Brief Bio-Data of Dr. Kanwar Singh

Dr. Kanwar Singh has graduated from Jamia Millia Islamia and obtained his M.Tech and PhD degrees in Civil Engineering from Indian Institute of Technology (IIT), Roorkee. Presently, he is Senior Principal Scientist in Geotechnical Engineering Division of CSIR-CRRI. He has contributed more than 30 years at CSIR-CRRI in R&D/ Sponsored and consultancy services in the areas related to geotechnical and highway engineering. He has significantly contributed in ground improvement for soft and compressible soils, utilization of different kinds of waste and marginal materials in road construction and preventing methodologies for landslide & hazard mitigation projects. He also designed many ground improvement techniques such as stone columns, pile foundations, mechanically stabilized earth walls and soil nailing during box jacking for various live projects. He also completed foreign assignments invited from ministry of external affairs as an expert in Geotechnical Engineering for finalization of ASIAN HIGHWAY from INDIA-MAYANMAR-THAILAND. He is recipient of Supreme Engineer's Awards -2012 for designing and construction of Rail Underpass in Delhi. He has 02 national and international patents namely (i) Soil stabilization with soil nailing during box jacking without disturbing the live Rail/Road traffic (ii) Construction of Multi direction Underpass intersection by box jacking. Recently, he has also filed a **third patent** in the month of August, 2020 on "Instant ground improvement during box jacking. He has published more than 20 papers in reputed international and national journals and conferences. He has successfully completed more than 85 prestigious difficult and challenging projects sponsored by agencies like; Delhi Development Authority (DDA), Central and State PWD's, Water services department (Irrigation)-Haryana, Ministry of Road Transport and Highways (MORTH), National Highway Authority (NHAI), Border Roads Organizations (BRO), Department of Science and Technology and several other Public and Private sector organizations. He is active member of Indian Roads Congress (IRC) and was the executive member of Indian Geotechnical Society (IGS) from 2003-05. He is still executive member in BIS committee for formulation of Indian Standards Codes of Practice for Soil and Pile foundations. He also delivered lectures in regular and customized training programs to highway professional in the above areas of specialization in IRC, CSIR-CRRI, and CPWD and IAHE.

Format for providing information (CV) of each scientist for CRRI website

1.	**NAME**	Dr. Kanwar Singh			
2.	**DESIGNATION AND ADDRESS**	Senior Principal Scientist Geotechnical Engineering Division CSIR-Central Road Research Institute Delhi-Mathura Road, PO- CRRI New Delhi- 110 025			
	MOBILE/FAX/E-MAIL	Mob : 9582567771 Fax : 011-26845943, 011-26830480 Email : skanwar7777@gmail.com			
3.	**AREAS OF INTEREST**	I. Geotechnical Engineering II. Pavement Engineering III. Bridge Engineering			
4.	**EDUCATIONAL QUALIFICATION**				
	Degree	**University/Institute**	**Year of Passing**	**Grade/Division**	**Specialisation**
	Ph.D	Indian Institute of Technology, Roorkee	2019		Research Topic: Response of Cohesionless Nailed Overburden Soil during Box Jacking for Underpass
	M. Tech	Indian Institute of Technology, Roorkee	2006	7.73 out of 10	Geotechnical Engg.
	B.E.	Jamia Millia Islamia, New Delhi	1997	84.5% (CGPA) 1st Div.	Civil Engineering
	Diploma (Civil Engg)	Haryana Board, of Technical Education, Chandigarh	1986	1st Div	Civil Engineering

5. PROFESSIONAL EXPERIENCE - in reverse chronological order

From	To	Name of organization	Position held
30/06/2017	**Till Date**	CSIR-Central Road Research Institute, New Delhi	Senior Principal Scientist
30/06/2012	29/06/2017	--- do ---	Principal Scientist
30/06/2008	29/06/2012	--- do ---	Senior Scientist
30/06/2003	29/06/2008	--- do ---	Scientist 'C'
30/06/1999	29/06/2003	--- do ---	Scientist 'B'
29/09/1994	29/06/1999	--- do ---	Sr. Tech. Assistant
29.09.1989	28.09.1994	--- do ---	Jr. Tech. Assistant
15/06/1988	15.09.1989	Bharat Engineering Enterprises	Site Engineer
10/6/1987	09/06/1988	Haryana Irrigation Deptt	JE Apprentice

` MEMBERSHIP TO PROFESSIONAL BODIES:

Professional Society/ Organization	Member/Activity
Indian Geotechnical Society (Main)	Life member
Indian Geotechnical Society (Delhi Chapter)	Life member & Executive Member (2003-05)
Indian Road Congress	Life member

6. HONORS AND AWARDS: **Supreme Engineers Award- 2012**

The team of CRRI scientists namely Dr. Kanwar Singh, Sudhir Mathur and Dr. P.S Prasad was awarded with Supreme Engineer's Award, 2012 by Economic Research of India, Mumbai for Yamuna bazar project.

7. RESEARCH PUBLICATIONS :(in two parts, Papers in Journals and papers in Conferences)

(a) INTERNATIONAL PATENT

Singh, K., Prasad, P. S., Mathur, S., Gangopadhyay, S. and Azad F. (2016), "International patent on, stepwise repeated destabilization and stabilization of highly collapsible soil by soil nailing technique used for construction of railway/road underpass", Patent No. US9359725B2. https://patents.google.com/patent/US9359725B2/en?oq=9359725**Singh**

Patented 'Soil Nailing with Box Jacking' by CSIR-CRRI

Rapidly growing population, infrastructure development and unprecedented increase in vehicular traffic in metropolitan cities, has left little or no space for further expansion of infrastructure on the ground surface. Many situations, where flyovers are not possible due to site and other constraints, in such conditions, the construction of underpass by box jacking without disturbing the existing structures (road/rail track etc.,) has become need of the hour. The box jacking is a non-disruptive technique for underpass construction which provides the inherent safety, simplicity, economy in construction and time saving. In the last two decades, the scope of construction of underpass by jack pushing is tremendously increased. To date, the technique has been used to create underground space primarily for rail/road, car parking, water pipelines, drainages, and pedestrian accesses, etc after implementation of some site-specific measures.

Whenever a precast box tunnel is pushed to create an underpass beneath any existing structure, the soil above the box tunnel called as overburden soil (OB) experiences a considerable increase in the pressure on either side of box walls and above the box tunnel. The excessive increase in pressure may lead to upheaval or differential settlements in the overburden soil and some time it collapses also. Simultaneously, the redistribution of stresses at box tunnel face also takes place due to lateral movement of soil particles. Sometimes the magnitude of the stresses and strains at the box tunnel face crosses the allowable limits of the soil results in the tunnel face instability or the differential settlement problem occurs at the ground surface. In order to control these problems, ground improvement techniques like; ground freezing, grouting, and chemical stabilization generally used to stabilize soil to reduce the settlements or displacement of soil while box jacking. Many times, these techniques may not be feasible due to environmental or site conditions besides being time-consuming and therefore, one issue i.e., stabilising the soil at box face during box pushing operation still requires our special attention. The project becomes more challengeable and risky when such underpasses have to be constructed through cohesionless (Sandy Soil). It has been also observed that the front soil slope of box suddenly collapses and working manpower burry during box pushing operation.

The above problem was addressed by CSIR-CRRI and focused in one of the research project, carried out for strengthening the OB and box face soil during box jacking operations. Since, the soil nailing has been widely used for controlling the displacements and protection of natural and

man-made slopes. In view of the easy applications and advantages of soil nailing over the other ground improvement methods, **soil nailing technique with box jacking** was invented for stabilization of OB soil and de-stabilisation of box face soil. The technique of stabilization de-stabilization of soil by 'Soil Nailing with Box jacking' was nationally and internationally patented by CSIR-CRRI (Singh et.al, 2012 and 2016).

Patent No. (International Patent):

This patent describes an innovative **Stepwise repeated de-stabilisation and stabilisation of highly collapsible soil mass by 'Soil Nailing Technique' used for construction of railway/road underpass under live loading conditions without disturbing the traffic.** This technique was successfully used first time in the world for construction of three adjacent large size underpasses below a double rail tracks where 200-250 trains moves every day over the rail tracks on Old Delhi-Shahdara section near Salimgarh Fort, Yamuna Bazaar, Delhi, India. Thereafter many rail underpass projects namely; Apsara Border (Delhi), Sahibabad (Gzaziabad) Prgati Maidan (Delhi)) and road underpass at Mahipal Pur have been completed by Indian Railway and CPWD respectively by using said technique. The patent for said technique was granted in 5 countries namely US, Great Britain, Japan, Singapore and Sri Lanka. The said patent is now available on Google and complete details of technology can be search out from Goggle (https://www.google.com/patents/WO2014013508A2?cl=en);.

Singh, K., Prasad, P. S., Mathur, S., Gangopadhyay, S. and Azad F. (2016), "International patent on, stepwise repeated destabilization and stabilization of highly collapsible soil by soil nailing technique used for construction of railway/road underpass", Patent No. US9359725B2. *https://patents.google.com/patent/US9359725B2/en?oq=9359725*

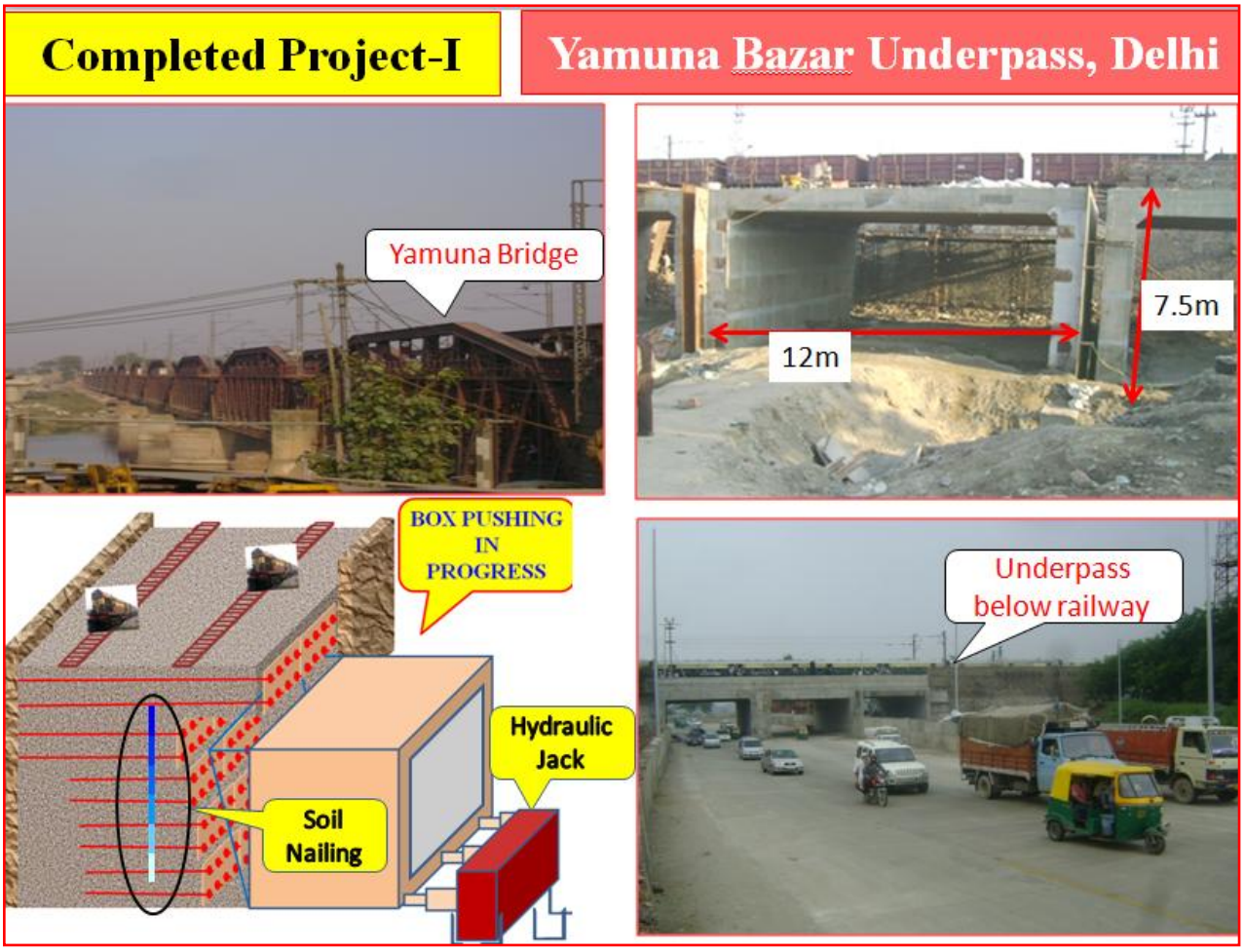
Application number: PCT/IN2013/000442; Granted on Priority date17.07.2012;

Field Demonstration of Patent

Case Study -I: Yamuna Bazaar Rail Underpass, New Delhi

Indian railway had awarded the project of design and guidance for stabilisation of sandy soil during box pushing for construction of underpass through the approaches of Yamuna Bridge, Delhi-Shahdra line. As reported by railways authorities, about 200 to 250 trains passing over this track and the site falls under zero tolerance zone. In this project, two boxes of 10.5m x 5.75m

and one box of 9m x 4m (inside size) were pushed through the approach retaining walls of Yamuna Bridge constructed with random rubble masonry by British's about 150 years ago. Initially, Railway authority, thought about many options like; grouting of sand by chemical, ground freezing and cement/lime and accordingly done the cost analysis. Finally, railway opted the Soil Nailing Technique suggested by CRRI for the stabilisation of cohesionless fine sand during the box pushing. This technique was invented at CSIR-CRRI and implemented first time in the world for this prestigious project. The project was safely and successfully completed before stipulated time. Many more projects like (i) rail underpass constructed near Apsara border (ii) rail underpass near Shahibabad (iii) road underpass near Mahipal pur below NH-8 near IGI airport and (iv) rail underpass at Pragatimaidan were safely and timely completed by this technique.



Case Study -II: Apsara Border, New Delhi

The second project was referred by CPWD, Delhi to construct two subways across the Shadhara-Ghaziabad road at the intersection of Apsara border. One of the underpasses was proposed from ISBT Anand Vihar side to Seemapuri and the other was proposed from Seemapuri side to ISBT Anandvihar bus terminal. Both the sub ways were proposed to construct parallel to existing Railway Over Bridge (ROB). The soil investigation report revealed that the sub soil strata consisted of sandy soil strata/ Silty sand/Poorly graded fine sand. The five precast box segments (9x5.75)m internal dimension had been pushed through cohesionless collapsible (sandy) soil. The railway embankment soil was collapsed prior to pushing and stabilized with Soil Nailing Technique. The scheme of soil nailing design was done as per railway loading. The nailing system provided the extra safety to the cut slope inside and outside the box during excessive rains also.

Case Study -III: Sahibabad Rail Underpass, Ghaziabad (U.P)

This project was awarded to CSIR-CRR by Northern Railway, and Ghai Construction Ltd. to design of suitable technique for the stabilisation of sandy soil for construction of underpass below 9 rail tracks subway near Sahibabad Railway Station, (U.P). The initial condition of soil failed during excavation as well as when the cutting shoe of box was just touched to the soil mass as shown in Fig. The inner dimensions of each segments of RCC precast boxes was 9.0 m x 4.5. The inside soil mass was stabilised with Soil Nailing Technique. The underpass had been successfully completed covering 76m length of pushing below nine rail tracks.

(b) NATIONAL PATENT

i. Singh, K., Prasad, P. S., Mathur, S., Gangopadhyay, S. and Azad, F. (2012), **"Patent** on stepwise repeated de-stabilisation and stabilisation of highly collapsible soil by 'soil nailing technique' used for construction of railway/road underpass", *Patent* no. WO2014013508A2, https://patents.google.com/patent/WO2014013508A2/en

ii. Singh, K., Chandra S, Kumar K and Mittal S (2019), **"Patent** on A process for construction of Shallow Multi Directional Underpass Intersection by Box Jacking and Soil Nailing without affecting the existing trafic" Application No 201911033449, CSIR-CRRI/ 0128NF2019; Filing Date 20.08.2019

iii. Singh, K., Chandra S, Saurikhia A (2020), "Method/process for Instant improvement of foundation soil during box jacking operation without affecting the live rail/road traffic thereof". Application No 202011034410 , CSIR-CRRI/ ; Filing Date 11.08.2020.

(c) PAPERS IN JOURNALS and CONFRENCES

1. **Kanwar Singh,** Satyendra Mittal and Kishor Kumar**,** (2019), "Vertical displacement reduction of cohesionless overburden soil by nails in box jacking", *International Journal of Geotechnical Engineering*, pp. 1-13. DOI: 10.1080/19386362.2019.1643521.

2. **Kanwar Singh,** Satyendra Mittal and Kishor Kumar**,** (2018) "Reduction in lateral displacement of cohesionless soil at box tunnel face using nails in overburden", *International Journal of Geosynthetics and Ground Engineering*, 4(3), pp. 21. DOI: 10.1007/s40891-018-0138-6.

3. Satyendra Mittal, **Kanwar Singh** and Sudhir Mathur (2008), "Behaviour of vertical cut using Soil Nailing Technique in saturated condition." Journal of the south east Geotechnical society June 2008, pp113-120
4. Satyendra Mittal, Sefali Biswas and **Kanwar Singh** Application of Geocells in cohesion less soil an experimental study " Indian Journal of Water & Energy International Vol. 69, No.4 , April, 2012, pp 47- 55.

5. **Kanwar Singh,** Satyendra Mittal, P.S. Prasad and Kishor Kumar (2018) Critical Evaluation on Retention of Fine Sand through Soil Nailing for Construction of Rail Underpass by Box Jacking - A Case Study." *International Symposium on Geotechnics for Transportation Infrastructure* (ISGTI-2018)" April 7-8, 2018.pp 539-542.

6. Gupta, P., Kanaujia, V. K. and **Singh. Kanwar**, 2013 "Human Negligence Leads to Amparav Landslide on National Highway", INDOROCK-2013, 4th Indian Rock Conference, 29-31 May 2013.

7. Jai Bhagwan and **Kanwar Singh** (2012), Paper on "Road Embankments in Water Logged & Frost Affected Areas – Problems & Solutions" *National Workshop on Emerging Trends in Geotechnical Engineering* (*ETGE-12*), June 8th, IIT, Guwahat

8. Kishor Kumar, Anil Kathait, P. S. Prasad, Nitesh Goyal, **Kanwar Singh**, Indervir Singh and S. Gangopadhyay (2012), "Geoenvironmental Appraisal of Landslide Hazards on Highways", *13th Esri India User Conference, Noida*, December 5-6.

9. P.S. Prasad, Kishor Kumar, U.K.Guru Vittal, Sudhir Mathur, Jai Bhagwan, **Kanwar Singh** (2012), "Landslide Investigation at km 162, NH-39, - a case study", Proc. of the Indian geotechnical conference (IGC), December 13-15 2012, Delhi.

10. Kishor Kumar, P.S Prassad , Indervir S. Negi, Anil Kathiat, S. Kimothi, **Kanwar Singh**, & Sudhir Mathur, (2011), Recent reactivation of Kaliasaur landslide and impact thereafter, Proc. Landslide Hazard - Consequences and Challenges, CSIR-CBRI, Roorkee, Feb. 10-12, pp 48-58.

11. Jai Bhagwan, **Kanwar Singh,** P.S.Prasad and Sudhir Mathur (2011), "Geotechnical conference for construction design and performance of structure" Sep., 9-10, IGS Kolkata chapter.
12. Anil Kathait, Kishor Kumar, P. S. Prasad, **Kanwar Singh**, Indervir S. Negi (2011), "Simple Method for Quick Change Detection Using Some Topographic Attributes within Patalganga Landslide", Disaster & Development, Journal of the national Institute of Disaster Management, Vol. 5 No.1&2 April & Nov 2011.

13. **Kanwar Singh,** P.S. Prasad, J. Ganesh, Jai Bhagwan & Sudhir Mathur (2011), Geotechnical investigations and design of remedial measures for roads at Visakhapatnam port area, Visakhapatnam, pp. 1015 – 1018, IGC 2011,Dec. 15 – 17, 2011, Kochi, Kerala, India.

14. Kishor Kumar, Shivashish Kimothi, P.S. Prasad, **Kanwar Singh** and Sudhir Mathur (2010), Landslide Hazard Potential Analysis of Patalganga Valley, Garhwal, Western Himalayan Region of India. 13th Annual International Conference and Exhibition on Geo-spatial Information Technology and Applications (Map India), Gurgaon, Jan 19th -21st.

15. Jai Bhagwan, **Kanwar Singh**, P. S. Prasad & Sudhir Mathur (2009), "Stabilisation of soil for police parade grounds of Delhi police training school, Delhi" Indian Geotechnical Conference, Guntur, India, pp 569 – 573.

16. Jai Bhagwan, **Kanwar Singh**, P. S. Prasad & Sudhir Mathur (2009), " Feasibility of suitable fill material for embankments – A Case Study" Proceedings of Indian Geotechnical Conference, Bangalore, Dec 2009.

17. S.Mittal, **Kanwar Singh**, and S. Mathur (2008), "Soil Nailing" Proceedings of National symposium on Geoenvironment, Geohazards, Geosynthetics and Ground Improvement – Experiences and Practices, Delhi, 2008.

18. P.K.Sikdar, O.P.Yadav, Kishor Kumar and **Kanwar Singh** (2002). An approach for investigation and correction of the landslides at Km. 180 on NH-39 in Nagaland. Proc. Of XVIII National Convention of Civil Engineers Guwahati, 9-10, November 2002.

19. Kishor Kumar, R.K.Panigrahi and **Kanwar Singh** (2001). Landslide Hazard Evaluation in Northwestern Himalaya Int. Conference on Civil Engineering ICCE, July 23-25, 2001, IISc. Bangalore
20. O.P.Yadav, Kishor Kumar, R.K.Panigarhi, **Kanwar Singh** (2001). Stabilization of cut slope through the use of soil nailing technique. Proceeding of the workshop on Reinforcing Technologies for slope stabilization and control of landslides jointly organized by CRRI and CDMM, at CRRI, New Delhi.

21. O.P. Yadav, Jai Bhagwan, Kishor Kumar and **Kanwar Singh** (2000). Engineering database on landslides-Presented in the Silver Jubilee National Seminar on Geodynamics and Environmental Management of Himalaya – Dec 4-7, 2000.

(d) RESEARCH PROJECTS

List of Research and Consultancy completed project

List of Some Important Projects completed at CSIR-CRRI - 88 Projects

Sr. *No*	**Title of the project**	**Role**	**Project Status**
1	Design and Guidance of Ground Improvement Techniques for Construction of Rail Underpass at Chainage Km 33+585 between Julmi and Jhalawar City, Rajasthan	**Project Leader**	**On going**
2	Design & Guidance during Implementation of Soil Nailing for the Stabilization of Embankment for Construction of Rail Underpasses, Pragati Maidan, New Delhi	**Project Leader**	**On going**
3	Investigation for rehabilitation centered improvements of condition of DDA master plan roads in Dwarka (Delhi)	Team Member	Completed
4	Development and Evaluation of 'Soil Nailing Technique' for construction of underpass intersection below Roads- **Research Project No: MLP-0580**	**Project Leader**	Completed
5	Development and Evaluation of 'Soil Nailing Technique' for construction of underpass below Roads/Railways" **Research Project No: OLP-0521**	**Project Leader**	Completed
6	Design and Supervision of Suitable Methodology for Minimizing Upheaval of carriageway during Box Jacking	**Project Leader**	Completed

	for Construction of Underpass on NH-8 near Mahipal Pur, Delhi		
7	Geotechnical investigations and feasibility of de-watering in water logged area along the Gurgaon canal both side from RD 105000 to 149000, Hathin, Palwal	**Project Leader**	Completed
8	Noise & Vibration Study and remedial measures for the work of Construction of elevated corridor on Portal Structure from Munirka to Army RR Hospital	Team Member	Completed
9	Ground Improvement measures for the road over soft organic soft soil in the Northern campus of NIT Manipur Langol Imphal	Team Member	Completed
10	Design and Implementation of remedial measure for preventing of hill slope and landslide at Shri Ram Laxman Mandir at Gadmandir, Ramtek, Nagpur	**Project Leader**	Completed
11	Comprehensive study of seepage and design of suitable preventive measures for seepage in ISSH hostel, IGIB campus, New Delhi	**Project Leader**	Completed
12	Stability of slope and stability of foundation for the construction of buildings at coast guard campus, Port Blair	Team Member	Completed
13	Soil investigation for the construction of 4 lane single span Bridge over Gurgaon canal at two different RD's 9800 (Palla Bridge) and 20780 (Atmadpur Bridge), Faridabad, Haryana	**Project Leader**	Completed
14	Evaluation & Consultancy services for land Reinforcement at UPES, Bidholi, Dehradun	**Project Leader**	Completed
15	Proof checking of design and quality assurance of construction of New 2 Lane River Bridge on D/S Side of Existing Bridge over Hindon River and its Approaches at NH-58E Ghaziabad	Team Member	Completed
16	External party quality checking of construction of inner ring road (Ph-1) from Kuberpur to Fatehabad Road, Agra, U.P	Team Member	Completed
17	Designing of suitable remedial measures for sinking / landslide affected 12 stretches in NH 54, package as 21, 'Silchar, Assam **(NHAI PROJECT)**	Team Member	Completed
18	Soil investigation for the construction of pedestrian subway at Air Force Palam area New Delhi.	**Project Leader**	Completed
19	Assurance of quality control of corridor of elevated road on	Team	Completed

	outer ring road from Mangol puri to Madhuban chowk, and Madhuban chowk to Mukarba Chowk, New Delhi	Member	
20	Design and construction of soil nailed system for the construction of Underpass at railway level crossing No. 156, Sahibabad, U.P	**Project Leader**	Completed
21	Stabilisation of slope of pile cap and suggestion of river bank protection measures for the construction of PMT bridge at river Ravi, Basohli Jammu	**Project Leader**	Completed
22	Geotechnical investigation and suggestion for ground improvement measures for the construction of 100m road from RD 1500 to RD 20550 connecting to NH-10 Bakkarwala, New Delhi.	**Project Leader**	Completed
23	Sub soil investigation for the construction of 6 lane Bridge at km. 8.050 on Agra canal linking Mithapur/Jait pur location to Delhi-Agra national highway	**Project Leader**	Completed
24	Design and soil investigation for the construction of 6 lane Bridge(2 way 3 lane) on Gurgaon canal Feeder at RD 54520 connecting the intersecting road of sector 74 and 75 near sector 3&8 phase-1, Haryana	**Project Leader**	Completed
25	Soil investigation for the construction of 4 lane Bridge single span Bridge at RD 17800, on Gurgaon canal Sector 55,and Sector 56 Ballabhgarh , Haryana.	**Project Leader**	Completed
26	Soil investigation for the construction of 6 lane Bridge single span Bridge at three locations at three different RD 29800, 37000 and 42000 over Gurgaon canal Feeder connecting Sector 19-28, 17-18 and Sector 14-17 Faridabad, Haryana.	**Project Leader**	Completed
27	Soil Nailing Technique for Stabilisation of vertical slopes with surcharge	**Project Leader**	Completed
28	Embankment design for construction of two lane road with paved shoulder in NH-31of Khagria-Purnia section (Pasraha Zone) (Km 301+00 to Km 317+00).	**Project Leader**	Completed
29	Evaluation of Soil Strata for Centre Spine Road near T3 Terminal at IGI Airport.	Team Member	Completed
30	Development and evaluation of Soil Nailing Technique for the construction of underpass construction in sandy Strata	**Project Leader**	Completed
31	Utilization of industrial wastes / Marginal materials for mechanically stabilized earth wall/Soil Nailing applications	Team Member	Completed

32	Site Stabilisation for Platform at Digilipur , MES project (North Andaman.	Team Member	Completed
33	Network project on Engineering of structure against natural and other disasters.	Team Member	Completed
34	Validation of Slope Protection Works of Zirakpur-Parwanoo Four laning Project (NH – 22)	Team Member	Completed
35	Sub soil investigation for the construction of Overhead water Tank in CRRI Campus.	**Project Leader**	Completed
36	Design and execution of soil nail wall system for the stabilization of railway embankment for the trenchless crossing of 1700mm Dia, MS pipe below railway tracks near old steel bridge near Yamuna Bazar, Delhi.	**Project Leader**	Completed
37	Design of soil nailing for stabilisation of vertical cut slopes for construction of road under the railway embankment near Apsara Border on Delhi Gaziabad Railway line.	**Project Leader**	Completed
38	Design of soil nailing for stabilisation of vertical cut slopes for construction of road under the approach embankment of bridge by box pushing technique at west end approach of old Yamuna bridge No. 249 Shahadra Section, Delhi.	**Project Leader**	Completed
39	Investigation of roads in Vishakhapatnam port area Vishakhapatnam, AP.	**Project Leader**	Completed
40	To conduct the initial and routine pile load tests for the construction of bridge over Gurgaon canal at RD 400 near Meethapur, New Delhi.	**Project Leader**	Completed
41	Stabilisation of soil for parade grounds of Delhi Police Training school, Jharoda Kalan, Delhi (sponsored by Delhi Police	Team Member	Completed
42	Sub soil investigation for the construction of Overhead water Tank in CRRI Campus.	**Project Leader**	Completed
43	Sub soil investigation for the construction of Bridge over Gurgaon canal at RD 400.	**Project Leader**	Completed
44	Design and construction quality control (phase-I) of 6 lane bridge two way 3 lane on Gurgaon canal RD-3565 linking to Meethapur, New Delhi	Team Member	Completed
45	Design of Stone column and Reinforced earth retaining wall for Railway Project at Patna, Bihar	**Project Leader**	Completed
46	Technical audit of National highway No.8- Expressway	Team	Completed

	(Delhi Gurgaon) **(NHAI PROJECT)**	Member	
47	Technical audit of National Highway No.2 (Panagarh to Palcit) **(NHAI PROJECT)**	Team Member	Completed
48	Sub soil investigation for the construction of Bridge on Gurgaon Canal for BPTP project at Faridabad	**Project Leader**	Completed
49	Study the behaviour of vertical cut using 'Soil Nailing Technique	**Project Leader**	Completed
50	Landslide investigations on Phuentsholling Thimpu Road, Bhutan	Team Member	Completed
51	Investigation and design of high embankment on soft ground using Fly ash fill for byepass road from Kalindi Colony to Kalindi Kunj, New Delhi	Team Member	Completed
52	Study of Landslide and Rockfall on Mumbai Pune expressway	Team Member	Completed
53	GIS Based Sub-Surface Geotechnical map of Delhi.	Team Member	Completed
54	Investigation, instrumentation and monitoring of Patalganga landslide on NH-58, Uttranchal (phase-1).	Team Member	Completed
55	Instrumentation and monitoring of Band Drains for the development of Adequate Road Connectivity at Visakhapatnam, Port Area.	Team Member	Completed
56	Sub Soil investigation for the proposed construction of bridge Budhia Nallah, AFNHB	Team Member	Completed
57	Quality control of Dwarka sub city roads	Team Member	Completed
58	Monitoring of Soil-Nailed slope near Rishikesh.	Team Member	Completed
59	Report on Remedial Measures for Sinking/subsidence of NH-31, km 292 to km312, near Khagaria, Bihar.	Team Member	Completed
60	Report on Investigations and Improvement of approaches to New Surajbari, Gujrat.	Team Member	Completed
61	Determination of Bearing Capacity of soil at Andrewsganj fly over approach Embankment, New Delhi.	Team Member	Completed
62	Sub-soil Investigations for Bandhwa Majdoor Resettlement Scheme, Sector 43 (Part), Faridabad.	Team Member	Completed
63	Sub-soil investigation and foundation recommendations for	Team	Completed

	Bridges on Palam Drain in Dwarka sub-city, New Delhi.	Member	
64	Sub-soil investigation and foundation recommendations for Culverts in Dwarka sub-city, New Delhi.	Team Member	Completed
65	Report on Investigations, Analysis and Correction of Landslides on Dimapur- Kohima Road, NH-39, Nagaland.	Team Member	Completed
66	Use of Pond ash in Approach Embankment for Bridge across Supplementary drains Near Mukrba Chowk, NH-1, New Delhi.	Team Member	Completed
67	Sub-soil Investigation for Escorts JCB LTD., Mathura Road, Ballabhgarh.	Team Member	Completed
68	Sub-soil Investigation for Samtel Color Ltd, Bullundshar Road, Ghaziabad.	Team Member	Completed
69	Sub-soil Investigation for Samtel Electron Devices Limited, Plot No. C-1, C-2 and C-3, Industrial Area, Ghaziabad.	Team Member	Completed
70	Slope stabilization using "Soil Nailing Techniques" on NH-58 near Rishikesh	Team Member	Completed
71	Sub Soil investigation for the proposed construction of Bridge at Gurgaon Canal near Meethapur, BadarPur New Delhi.	Team Member	Completed
72	Development of engineering Data Base for Landslide	Team Member	Completed
73	Development and promototation of jute geotextile (UNDP-Sponsored project)	Team Member	Completed
74	Investigation, instrumentation and monitoring of landslide	Team Member	Completed
75	Design of cement concrete pavement for some roads in Nagpur.	Team Member	Completed
76	Investigation of Import and export post road pavement area at Shambhu Post, Punjab.	Team Member	Completed
77	Sub-Soil investigation for the construction of fly over clover leaf at Peeragarhi Project	Team Member	Completed
78	Sub- Soil Investigation and foundation recommendation for bridges on Gurgaon canal at Ballabhgarh, Haryana	Team Member	Completed
79	Study the soft clay problems in cargo berth area at Kandla Port Trust area.	Team Member	Completed
80	Sub- Soil investigation and foundation analysis for three	Team	Completed

	culverts on Delhi Mathura Road, NH-2, near Hodel	Member	
81	Jute based Geotextiles and their evaluation for civil engineering applications	Team Member	Completed
82	Site investigation and foundation analysis, recommendations for multi-storey building at Haryana Bhawan, New Delhi.	Team Member	Completed
83	Laboratory studies on composite stone columns	Team Member	Completed
84	Ground Improvement using Stone columns- A field trial at Visakhapatnam port trust	Team Member	Completed
85	Geotechnical aspect of Classic Golf Resort, Gurgaon	Team Member	Completed
86	State of art report on high embankment on soft ground	Team Member	Completed
87	Design of embankment for Eastern Freeway Bombay	Team Member	Completed
88	Ground Improvement using stone columns for soft soils	Team Member	Completed

(e) Any Other information – whatever you feel should be displayed on the website (like courses conducted, lectures delivered outside, keynote speech, member of editorial boards, etc. etc.)

- ✓ Expertise in Sub-Soil investigations, designing of ground improvement for soft soil, design of foundation system for bridges and Multilevel Roads, Stabilisation of natural and manmade slopes.
- ✓ Expertise in stabilization of overburden and box face soil by soil nailing during box jacking (Patented technique) operations for the construction of underpass below live rail/road traffic.
- ✓ Design and developed various computerized program for pile foundation, stone column, RE wall and computation of safe bearing capacity of soil for different type of foundation system.
- ✓ Conducted training program on Geotechnical and Landslide investigations for highway projects in CSIR-CRRI as coarse coordinator.
- ✓ Delivered lectures in regular and customized training program on soil investigations, design of soil nailing technique and design of pile foundation organized by CSIR-CRRI and other organizations like CPWD, CBIP and IAHE.
- ✓ Conducted Technical quality audit/quality control of road works of NHAI and NCR.