
C3	450*450	STONE MASONRY
C4	360*450	STONE MASONRY
C5	550*450	STONE MASONRY
C6	230*500	RCC
C7	500*400	RCC
C8	500*220	STONE MASONRY
C9	4804220	STONE MASONRY
C10	560*480	RCC
C11	350*250	RCC
C12	590*450	STONE MASONRY
C13	900*330	STONE MASONRY
C14	600*330	STONE MASONRY
C15	460*350	STONE MASONRY
C16	500*480	RCC
C17	420*400	STONE MASONRY
C18	DIA-440	RCC
C19	DIA-300	RCC



PROECT- KENDRIYA VIDYALAYA - NO 1 NEEMUCH
TITLE- G.F & F.F COLUMN LAYOUT DETAILS
DRAWING NO-02

Figure 6: Grond Floor and First Floor column Layout details

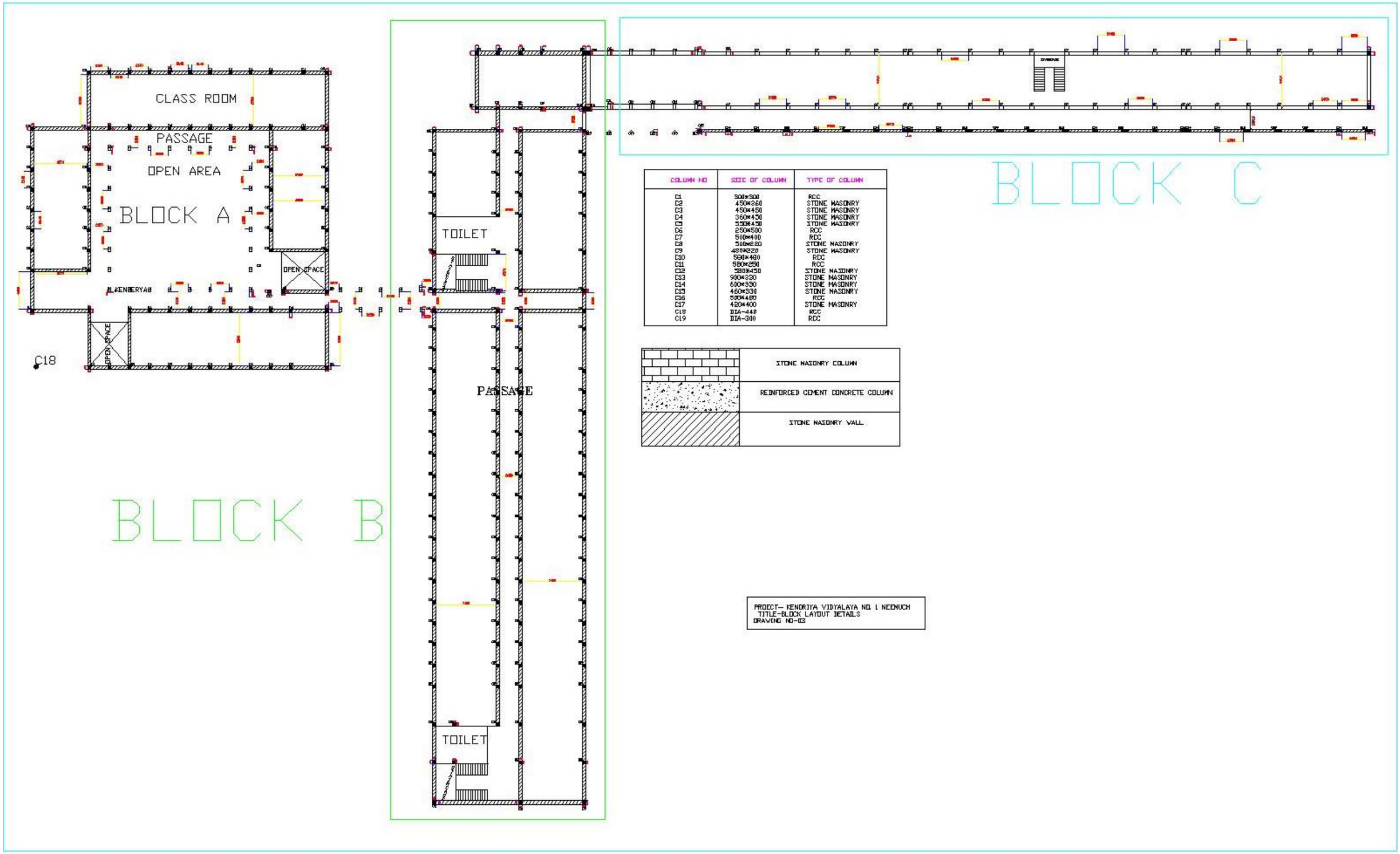


Figure 7: Block Layout detail of School Building

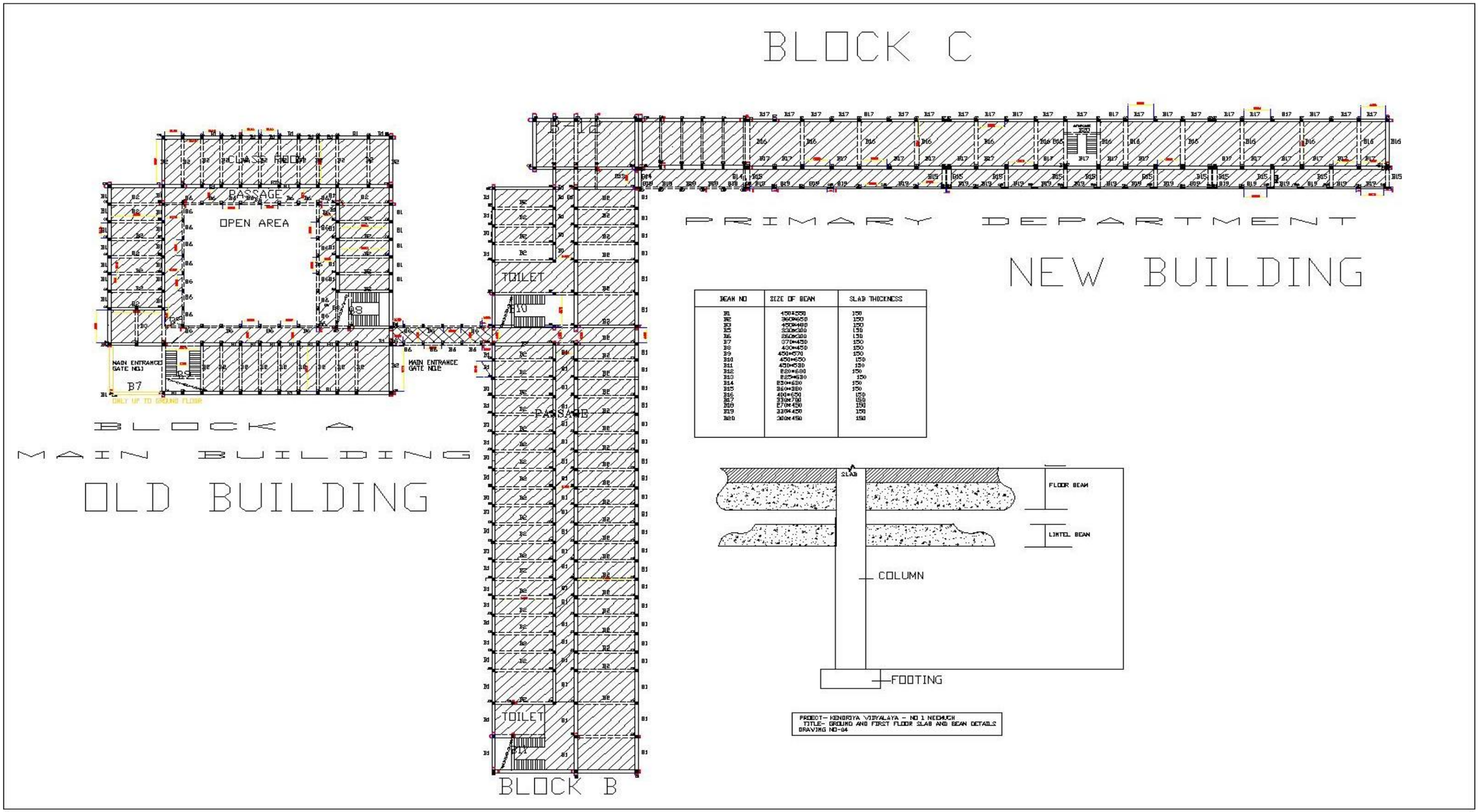


Figure 8: Slab and Beam details of Ground and First Floor of School building

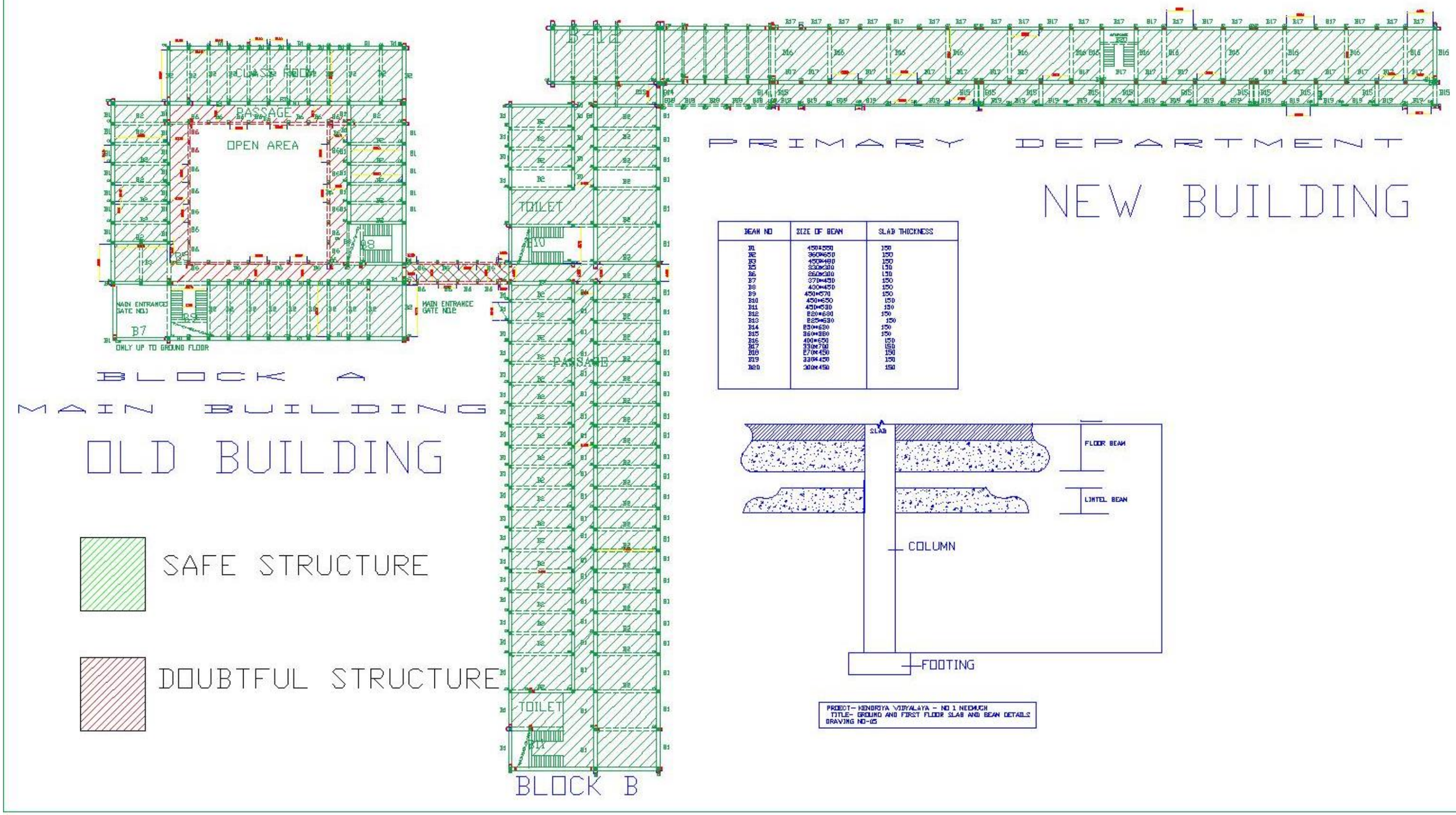


Figure 9: Structural Safety details of ground and first of school building

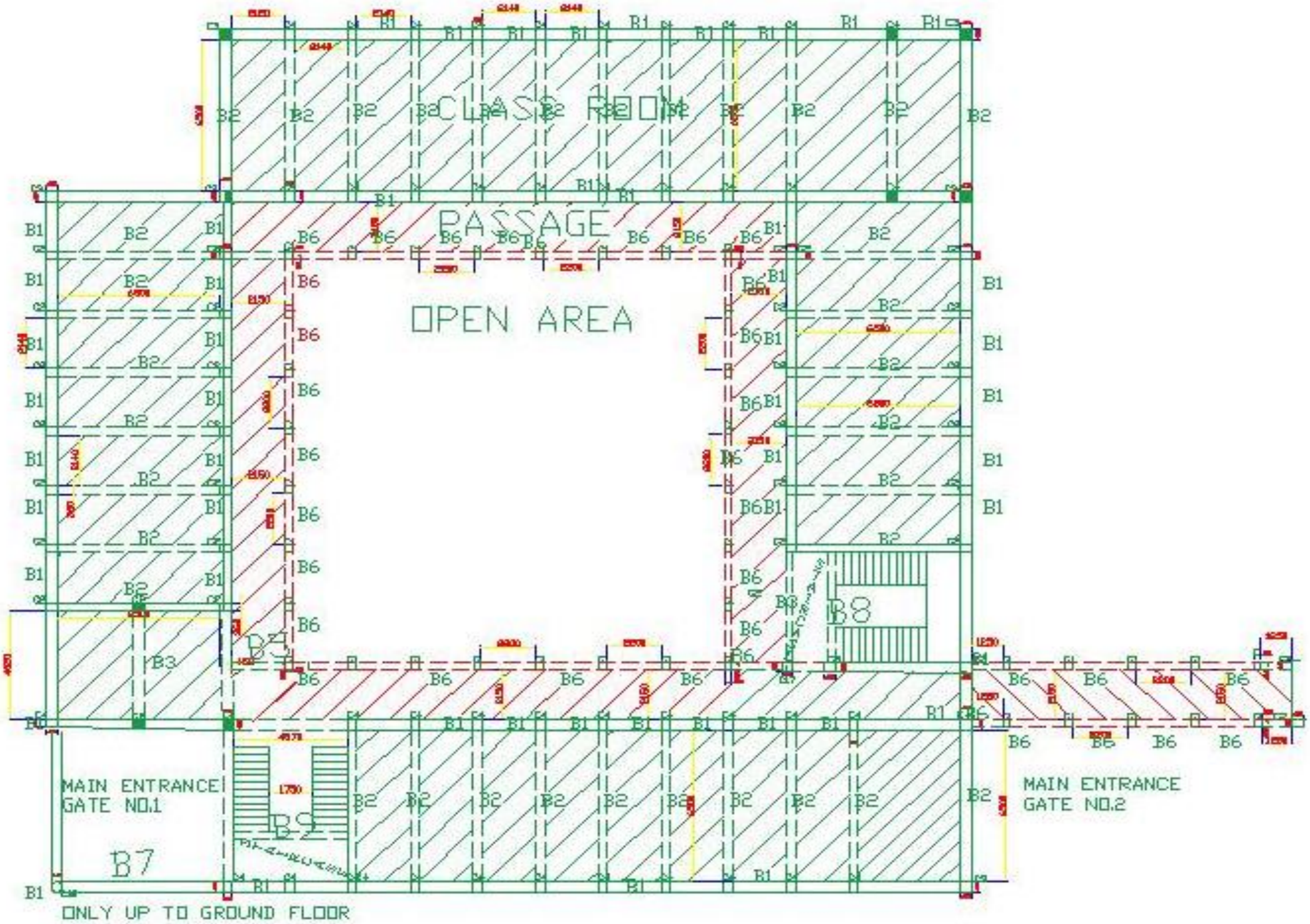


Figure 10: Structural Failure in RCC member of Block A (Marked in Red Colour)

2. Preliminary Inspection:

The current condition of the KV-1 building in Neemuch is evaluated to understand the structural damage caused in the building. It has been observed that several structural members, including beam, Column, and slab, are damaged. The cover surface of the RCC passage has deteriorated, and severe cracks in the structural elements have been observed. The building is having serious seepage issues and also, the expansion joints of the Block C are filled with debris which can be caused serious structural issues in the building. The structural condition of the projection of windows/lintels is highly poor. The details of the preliminarly inspection is mentioned in this section.

Figure 11: Structural Damage in the beam of old school building

Figure 12: Structural Damage in the Column of old school building

Figure 13: Failure in the roof of an inside school building

Figure 14: Damage in the inside passage area of old school building beam

Figure 15: Structural Damage in passage area of old school building (Block A)

Figure 16: Major damages in the RCC member of School building

Figure 17: Structural Damage in the RCC member of passage area

Figure 18: Reinforced bars exposed to open environment in a backside school building

Figure 19: Damages in the projection of windows backside school building

Figure 20: Structural Damages in the RCC member of old school building (Passage Area)

Figure 21: Sound structure of Primary Department building

3. Condition Assessment Through Non-destructive Field Tests

To assess the existing condition of the structural elements, non-destructive testing has been carried out in the critical section of the building. The testing has been done to obtain the existing compressive strength of the structural members and assess the current condition of the concrete used for the construction. The NDT test has been conducted as per the Indian standard codes. The following field tests are carried out:

1. Rebound Hammer test [IS: 13311 (part 2) – 1992]
2. Ultrasonic Pulse Velocity test [IS: 13311 (part 1) – 1992]

Figure 22: Rebound Hammer Testing

Figure 23: Ultrasonic pulse velocity Testing of column

Figure 24: Rebound Hammer Testing of slab

3.1 Ultrasonic pulse Velocity Criteria

UPV (km/sec)	Quality of Concrete
Above 4.5	Excellent
3.5 to 4.5	Good
3.0 to 3.5	Medium
Below 3.0	Doubtful

Test Results of NDT

Table 1: Results of Rebound Hammer Test

Sr.No.	Location	Structure/ RCC Member	Rebound Number	Estimated Comp. Strength (N/mm^2)	Average Comp. Strength (N/mm^2)
Kendriya Vidyalaya School Neemuch main building					
1	C1	RCC Column	42	46	46.44
			44	50	
			46	54	
			42	46	
			45	52	
			41	44	
			44	50	
			38	40	
			36	36	
2	C1	RCC Column	42	46	43
			44	50	
			38	40	
			44	50	
			38	40	
			39	42	
			36	36	
			40	43	
			38	40	
3	C1	RCC Column	28	24	26.22
			30	26	
			30	26	
			27	23	
			29	25	
			32	29	
			29	25	
			34	32	

			30	26	
4	C1	RCC Column	35	34	28.55
			28	24	
			29	25	
			35	34	
			34	32	
			35	34	
			28	24	
			29	25	
			29	25	
5	C1	RCC Column	38	40	39.66
			32	29	
			43	48	
			42	46	
			40	43	
			35	34	
			38	40	
			40	43	
			35	34	
6	C1	RCC Column	30	26	34.77
			35	34	
			38	40	
			35	34	
			30	26	
			40	43	
			41	44	
			38	40	
			30	26	
7	C1	RCC Column	36	36	32.22
			32	29	
			34	32	
			32	29	
			36	36	
			33	30	
			34	32	
			38	40	
			30	26	
8	C1	RCC Column	33	30	29.33
			30	26	
			32	29	
			31	27	
			33	30	
			29	25	
			34	32	
			32	29	
			36	36	

9	C1	RCC Column	36	36	35.88
			34	32	
			34	32	
			31	27	
			38	40	
			28	24	
			42	46	
			41	44	
			39	42	
10	C1	RCC Column	33	30	30.33
			30	26	
			28	24	
			29	25	
			36	36	
			34	32	
			34	32	
			39	42	
			30	26	
11	C2	Stone Masonry Column	42	46	46.44
			44	50	
			46	54	
			42	46	
			45	52	
			41	44	
			44	50	
			38	40	
			36	36	
12	C2	Stone Masonry Column	42	46	43
			44	50	
			38	40	
			44	50	
			38	40	
			39	42	
			36	36	
			40	43	
			38	40	
13	C2	Stone Masonry Column	44	50	51.55
			48	58	
			42	46	
			50	62	
			48	58	
			46	54	
			38	40	
			44	50	
			42	46	
			41	44	

14	C2	Stone Masonry Column	42	46	54.77
			44	50	
			40	43	
			50	62	
			52	66	
			44	50	
			54	70	
			50	62	
15	C2	Stone Masonry Column	48	58	47.55
			42	46	
			43	48	
			42	46	
			40	43	
			45	52	
			48	58	
			40	43	
			35	34	
16	C2	Stone Masonry Column	48	58	44.33
			35	34	
			48	58	
			38	40	
			39	42	
			40	43	
			41	44	
			38	40	
			38	40	
17	C2	Stone Masonry Column	39	42	52.33
			38	40	
			44	50	
			52	66	
			46	54	
			53	68	
			44	50	
			48	58	
			40	43	
18	C2	Stone Masonry Column	43	48	51.11
			50	62	
			43	48	
			41	44	
			43	48	
			49	60	
			44	50	
			42	46	
			46	54	
			46	54	
			44	50	

19	C2	Stone Masonry Column	44	50	49.55
			41	44	
			48	58	
			48	58	
			42	46	
			41	44	
			39	42	
20	C2	Stone Masonry Column	43	48	47.44
			40	43	
			48	58	
			49	60	
			46	54	
			34	32	
			44	50	
			39	42	
			38	40	
21	C3	Stone Masonry Column	42	46	47.11
			44	50	
			46	54	
			42	46	
			45	52	
			41	44	
			44	50	
			38	40	
			39	42	
22	C3	Stone Masonry Column	42	46	43
			44	50	
			38	40	
			44	50	
			38	40	
			39	42	
			36	36	
			40	43	
			38	40	
23	C3	Stone Masonry Column	44	50	51.55
			48	58	
			42	46	
			50	62	
			48	58	
			46	54	
			38	40	
			44	50	
			42	46	
			41	44	
			42	46	
			44	50	

24	C4	Stone Masonry Column	40	43	54.77
			50	62	
			52	66	
			44	50	
			54	70	
			50	62	
25	C4	Stone Masonry Column	48	58	49.55
			42	46	
			43	48	
			42	46	
			40	43	
			45	52	
			48	58	
			40	43	
			45	52	
26	C4	Stone Masonry Column	48	58	52.22
			45	52	
			48	58	
			45	52	
			40	43	
			40	43	
			41	44	
			48	58	
			50	62	
27	C4	Stone Masonry Column	46	54	49.88
			42	46	
			44	50	
			42	46	
			46	54	
			43	48	
			44	50	
			48	58	
			40	43	
28	C4	Stone Masonry Column	43	48	50.55
			40	43	
			39	42	
			41	44	
			43	48	
			49	60	
			44	50	
			52	66	
			46	54	
		Stone	46	54	
			44	50	
			44	50	
			39	42	

29	C4	Masonry Column	38	40	47.33
			48	58	
			42	46	
			41	44	
			39	42	
30	C4	Stone Masonry Column	43	48	49.66
			40	43	
			48	58	
			49	60	
			46	54	
			44	50	
			44	50	
			39	42	
			39	42	
31	C4	Stone Masonry Column	42	46	47.22
			44	50	
			46	54	
			42	46	
			45	52	
			41	44	
			44	50	
			38	40	
			40	43	
32	C4	Stone Masonry Column	42	46	47
			44	50	
			38	40	
			44	50	
			38	40	
			39	42	
			46	54	
			40	43	
			48	58	
33	C4	Stone Masonry Column	44	50	53.55
			48	58	
			42	46	
			50	62	
			48	58	
			46	54	
			48	58	
			44	50	
			42	46	
34	C5	Stone Masonry Column	41	44	54.77
			42	46	
			44	50	
			40	43	
			50	62	

			52	66	
			44	50	
			54	70	
			50	62	
35	C5	Stone Masonry Column	38	40	51.77
			42	46	
			43	48	
			42	46	
			50	62	
			45	52	
			48	58	
			50	62	
			45	52	
36	C5	Stone Masonry Column	48	58	52.22
			45	52	
			48	58	
			45	52	
			40	43	
			40	43	
			41	44	
			48	58	
			50	62	
37	C6	RCC Column	46	54	63.11
			52	66	
			54	70	
			52	66	
			46	54	
			53	68	
			54	70	
			48	58	
			50	62	
38	C6	RCC Column	53	68	57.77
			50	62	
			53	68	
			51	64	
			43	48	
			49	60	
			44	50	
			42	46	
			46	54	
39	C6	RCC Column	46	54	49.55
			44	50	
			44	50	
			41	44	
			48	58	
			48	58	

			42	46	
			41	44	
			39	42	
40	C7	RCC Column	33	30	51.55
			50	62	
			48	58	
			49	60	
			46	54	
			44	50	
			44	50	
			49	60	
			38	40	
41	C7	RCC Column	42	46	46.44
			44	50	
			46	54	
			42	46	
			45	52	
			41	44	
			44	50	
			38	40	
			36	36	
42	C7	RCC Column	42	46	43
			44	50	
			38	40	
			44	50	
			38	40	
			39	42	
			36	36	
			40	43	
			38	40	
43	C7	RCC Column	44	50	51.55
			48	58	
			42	46	
			50	62	
			48	58	
			46	54	
			38	40	
			44	50	
			42	46	
44	C7	RCC Column	41	44	52.55
			42	46	
			44	50	
			40	43	
			50	62	
			52	66	
			44	50	

			44	50	
			50	62	
45	C7	RCC Column	38	40	46.88
			38	40	
			43	48	
			42	46	
			40	43	
			45	52	
			48	58	
			40	43	
			45	52	
46	C7	RCC Column	48	58	54.33
			45	52	
			48	58	
			45	52	
			50	62	
			40	43	
			41	44	
			48	58	
			50	62	
47	C7	RCC Column	46	54	54.33
			52	66	
			44	50	
			42	46	
			46	54	
			53	68	
			44	50	
			48	58	
			40	43	
48	C7	RCC Column	53	68	55.55
			50	62	
			43	48	
			51	64	
			43	48	
			49	60	
			44	50	
			42	46	
			46	54	
49	C7	RCC Column	46	54	**53.77**
			44	50	
			44	50	
			51	64	
			48	58	
			48	58	
			42	46	
			41	44	

			49	60	
50	C7	RCC Column	43	48	**53.88**
			40	43	
			48	58	
			49	60	
			46	54	
			44	50	
			44	50	
			49	60	
			50	62	
51	C8	Stone Masonry Column	42	46	48.44
			44	50	
			46	54	
			42	46	
			45	52	
			41	44	
			44	50	
			38	40	
			46	54	
52	C9	Stone Masonry Column	42	46	49
			44	50	
			48	58	
			44	50	
			48	58	
			39	42	
			46	54	
			40	43	
			38	40	
53	C10	RCC Column	33	30	39
			34	32	
			42	46	
			30	26	
			31	27	
			46	54	
			38	40	
			44	50	
			42	46	
54	C11	RCC Column	41	44	40.33
			42	46	
			44	50	
			40	43	
			31	27	
			30	26	

			44	50	
			44	50	
			31	27	
55	C11	RCC Column	38	40	44.33
			42	46	
			43	48	
			42	46	
			40	43	
			45	52	
			32	29	
			40	43	
			45	52	
56	C11	RCC Column	30	26	37.55
			45	52	
			31	27	
			35	34	
			38	40	
			40	43	
			41	44	
			32	29	
			40	43	
57	C12	Stone Masonry Column	46	54	53.44
			42	46	
			44	50	
			52	66	
			46	46	
			53	68	
			44	50	
			48	58	
			40	43	
58	C13	Stone Masonry Column	43	48	51.22
			40	43	
			43	48	
			51	64	
			43	48	
			49	60	
			44	50	
			42	46	
			46	54	
59	C13	Stone Masonry Column	46	54	47.55
			44	50	
			44	50	
			41	44	
			48	58	
			38	40	
			42	46	

			41	44	
			39	42	
60	C13	Stone Masonry Column	43	48	49.77
			40	43	
			48	58	
			49	60	
			46	54	
			44	50	
			44	50	
			39	42	
			40	43	
61	C13	Stone Masonry Column	42	46	49.11
			44	50	
			46	54	
			42	46	
			45	52	
			41	44	
			44	50	
			38	40	
			48	58	
62	C14	Stone Masonry Column	42	46	53.22
			44	50	
			48	58	
			44	50	
			48	58	
			49	60	
			46	54	
			49	60	
			40	43	
63	C14	Stone Masonry Column	44	50	51.55
			48	58	
			42	46	
			50	62	
			48	58	
			46	54	
			38	40	
			44	50	
			42	46	
64	C14	Stone Masonry Column	41	44	50.33
			42	46	
			44	50	
			40	43	
			50	62	
			42	46	
			44	50	
			44	50	

			50	62	
65	C14	Stone Masonry Column	48	58	49.55
			42	46	
			43	48	
			42	46	
			40	43	
			45	52	
			48	58	
			40	43	
			45	52	
66	C14	Stone Masonry Column	44	50	47.88
			38	40	
			48	58	
			45	52	
			40	43	
			40	43	
			41	44	
			48	58	
			40	43	
67	C14	Stone Masonry Column	46	54	52
			42	46	
			44	50	
			42	46	
			46	54	
			43	48	
			44	50	
			48	58	
			50	62	
68	C15	Stone Masonry Column	53	68	52.77
			40	43	
			39	42	
			51	64	
			43	48	
			49	60	
			44	50	
			42	46	
			46	54	
69	C16	RCC Column	46	54	53.77
			44	50	
			44	50	
			51	64	
			48	58	
			48	58	
			42	46	
			41	44	
			49	60	

70	C17	Stone Masonry Column	43	48	51.77
			40	43	
			48	58	
			49	60	
			46	54	
			44	50	
			44	50	
			49	60	
			40	43	
71	C18	RCC Column	42	46	46.44
			44	50	
			46	54	
			42	46	
			45	52	
			41	44	
			44	50	
			38	40	
			36	36	
72	C18	RCC Column	42	46	53
			44	50	
			48	58	
			44	50	
			48	58	
			49	60	
			46	54	
			40	43	
			48	58	
73	C18	RCC Column	44	50	51.55
			48	58	
			42	46	
			50	62	
			48	58	
			46	54	
			38	40	
			44	50	
			42	46	
74	C18	RCC Column	41	44	50.33
			42	46	
			44	50	
			40	43	
			50	62	
			42	46	
			44	50	
			44	50	
			50	62	
			38	40	

75	C18	RCC Column	42	46	47.55
			43	48	
			42	46	
			40	43	
			45	52	
			48	58	
			40	43	
			45	52	
76	C19	RCC Column	48	58	50.11
			45	52	
			48	58	
			45	52	
			40	43	
			40	43	
			41	44	
			48	58	
			40	43	

Sr.No.	Location	Structure/ RCC Member	Rebound Number	Estimated Comp. Strength (N/mm^2)	Average Comp. Strength (N/mm^2)
Kendriya Vidyalaya School Neemuch main building					
1	B1	RCC Slab & Beam	42	46	47.55
			44	50	
			46	54	
			38	40	
			35	34	
			46	54	
			42	46	
			44	50	
			46	54	
2	B1	RCC Slab & Beam	44	50	43.55
			42	46	
			48	58	
			46	54	
			34	32	
			39	42	
			28	24	
			40	43	
			40	43	
3	B1	RCC Slab & Beam	46	54	40.88
			34	32	
			42	46	
			32	29	

			41	44	
			39	42	
			35	34	
			40	43	
			41	44	
4	B1	RCC Slab & Beam	32	29	41.44
			42	46	
			36	36	
			41	44	
			36	36	
			44	50	
			40	43	
			42	46	
			40	43	
5	B2	RCC Slab & Beam	38	40	36.55
			33	30	
			35	34	
			41	44	
			40	43	
			36	36	
			35	34	
			34	32	
			36	36	
6	B2	RCC Slab & Beam	38	40	40.44
			38	40	
			35	34	
			39	42	
			42	46	
			36	36	
			38	40	
			40	43	
			40	43	
7	B2	RCC Slab & Column	38	40	35.11
			39	42	
			30	26	
			33	30	
			36	36	
			34	32	
			30	26	
			41	44	
			38	40	

8	B2	RCC Slab & Beam	39	42	33.00
			38	40	
			33	30	
			35	34	
			32	29	
			30	26	
			35	34	
			30	26	
			36	36	
9	B2	RCC Slab & Beam	40	43	33.22
			36	36	
			36	36	
			31	27	
			30	26	
			29	25	
			38	40	
			30	26	
			38	40	
10	B2	RCC Slab & Beam	44	50	45.00
			46	54	
			41	44	
			40	43	
			38	40	
			39	42	
			42	46	
			42	46	
			38	40	
11	B2	RCC Slab & Beam	45	52	45.22
			44	50	
			39	42	
			42	46	
			45	52	
			39	42	
			40	43	
			38	40	
			38	40	
12	B3	RCC Slab & Beam	36	36	46.88
			42	46	
			45	52	
			46	54	
			39	42	
			40	43	
			45	52	

			46	54	
			40	43	
13	B3	RCC Slab & Beam	42	46	51.25
			44	50	
			48	58	
			45	52	
			44	50	
			46	54	
			44	50	
			44	50	
14	B4	RCC Slab & Beam	46	54	48.33
			40	43	
			41	44	
			41	44	
			44	50	
			45	52	
			44	50	
			48	58	
			38	40	
15	B4	RCC Slab & Beam	34	32	34.33
			33	30	
			33	30	
			40	43	
			38	40	
			31	27	
			38	40	
			35	34	
			35	34	
16	B4	RCC Slab & Beam	40	43	40.66
			41	44	
			40	43	
			41	44	
			40	43	
			39	42	
			38	40	
			31	27	
			38	40	
17	B5	RCC Slab & Beam	35	34	35.33
			38	40	
			34	32	
			39	42	
			35	34	
			35	34	

			6	36	
			35	34	
			34	32	
18	B5	RCC Slab & Beam	41	44	35.88
			36	36	
			35	34	
			40	43	
			34	32	
			33	30	
			35	34	
			35	34	
			36	36	
19	B5	RCC Slab & Beam	28	24	28.88
			29	25	
			30	26	
			32	29	
			34	32	
			33	30	
			35	34	
			33	30	
			33	30	
20	B6	RCC Slab & Beam	34	32	28.77
			32	29	
			28	24	
			29	25	
			31	27	
			32	29	
			33	30	
			31	27	
			36	36	
21	B6	RCC Slab & Beam	30	26	25.88
			28	24	
			29	25	
			30	26	
			28	24	
			29	25	
			30	26	
			33	30	
			31	27	
22	B7	RCC Slab & Beam	46	54	44.66
			43	48	
			44	50	
			39	42	

			35	34	
			36	36	
			39	42	
			42	46	
			44	50	
23	B8	RCC Slab & Beam	44	50	46.00
			45	52	
			39	42	
			36	36	
			45	52	
			35	34	
			41	44	
			41	44	
			49	60	
24	B9	RCC Slab & Beam	40	43	40.00
			42	46	
			44	50	
			41	44	
			39	42	
			36	36	
			35	34	
			32	29	
			36	36	
25	B10	RCC Slab & Beam	41	44	40.00
			46	54	
			45	52	
			30	26	
			44	50	
			33	30	
			35	34	
			35	34	
			36	36	
26	B11	RCC Slab & Beam	35	34	44.88
			34	32	
			44	50	
			44	50	
			46	54	
			45	52	
			39	42	
			41	44	
			42	46	
27	B12	RCC Slab & Beam	43	48	34.88
			42	46	

			30	26	
			42	46	
			32	29	
			33	30	
			33	30	
			33	30	
			32	29	
28	B13	RCC Slab & Beam	38	40	38.11
			35	34	
			35	34	
			34	32	
			36	36	
			46	54	
			32	29	
			45	52	
			34	32	
29	B14	RCC Slab & Beam	46	54	44.88
			43	48	
			43	48	
			40	43	
			48	58	
			31	27	
			38	40	
			45	52	
			35	34	
30	B15	RCC Slab & Beam	40	43	35.22
			31	27	
			30	26	
			31	27	
			30	26	
			49	60	
			48	58	
			30	26	
			28	24	
31	B16	RCC Slab & Beam	35	34	35.33
			38	40	
			34	32	
			39	42	
			35	34	
			35	34	
			36	36	
			35	34	
			34	32	

32	B17	RCC Slab & Beam	41	44	43.88
			46	54	
			35	34	
			40	43	
			44	50	
			43	48	
			45	52	
			35	34	
			36	36	
33	B18	RCC Slab & Beam	35	34	35.00
			44	50	
			44	50	
			34	32	
			36	36	
			35	34	
			29	25	
			31	27	
			32	27	

Table 2: Results of Ultrasonic Pulse Velocity Test

Sr.No	Location	Structure/ RCC Member	Structure/ RCC Member	Structure/ RCC Member	Concrete Quality Grading as per Table 2 BIS 13311 (Part 1)-1992
Kendriya Vidyalaya School Neemuch main building					
1	C1	RCC Column	2301	3.11	Medium
			3450		
			3304		
			1921		
			4519		
			4019		
			3549		
			2458		
			2548		
2	C1	RCC Column	3210	2.6	Doubtful
			2548		
			2469		
			1586		
			1938		
			3364		
			3219		
			2159		
			2964		
3	C1	RCC Column	3601	2.62	Doubtful

			2549		
			2495		
			1564		
			3364		
			3159		
			2468		
			2487		
			1965		
4	C1	RCC Column	1568	2.75	Doubtful
			2658		
			3214		
			2965		
			2486		
			3298		
			3300		
			3495		
			1824		
5	C1	RCC Column	2156	2.63	Doubtful
			2369		
			2954		
			3214		
			3561		
			1586		
			1965		
			3321		
			2564		
6	C1	RCC Column	3758	2.86	Doubtful
			3546		
			2555		
			2586		
			3564		
			2698		
			2468		
			2598		
			1987		
7	C1	RCC Column	3219	2.8	Doubtful
			3657		
			1596		
			2587		
			3579		
			1525		
			2654		
			3954		
			2468		
8	C1	RCC Column	4256	2.83	Doubtful
			3258		

			3654		
			2586		
			2459		
			3214		
			2475		
			1654		
			1987		
9	C1	RCC Column	1564	2.5	Doubtful
			1954		
			2586		
			3214		
			2589		
			2147		
			3254		
			2589		
			2648		
10	C1	RCC Column	2589	2.68	Doubtful
			2486		
			2459		
			2165		
			2697		
			2313		
			3219		
			2597		
			3645		
11	C1	RCC Column	3654	2.93	Doubtful
			2584		
			2546		
			2586		
			3654		
			2355		
			3215		
			2158		
			3654		
12	C6	RCC Column	3256	3.24	Medium
			2569		
			2489		
			3265		
			3245		
			3654		
			3219		
			3895		
			3654		
13	C6	RCC Column	2448	3.25	Medium
			2594		

			3698		
			2547		
			3546		
			4549		
			3695		
			2598		
			3614		
14	C7	RCC Column	4451	5.33	Excellent
			4598		
			5514		
			5514		
			6541		
			4524		
			5952		
			5455		
			5468		
15	C7	RCC Column	5561	4.18	Good
			4136		
			3695		
			6514		
			3644		
			4495		
			2698		
			3651		
			3265		
16	C10	RCC Column	6514	4.42	Good
			4562		
			5144		
			2545		
			5555		
			1488		
			4669		
			5195		
			4196		
17	C11	RCC Column	3625	3.89	Good
			3987		
			4268		
			4169		
			3691		
			1459		
			2594		
			6547		
			4752		
18	C11	RCC Column	5512	4.93	Excellent
			4151		
			4692		

			2644		
			2554		
			6441		
			5412		
			6444		
			6555		
19	C11	RCC Column	3844	3.92	Good
			6687		
			3249		
			4169		
			3269		
			2548		
			6541		
			1954		
			3024		
20	C16	RCC Column	2546	4.37	Good
			1595		
			6513		
			4356		
			2456		
			5654		
			6256		
			3442		
			6555		
21	C16	RCC Column	6552	3.45	Medium
			4512		
			3216		
			2156		
			3571		
			1596		
			2584		
			3654		
			3216		
22	C18	RCC Column	2656	3.17	Medium
			6114		
			4215		
			2314		
			1596		
			3548		
			2561		
			2354		
			3214		
23	C18	RCC Column	1562	3.45	Medium
			6541		
			3214		
			1562		

			3258		
			4562		
			1527		
			6321		
			2561		
24	C19	RCC Column	3265	3.15	Medium
			2156		
			3579		
			6541		
			1526		
			2569		
			3654		
			1569		
			3541		
25	C19	RCC Column	6521	3.82	Good
			2261		
			6214		
			3214		
			1562		
			5214		
			3621		
			3321		
			2514		
Sr. No	**Location**	**Structure/ RCC Member**	**Velocity (m/sec)**	**Average Velocity (Km/sec)**	**Concrete Quality Grading as per Table 2 BIS 13311 (Part 1) - 1992**
Kendriya Vidyalaya School Neemuch main building					
1	B1	RCC SLAB & BEAM	3355	3.47	Medium
			3618		
			6415		
			3448		
			3828		
			2781		
			3049		
			2345		
			2425		
2	B2	RCC SLAB & BEAM	4003	4.61	Excellent
			6600		
			3500		
			3686		
			5343		
			6039		
			4204		
			3195		
			4980		

3	B3	RCC SLAB & BEAM	5079 4569 3569 6514 7521 1963 5109 4313 6205	4.98	Excellent
4	B6	RCC SLAB & BEAM	2335 3047 3039 3292 2571 3050 3207 3268 2855	2.96	Doubtful
5	B6	RCC SLAB & BEAM	2406 2376 4819 2812 3500 1447 2913 3507 2647	2.93	Doubtful
6	B9	RCC SLAB & BEAM	3267 3476 3700 2406 2606 3066 3773 3015 3281	3.18	Medium
7	B10	RCC SLAB & BEAM	3189 3289 5649 4091 4019 4812 3389 2914 3149	3.83	Good
8	B11		4039	3.59	Good

		RCC SLAB & BEAM	3915		
			3285		
			3882		
			3219		
			2708		
			3408		
			3066		
			4816		
9	B12	RCC SLAB & BEAM	2621	3.72	Good
			2929		
			4879		
			2506		
			4118		
			3258		
			2908		
			4619		
			5701		
10	B13	RCC SLAB & BEAM	2351	3	Medium
			2375		
			3792		
			3239		
			2600		
			2732		
			3601		
			2962		
			3375		
11	B15	RCC SLAB & BEAM	2160	3.8	Good
			5000		
			2610		
			2406		
			3347		
			3066		
			5335		
			5652		
			4664		
12	B15	RCC SLAB & BEAM	2918	3.05	Medium
			2646		
			2949		
			3049		
			2515		
			2839		
			2856		
			3754		
			3958		
13	B16	RCC SLAB & BEAM	3914	3.81	Good
			3314		

			3160		
			4068		
			3415		
			3640		
			3468		
			5000		
			4355		
14	B16	RCC SLAB & BEAM	4808	4.07	Good
			5208		
			4258		
			5318		
			3408		
			3390		
			2890		
			2658		
			4657		
15	B17	RCC SLAB & BEAM	3999	4.63	Excellent
			4119		
			4815		
			4542		
			3742		
			3082		
			5992		
			4576		
			6797		
16	B18	RCC SLAB & BEAM	3363	5.03	Excellent
			3500		
			7226		
			5039		
			5163		
			6550		
			6000		
			3882		
			4507		
17	B19	RCC SLAB & BEAM	3867	4.93	Excellent
			6136		
			7142		
			4550		
			7742		
			3325		
			4526		
			3088		
			4000		

4. Observation and Recommendation

The detailed structural strength assessment of the Kendriya Vidyalaya - 1, Neemuch has been carried out as per the project scope. The following observations and recommendations based on extensive non-destructive testing and site visits has been made of the entire KV-1 school building.

- The KV-1 school consists of two buildings, one of them (old building) was constructed in the year 1980, and the other building (Primary Section) was constructed in the year 2010. The design /drawing is not available; therefore, the detailed plan of the building has been prepared based on on-site measurements. The complete KV-1 School buildings were divided into three blocks: A, B, and C, as shown in building plan figures.
- The old building was divided into blocks A and B in this report. Block A and B are constructed with stone masonry, and both the blocks are connected with the RCC structure passage (near Gate no. 02). The structural stability assesmsnet of the RCC structure of the passage has been carried out, and it has been observed that the existing condition of the RCC passage is not suitable for the operation. The beams and columns of the RCC structure are damaged, and several significant cracks have been observed. The non-destructive results obtained show the doubtful condition of the RCC structure, and therefore, it is advised not to consider this section for the operation on an immediate basis. The RCC section of the building should be demolished, and a new passage should be constructed for connection blocks A and B. The retrofitting of the RCC structure is not recommended, considering the poor structural stability.
- Block A and B are constructed with stone masonry, and it has been observed that the existing condition of both blocks is fine, however the block A and B having seepage issues. The seepage is considered a serious cause for the continuous structural damage; therefore, it is highly recommended to take necessary remedies on the immediate basis in both A and B blocks. Also, some minor cracks in the Block A and B are also observed; therefore, it is suggested to take structural strengthening measures. The unsafe RCC structure has been marked with red color in the drawing.

- The projection of lintel and windows in blocks A and B were found in very poor condition. It is suggested to dismantle all the projection of windows/lintel and repair it.

- In block A, corrosion of the reinforcement bar occurred due to the deterioration of the covering of the structural elements. Corrosion in the structural elements of the building has reduced the load-carrying capacity of the building, and the structural stability of the building has become a serious concern. Since corrosion has also occurred in the internal reinforcement. It is suggested to adopt suitable remedial methods.

- Block C of the school building, also known as the primary section, is constructed with RCC framed structure in 2010, although the rectangular columns in the passage area are made of stone masonry. In the expansion joint of block C, debris in heavy quantity has been observed. During the rainy season, it will create seepage and affect the structural stability of block C. This can be caused serious damage to the reinforcement and may lead to the problem of corrosion of the RCC structure. So it is suggested to remove debris and clean that area in order to avoid all these problems. Also highly recommended providing damp-proof course between expansion joints.

Recommendation:

Based on the detailed field observations and non-destructive results obtained, it is clear that structural stability of the RCC structure (passage between block A and B) is very poor; therefore, it is advised not to consider this section for the operation on an immediate basis. The RCC section of the building should be demolished, and a new passage should be constructed for connecting blocks A and B. Block A and B are constructed with stone masonry and having a well-maintained condition; however, the block A and B having seepage issues. The seepage is considered a severe cause for continuous structural damage; therefore, it is highly recommended to take necessary remedies immediately. The projected portion of the windows/lintels in old buildings has the poor condition; consequently, it should be demolished and reconstructed. Block A having corrosion issues in the reinforcement bar; therefore, it is advised to take adequate remedy for the repair work. Block C (primary section) having good structural stability at the present condition; and

however, the maintenance work of the building needs to be carried out. The cleaning of the expansion joint of Block C is recommended, and damp-proof course should be provided in expansion joints.

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