



TECHNICAL REPORT

Report on: Carrying out Non-Destructive Tests on identified RC members of Shri. R. Krishnappa Memorial Hall at Old Academic Block of National Law School of India University Nagarabhavi, Bengaluru

Report for: National Law School of India University
Gnana Bharathi Main Road, Opp NAAC,
Nagarabhavi Bengaluru-560072

NOVEMBER - 2024



STEDRANT Technoclinic Private Limited

NABL ACCREDITED LABORATORY AS PER ISO/IEC 17025-2017

95, "Suvak Pride" Model House Street, Basavanagudi, Bengaluru - 560 004

Email: info@stedrant.com, Phone: 080 2662 9992



Report on	:	Carrying out Non-Destructive Tests on identified RC members of Shri. R. Krishnappa Memorial Hall at Old Academic Block of National Law School of India University Nagarabhavi, Bengaluru
Report for	:	National Law School of India University Gnana Bharathi Main Road, Opp NAAC, Nagarabhavi Bengaluru-560072
Reference	:	Purchase Order: GF/PO/24-25/0085 Dtd:22 nd Oct 2024.
Period of Tests	:	14 th to 18 th November 2024.
Tests carried out under the guidance of	:	Sri Sudarshan S Iyengar Senior Director – (NDT, R & R Services) M/s. Stedrant Technoclinic Pvt. Ltd., Bengaluru
Tests carried out by	:	Mr. Sheetal Y R Manager Mr. Chethan Kumar S Assistant Engineer Mr. Chennappa K Technician (NDT & RR Services) M/s. Stedrant Technoclinic Pvt. Ltd. Bengaluru
Tests carried out in the presence of	:	Mrs. Meenakashi Chauhan Estate Engineer Mr. Mohammad Tahir Assistant Manager-Operations M/s. NLSIU, Bengaluru.
Report submission date	:	26 th November 2024.
Total No. of Pages	:	19 pages





CONTENTS

- 1.0 INTRODUCTION**
- 2.0 NON-DESTRUCTIVE TESTS**
- 3.0 RESULTS OF NON-DESTRUCTIVE TESTS**
- 4.0 CONCLUDING REMARKS**

APPENDIX

- ❖ TABLES**
- ❖ DRAWINGS**
- ❖ PHOTOGRAPHS**





1.0 INTRODUCTION

The existing **Old Academic Block** is located at the premises of National Law School of India University Campus at Nagarabhavi Bengaluru is a typical RC framed structure with infilled masonry walls comprising of ground plus two upper floors. It is reported that the Ground & First floors were constructed in 1991 and the Second floor was added subsequently during 2012-13. Since then all the floors were occupied.

Now, the concerned authorities decided to construct one additional floor on the existing Shri. R. Krishnappa Memorial Hall and the other regions of the block i.e., ground, first and second floors to be dismantled to create larger open area in the vicinity.

In view of this, a reference was made to M/s. Stedrant Technoclinic Pvt. Ltd., (STPL) Bengaluru to carry out the Non-Destructive tests on the identified RC members of ground and first floor (as per the requirement of structural consultant).

In response to this, the Non-destructive tests were carried out by us from 14th to 18th November 2024. This report, in brief, summarizes the outcome of the test results.

2.0 NON-DESTRUCTIVE TESTS

To assess the quality and strength of in-situ concrete in the identified RC members of both the floors, the following Non-destructive tests were carried out as specified:

1. Rebound Hammer test on RC members to assess the strength of concrete near to surface.
2. Ultrasonic Pulse Velocity test on RC members to assess the quality/integrity of concrete in RC members.

1. Rebound Hammer test on RC Members:

Rebound Hammer test was carried out on identified region of RC slabs in first floor after removal of existing plaster and surface preparation to assess the strength of in-situ concrete. The test was conducted using “**Schmidt Hammer**” from M/s. Proceq, **Switzerland** as per the guidelines in Indian Standard **IS: 516 (Part 5/Sec 4): 2020**. The position of the hammer was vertically upwards during the testing.

The results of the tests are tabulated in **Table-1** and the corresponding reference strength chart is appended in **Table-1A**.





2. Ultrasonic Pulse Velocity test on RC members:

Ultrasonic Pulse Velocity test was conducted on identified RC columns and beams of identified region of ground and first floors to assess the quality and integrity of in-situ concrete. The test was conducted using “PUNDIT Lab+” (Portable Ultrasonic Non-destructive Digital Indicating Tester) equipment from M/s. Proceq, Switzerland, as per the guidelines in Indian Standards IS: 516 (Part 5/Sec 1): 2018 & Amended No.1 in Nov 2019. Direct, indirect and semi-direct methods of the test were adopted at the site during testing.

The results of the tests are tabulated in *Table-2* and the corresponding quality grading chart is appended in *Table-2A*.

3.0 RESULTS OF TESTS AND INFERENCES:

The following are the results of tests carried out the identified RC members:

- a. Based on the results of the **Rebound Hammer test**, it is inferred that the in-situ strength of concrete in the tested RC slabs of the identified first-floor region is found to be in the range of **23N/mm² to 25N/mm²** after application of necessary correction factor.

The estimated compressive strength of concrete based on the Rebound Hammer Test will be in the order of $\pm 25\%$ as per the relevant standards.

- b. Based on the results of the **Ultrasonic Pulse Velocity test**, it is inferred that the quality grading of concrete in the tested RC columns and beams of **identified ground and first-floor** regions fall under the category of “**Good Concrete**” in identified members in both the floors as per relevant standards.

4.0 CONCLUDING REMARKS:

Based on the results of Rebound Hammer and Ultrasonic Pulse Velocity tests, it is concluded that the in-situ strength of concrete and the quality grading of concrete are found to be uniform and there is no much variation in the results.





However, the acceptance or otherwise of the member, based on the test results are the prerogative of the concerned structural consultant.

SHEETAL Y R
Manager
(NDT, R & R Services)

SUDARSHAN S IYENGAR
Senior Director
(NDT R & R Services)



APPENDIX

TABLES

DRAWINGS

PHOTOGRAPHS

TABLES

TABLE - 1
REBOUND HAMMER TEST RESULTS

Client	: M/s. National Law School of India University Gnana Bharathi Main Road, Opp. NAAC Teachers Colony, Nagarabhavi, Bengaluru.
Project*	: Carrying out Geotechnical Investigation and Non-Destructive Tests on the identified RC members of Old Academic Block in the premises of National Law School of India University, located at Nagarabhavi, Bengaluru.
Date/Period of test	: 14 th November & 18 th November 2024
Members tested	: Identified locations of First Floor (i.e., Krishnappa Hall) RC Slab Panels (6no's) of Old Academic Block
Grade of concrete	: Unknown
Age of concrete*	: More than 20 Years
Reason for test	: To ascertain the surface strength of in-situ concrete
Test conducted by	: Mr. Sheetal Y R - Manager NDT Mr. Chethan Kumar S - Asst. Engineer NDT Mr. Chennappa K - Sr. Testing Assistant NDT from, M/s. Stedrant Technoclinic Pvt. Ltd., Bengaluru.
Test Witnessed by	: Mr. Meenakshi Chauhan Gupta Estate Engineer from, M/s. NLSIU, Bengaluru.
Test Instrument	: Schmidt Hammer, N Type.
Make & Sl. No	: M/s Proceq, Switzerland, Sl No 174920
Technical references	: Indian Standards IS: 516 (Part 5/Sec 4) : 2020

Sl. No.	Floor level / Location*	Structural Member /Grid Identification*	Position & Orientation	Average Rebound Number++	Remarks
1	First Floor Krishnappa Hall	RC Slab - C-D/1'-2	Vertical Upwards	31	Refer Table-1A for Estimated Compressive strength range of in-situ concrete
2		RC Slab - C-D/2-3	Vertical Upwards	31	
3		RC Slab - D-F/1-2	Vertical Upwards	32	
4		RC Slab - D-F/2-3	Vertical Upwards	32	
5		RC Slab - D-F/3-7	Vertical Upwards	32	
6		RC Slab - C-D/3-7	Vertical Upwards	32	

** Refer enclosed drawing no 1 & 2 for grid identification.

++ After applying necessary correction factors for the direction of impact

NOTE:

- (i) The Results relate only to the members tested.
- (ii) Report shall not be reproduced, except in full, without the written approval of the laboratory
- (iii) Any corrections invalidates this report.
- (iv) However, as per clause 8.1 of Indian Standards IS: 516 (Part5/Sec4):2020, the estimation of the strength of concrete by rebound hammer method cannot be held to be very accurate and probable accuracy of prediction of concrete strength in a structure is $\pm 25\%$.

for STEDRANT TECHNOCLINIC PVT. LTD.,


SUDARSHAN S IYENGAR
Senior Director
(NDT, R&R Services)



TABLE - 1A
REFERENCE STRENGTH CHART FOR REBOUND HAMMER TEST

Instrument : Schmidt Hammer, N Type
Sl. No : 174920
Make : M/s Proceq, Switzerland

REBOUND HAMMER NUMBER	ESTIMATED COMPRESSIVE STRENGTH RANGE (N/Sq.mm)
22 to 25	12 to 16
26 to 29	17 to 21
30 to 33	22 to 26
34 to 37	27 to 31
38 to 41	32 to 36
42 to 45	37 to 41
46 to 49	42 to 45
50 and above	>45

Note:

- 1 Estimated compressive strength is worked out based on the Calibration Chart developed for the above test instrument in our laboratory.
- 2 As per clause 8.1 of Indian Standards IS: 516 (Part5/Sec4):2020, the estimation of strength of concrete by rebound hammer method cannot be held to be very accurate and probable accuracy of prediction of concrete strength in a structure is ± 25 percent.

TABLE - 2
ULTRASONIC PULSE VELOCITY TEST RESULTS

Client : M/s. National Law School of India University
Gnana Bharathi Main Road, Opp. NAAC Teachers Colony,
Nagarabhavi, Bengaluru.

Project* : Carrying out Geotechnical Investigation and Non-Destructive
Tests on the identified RC members of **Old Academic Block** in
the premises of National Law School of India University, located
at Nagarabhavi, Bengaluru.

Period of test : 14th November & 18th November 2024

Members tested* : Identified locations of Ground Floor RC Columns (12no's) and
First Floor RC Beams (21no's) of Old Academic Block

Grade of concrete : Unknown

Age of concrete* : More than 20 Years

Reason for test : To ascertain the quality/uniformity of in-situ concrete

Test conducted by : Mr. Sheetal Y R - Manager | NDT
Mr. Chethan Kumar S - Asst. Engineer | NDT
Mr. Chennappa K - Sr. Testing Assistant | NDT
from, M/s. Stedrant Technoclinic Pvt. Ltd., Bengaluru.

Test Witnessed by : Mr. Meenakshi Chauhan Gupta | Estate Engineer
from, M/s. NLSIU, Bengaluru.

Test Instrument : PUNDIT LAB+ (Portable Ultrasonic Non-destructive Digital Indicating Tester)

Make & Sl. No : M/s. Proceq - Switzerland, PL02-004-0393 C0

Technical references : Indian Standards IS: 516 (Part 5/Sec 1) : 2018

Sl. No.	Floor level / Location*	Structural Member / Grid Identification**	Average Pulse Velocity (Km/Sec)	Method of test & Temperature	Remarks
1	Ground Floor	RC Column - F/5	3.86	In-Direct Method 24°C	Refer Table-2A for Concrete Quality Grading Chart
2		RC Column - F/6	4.41	Semi-Direct Method 24°C	
3		RC Column - F/7	3.71	In-Direct Method 24°C	
4		RC Column - F/1	3.83		
5		RC Column - F/2	3.52		
6		RC Column - F/4	3.65		
7		RC Column - F/3	3.72	Semi-Direct Method 24°C	

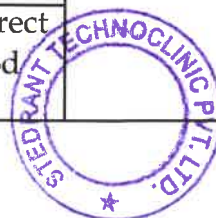


TABLE - 2
ULTRASONIC PULSE VELOCITY TEST RESULTS

Sl. No.	Floor level / Location*	Structural Member / Grid Identification**	Average Pulse Velocity (Km/Sec)	Method of test & Temperature	Remarks
8	Ground Floor	RC Column - D/2	3.66	In-Direct Method 24°C	Refer Table-2A for Concrete Quality Grading Chart
9		RC Column - D/3	3.56	Direct Method 24°C	
10		RC Column - D/7	3.51	In-Direct Method 24°C	
11		RC Column - E/1	3.61	Direct Method 24°C	
12		RC Column - D/1	3.50		
13	First Floor	RC Beam - C-D/2	3.61	Direct Method 24°C	
14		RC Beam - D-F/2	3.52		
15		RC Beam - D-F/3	3.91		
16		RC Beam - C-D/3	3.60		
17		RC Beam - C-D/1	3.50		
18		RC Beam - D/1-2	3.54	Semi-Direct Method 24°C	
19		RC Beam - D/2-3	3.50		
20		RC Beam - D/3-4	3.50		
21		RC Beam - D/4-5	3.51		
22		RC Beam - D/5-6	3.51		
23		RC Beam - F/1-2	3.72	In-Direct Method 24°C	
24		RC Beam - F/2-3	3.74		
25		RC Beam - F/3-4	3.68		
26		RC Beam - F/4-5	3.62		
27		RC Beam - F/5-6	3.71		

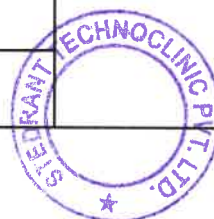


TABLE - 2
ULTRASONIC PULSE VELOCITY TEST RESULTS

Sl. No.	Floor level / Location*	Structural Member / Grid Identification**	Average Pulse Velocity (Km/Sec)	Method of test & Temperature	Remarks
28	First Floor	RC Beam - F/6-7	3.66	In-Direct Method 24°C	Refer Table-2A for Concrete Quality Grading Chart
29		RC Beam - C-D/7	3.73		
30		RC Beam - D-E/7	3.67		
31		RC Beam - E-F/7	3.63		
32		RC Beam - D-E/1	3.64		
33		RC Beam - E-F/1	3.67		

** Refer enclosed drawing no 1 & 2 for grid identification.

NOTE:

- (i) The Results relate only to the members tested.
- (ii) Report shall not be reproduced, except in full, without the written approval of the laboratory
- (iii) Any corrections invalidates this report.

for **STEDRANT TECHNOCLINIC PVT. LTD.,**


SUDHARSHAN S IYENGAR
Senior Director
(NDT, R&R Services)



TABLE - 2A
REFERENCE QUALITY GRADING CHART FOR
ULTRASONIC PULSE VELOCITY TEST

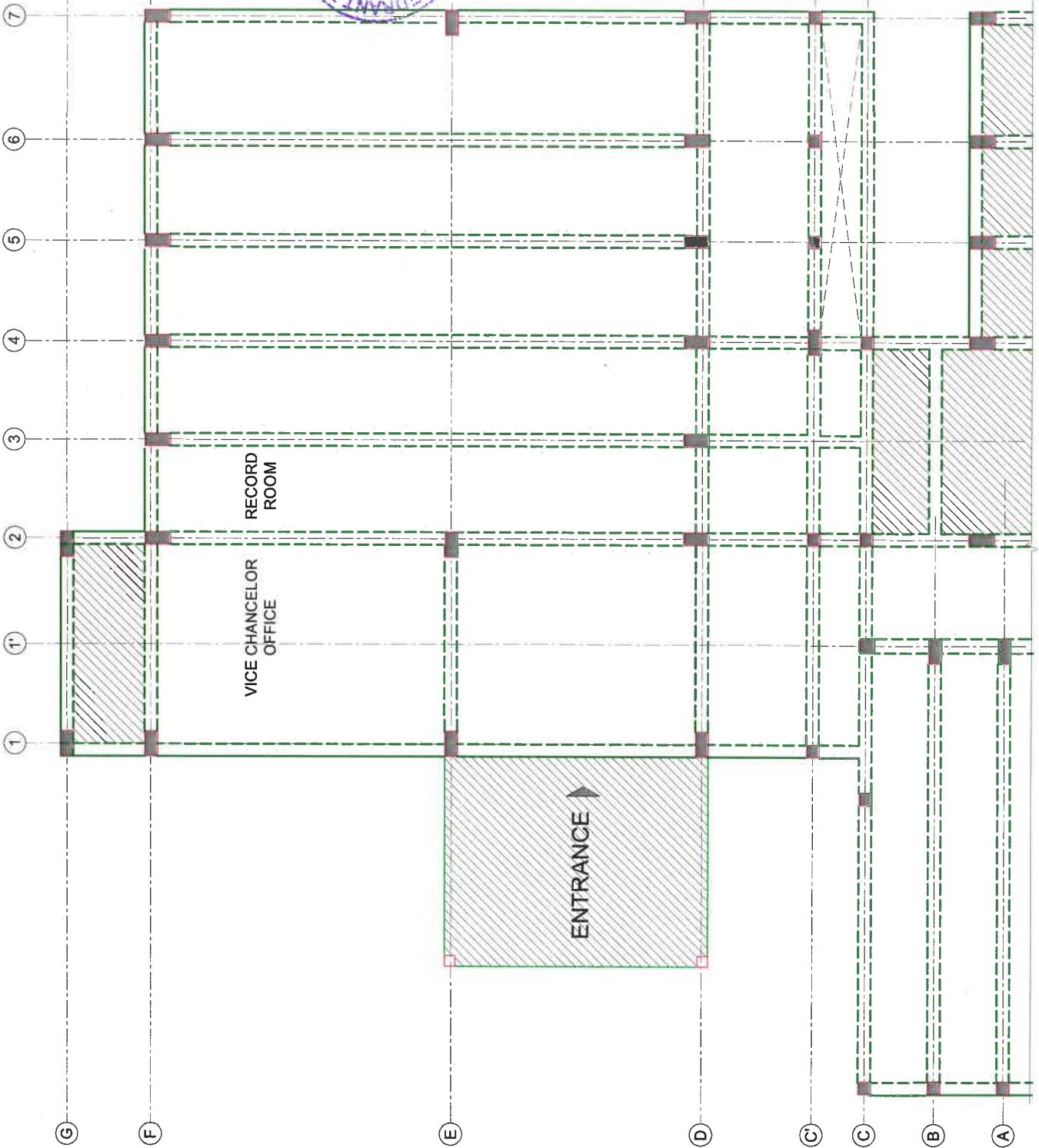
Pulse Velocity (Km/sec)	Concrete Quality Grading
For Concrete (\leq M 25)	
Below 3.50	Doubtful
3.50 to 4.50	Good
Above 4.50	Excellent
For Concrete ($>$ M 25)	
Below 3.75	Doubtful
3.75 to 4.50	Good
Above 4.50	Excellent

Note:

Concrete quality grading for different velocity criterion as reproduced from Amendment No.1 November 2019 to IS 516 (Part 5/Sec 1): 2018, (Page 4, Table 1).


In case of “**Doubtful quality**”, it may be necessary to carry out further testing.

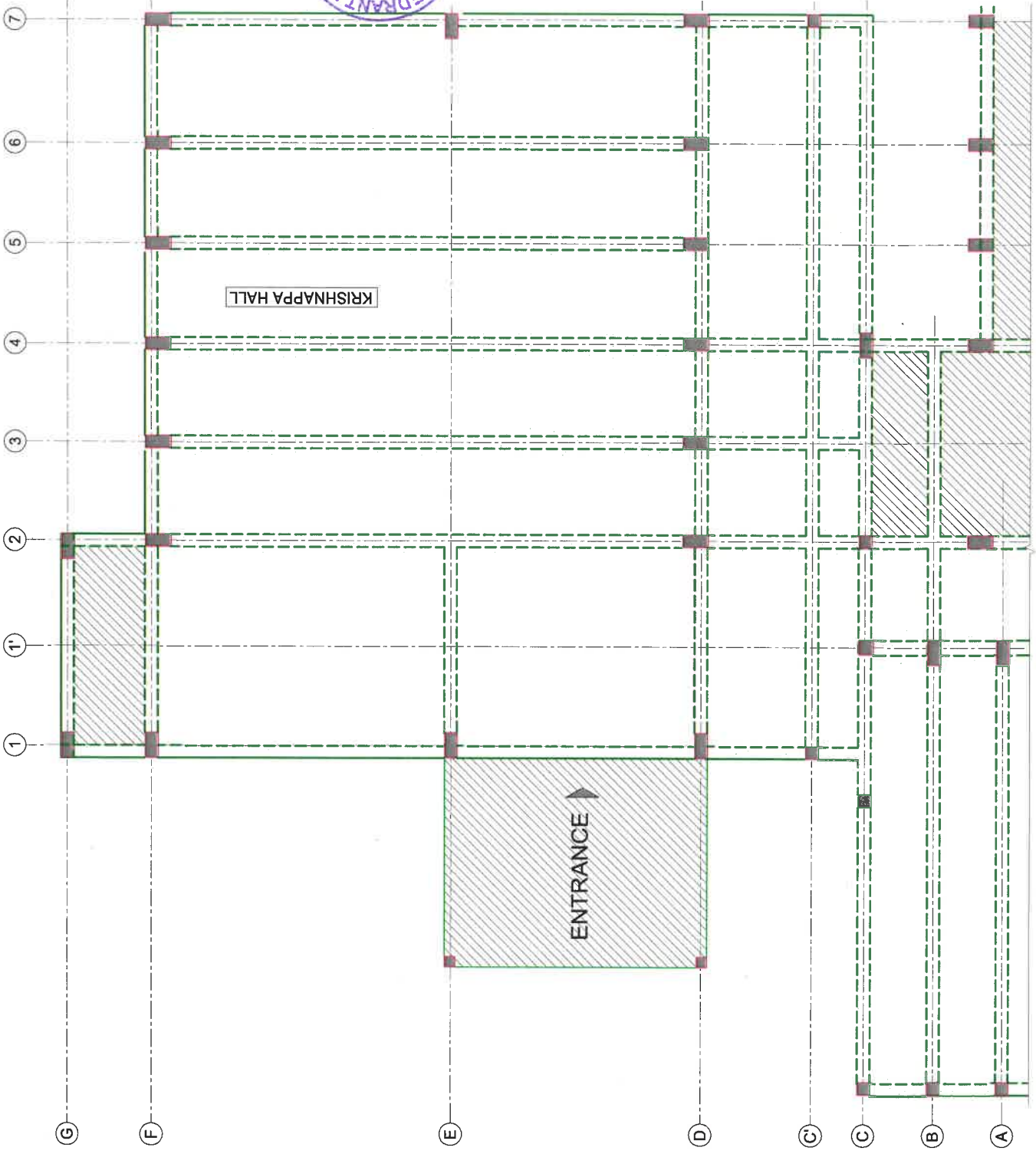
DRAWINGS



NOTES :-

- 1. DO NOT SCALE THE DRAWING.
- 2. THIS DRAWING LAYOUT ONLY FOR GRID IDENTIFICATION
- 3. FOLLOW WRITTEN DIMENSIONS ONLY.
- 4. IF ANY DISCREPANCY IS FOUND IN THE DRAWING, IT SHALL BE BROUGHT TO THE NOTICE OF THE STRUCTURAL CONSULTANT BEFORE EXECUTION.

REV.NO.	DATE	DESCRIPTION	REMARKS	
CONSULTANTS:-				
		STEDRANT TECHNOCLINIC PVT. LTD. "Suvak Pride", # 95, Model House Street, Basavanagudi, Bengaluru - 560 004 Tel. : 080-26629992.		
PROJECT:-		CARRYING OUT NON-DESTRUCTIVE TESTS ON IDENTIFIED RC MEMBERS OF SHRI. R. KRISHNAPPA MEMORIAL HALL AT OLD ACADEMIC BLOCK OF NATIONAL LAW SCHOOL OF INDIA UNIVERSITY NAGARABHAVI, BENGALURU	DWN	SHIVA.B
			FIELD INST. BY	C.K.S
			CHK	S.Y.R
			APPVD	S.S
CLIENT:-		NATIONAL LAW SCHOOL OF INDIA UNIVERSITY GNANA BHARATHI MAIN ROAD, OPP NAAC, NAGARABHAVI BENGALURU-560072	REPORT No: 320 PAGE.No: 13	
TITLE:-				
EXISTING COLUMN & BEAM LAYOUT OF IDENTIFIED REGION OF GROUND FLOOR				
SCALE	DATE	Dwg.No		
N.T.S	27-11-2024	STPL/NDT/2024-320/NLSU/01		



NOTES :-

1. DO NOT SCALE THE DRAWING.
2. THIS DRAWING LAYOUT ONLY FOR GRID IDENTIFICATION
3. FOLLOW WRITTEN DIMENSIONS ONLY.
4. IF ANY DISCREPANCY IS FOUND IN THE DRAWING, IT SHALL BE BROUGHT TO THE NOTICE OF THE STRUCTURAL CONSULTANT BEFORE EXECUTION.

REV.NO.	DATE	DESCRIPTION	REMARKS
CONSULTANTS:-			
<div>STPL</div> <div>STEDRANT TECHNOCLINIC PVT. LTD. "Sunvak Pride", # 95, Model House Street, Basavanagudi, Bengaluru - 560 004 Tel. : 080-26629992.</div>			
PROJECT:-			
CARRYING OUT NON-DESTRUCTIVE TESTS ON IDENTIFIED RC MEMBERS OF SHRI. R. KRISHNAPPA MEMORIAL HALL AT OLD ACADEMIC BLOCK OF NATIONAL LAW SCHOOL OF INDIA UNIVERSITY NAGARABHAVI, BENGALURU			<div>DWN</div> <div>FIELD INVEST. BY</div> <div>CHK</div> <div>APPVD</div> <div>SHIVA.B</div> <div>C.K.S</div> <div>S.Y.R</div> <div>S.S</div>
CLIENT:- NATIONAL LAW SCHOOL OF INDIA UNIVERSITY GNANA BHARATHI MAIN ROAD, OPP NAAC, NAGARABHAVI BENGALURU-560072			<div>REPORT No: 320</div> <div>PAGE.No: 14</div>
TITLE:-			
EXISTING COLUMN & BEAM LAYOUT OF IDENTIFIED REGION OF FIRST FLOOR (I.e SHRI KRISHNAPPA HALL)			
SCALE	DATE	Dwg.No	
N.T.S	27-11-2024	STPL/NDT/2024-320/NLSIU/02	

PHOTOGRAPHS

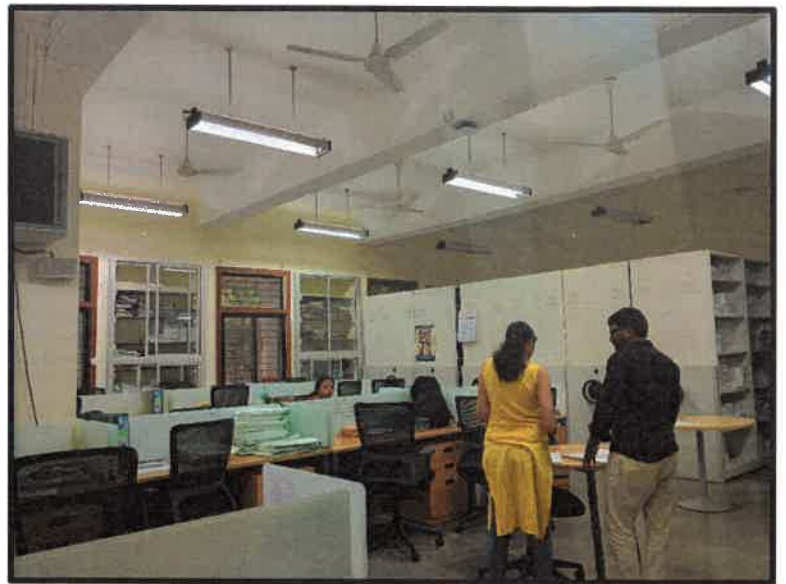


General Views of Old Academic Building





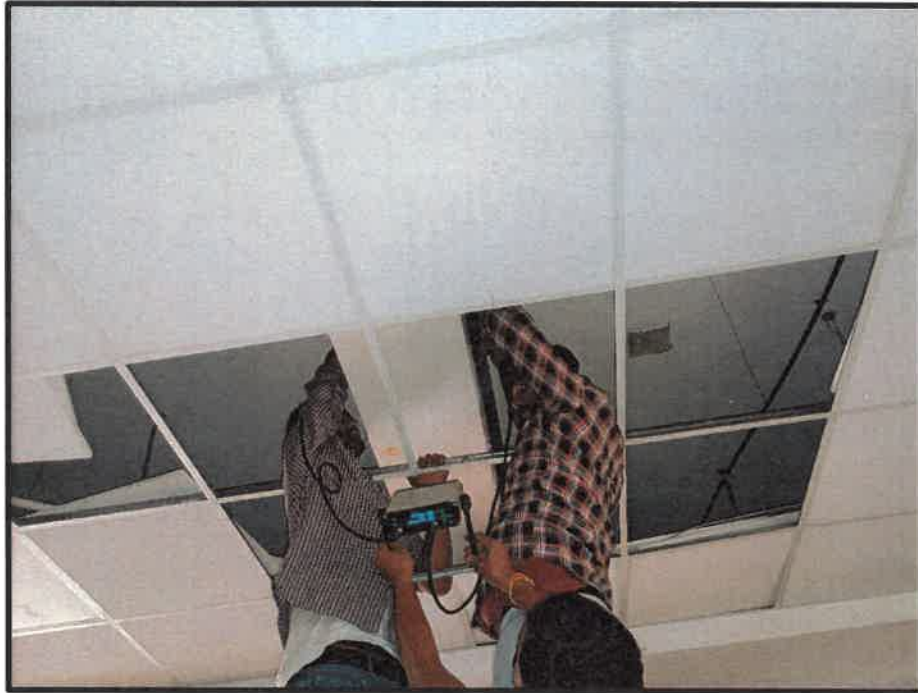
*Internal views of
the Ground Floor*





*Internal views of the First
Floor
(i.e., Shri. R. Krishnappa
Memorial Hall)*





RC Beam

Ultrasonic Pulse Velocity test on RC members is in Progress



RC Column





*Rebound Hammer
test on RC slab is in
Progress*