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CAPACITY BUILDING OF ROAD AGENCIES IN CHARGE OF IMPLEMENTATION OF ROAD PROJECTS IN URBAN AREAS

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CONTENTS

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ABBREVIATIONS AND ACRONYMS

ADB	:	Asian Development Bank
AE	:	Assistant Engineer
AMRUT	:	Atal Mission for Rejuvenation and Urban Transformation
BOT	:	Built, Operate and Transfer
CBUD	:	Capacity Building for Urban Development Project
CCBP	:	Comprehensive Capacity Building Program
CRRI	:	Central Road Research Institute
EE	:	Executive Engineer
GIS	:	Geographic Information System
GPS	:	Geographic Positioning System
IAHE	:	Indian Academy of Highway Engineers
ICT	:	Information and Communication Technology
IIT	:	Indian Institute of Technology
ITI	:	Industrial Training Institute
ITS	:	Intelligent Transportation System
IUT	:	Institute of Urban Transport
MoHUA	:	Ministry of Housing and Urban Affairs
NGO	:	Non-Governmental Organization
NIT	:	National Institute of Technology
NIUA	:	National Institute of Urban Affairs
NMT	:	Non-Motorized Transport
PIU	:	Project Implementation Unit
PMU	:	Project Management Unit
PoA	:	Plan of Action
PPP	:	Public Private Partnership
RPMC	:	Reform and Project Management Cell
SAAP	:	State Annual Action Plan

SE	:	Superintending Engineer
SKA	:	Skill, Knowledge, Attitude
SPV	:	Special Purpose Vehicle
SLIP	:	State Level Implementation Plan (for AMRUT)
TIF	:	Tax Increment Financing
TNA	:	Training Needs Assessment
ULB	:	Urban Local Body
UMC	:	Urban Management Cell
VRU	:	Vulnerable Road Users
WB	:	World Bank
WRI	:	World Resources Institute

CAPACITY BUILDING OF ROAD AGENCIES IN CHARGE OF IMPLEMENTATION OF ROAD PROJECTS IN URBAN AREAS

1 INTRODUCTION

1.1 The task for preparation of document "Capacity Building of Road Agencies in charge of Implementation of Road Projects in Urban Areas" was taken up by the Urban Roads, Streets & Transport Committee (H-8). The draft was deliberated in a series of meetings. The H-8 Committee finally approved the draft document in its meeting held on 14th October, 2016 and decided to send the final draft to IRC for placing before the HSS Committee.

The Composition of H-8 Committee is as given below:

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Director General (Road, Development) & Special Secretary to Govt. of India	(Kumar, Manoj), Ministry of Road Transport & Highways

Secretary General, Indian Roads Congress — Nirmal, Sanjay Kumar

The Highways Specifications & Standards Committee (HSS) considered and approved the draft document in its meeting held on 23rd June, 2017. The Executive Committee in its meeting held on 13th July, 2017 considered and approved the same document for placing it before the Council. The Council in its 212th meeting held at Udaipur on 14th and 15th July, 2017 considered and approved the draft IRC:SP:111-2017 "Capacity Building of Road Agencies in charge of Implementation of Road Projects in Urban Areas" for printing.

The responsibility for urban roads and streets rests with the State governments and the Urban Local Bodies. In some cities, the development authorities and public works department are also required to undertake implementation of road projects. This calls for concerted efforts at strengthening capabilities at the State and city level to efficiently implement the tasks involved in provision of sustainable urban transportation services and infrastructure including roads. Capacity building would have to be addressed at two levels – institutional and individual.

1.2 The Working Group on Urban Transport set up under the chairmanship of Secretary (Urban Development), Ministry of Urban Development by the National Transport Development Policy Committee had projected an investment of Rs. 9,17,000 crore to Rs.12,08,000 crore during the period, 2012-32. This would imply an investment of around Rs. 50,000 crore to Rs. 60,000 crore per year on roads in urban areas. Currently, NITI Aayog is formulating a Vision 2030 for various sectors of the economy. This will then be backed up with 7-year Strategy and 3-year Plan of Action. As such the amount of funds for urban roads may vary from year to year. In any case, investments for roads in urban areas shall remain quite high. With recent initiatives of the Government in creation of Smart Cities and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) project, it is necessary to ensure value for money from the investments in urban roads. This will require due diligence in planning, design, construction, operation and maintenance management of road infrastructure by the urban local bodies and other road departments entrusted with the road network in urban areas. This will necessitate improvement of skills, knowledge and capacity of decision makers, engineering personnel, staff members of consultancy organisations and managers and workers of contractors, etc. Even the city councillors are expected to have some understanding of issues involved in planning and design of road space and infrastructure from the angle of mobility and accessibility planning for cities with emphasis on safe and comfortable movement of people and goods on the road network including those who use the road space and provide services, safety and shelter to road users. The city corporation/council will have a key role to play in ensuring provision and management of road infrastructure in urban areas and human aspects of road design as an inclusive, safe and equitable public good.

1.3 The mode of delivery of projects in road infrastructure is also witnessing transformation. Besides item rate construction contracts, the central government has

introduced EPC (Engineering Procurement and Construction) contracts where the scope of work is stipulated by the government but the contractor is required to design and build. The sector has also seen good progress in PPP (Public Private Partnership) mode of delivery by the private entrepreneur on Design, Build, Finance, Operate and Transfer basis. These PPP projects may be implemented either through BOT (Toll) where the private entrepreneur collects the toll during operation period or BOT (Annuity or Hybrid Annuity) where the entrepreneur receives regular six monthly or annual amount from the government to recover his investments, interest thereon and the profits. For maintenance, Performance Based Maintenance Contracts are being practiced in several states. These are normally 5-year contract and standards of performance are laid down by the government. The contractor is paid based on his performance.

1.4 Funds for urban road infrastructure would also need to be tapped from private sector sources by way of equity from entrepreneurs and debt from banks and other financing institutions. This throws up demand for not only skills and competence in technical designs, social and environment safeguards, procurement processes, project management and maintenance, contract administration but also for financial and legal skills to ensure fair allocation of risks and rewards in implementation of PPP projects. Equally important is to ensure community participation and consensus-building with participation from all classes of future road users, and not just the motorists.

2 MoHUA GUIDELINES

2.1 Annual Capacity Building Plan

Presently, the Ministry of Housing and Urban Affairs (MoHUA) is supporting States and ULBs in capacity building activities through two schemes - Comprehensive Capacity Building Program (CCBP) and the Capacity Building for Urban Development Project (CBUD). Keeping in view the Smart Cities Mission and AMRUT, the Strategy and Plan of Action (PoA) for capacity building of ULBs are given below.

2.2 Strategy

Several reports and studies have recommended capacity building of both municipal functionaries and municipal institutions. Accordingly, the Capacity Building Plan consists of two strategic interventions - Individual Capacity Building and Institutional Capacity Building. The purpose of individual training is to enhance the functional knowledge, improve the job related skills and change the attitude of municipal functionaries. The one-year training will be imparted to municipal functionaries in training institutes (classroom) followed by its application at their work place. Additionally, they will be mentored and provided coaching services at their work place during the one year training period. The aim of Institutional Capacity Building is to improve institutional outcomes, as set out in the AMRUT Reform Agenda.

2.3 Plan of Action (PoA)

2.3.1 *Individual Capacity Building*

Based on the Training Needs Assessment (TNA), the focus will be on the following four departments in ULBs:

(i) Finance and Revenue: Financial Planning and Management, Revenue Mobilization.

(ii) Engineering and Public Health: Water and Sanitation, Drainage and Solid Waste Management.

(iii) Town Planning: Urban Planning including pro-poor planning approaches.

(iv) Administration: e-Governance, Computer and Soft Skills.

The ULBs will plan to train at least 30 functionaries from the four departments every year and all elected representatives. The elected representatives will be imparted training once at the training institutes, which will include a site-visit to learn from best practices in India.

The training will consist of three capsules spread over a year. Each capsule will consist of three days training in the training institute followed by four months during which the training will be applied in their work by the municipal functionaries.

During a period of one year, therefore, a municipal functionary will be imparted training for nine (9) days in the training institute. There are several retired officers from the Central, State and Municipal services who are settled in the ULBs. During the four months when the trainees return to their work place, such retired officers can work as mentors. For this, the training agencies will match mentors with the municipal functionaries.

Finally, the year-long training will also contain one visit to an initiative in India identified as a best practice and one participation in an International/National workshop.

The training will be conducted by empanelled training agencies, academic institutes and other not-for-profit organizations (henceforth called entities). They will be allocated ULBs located within States/regions/areas. Payments to entities will be made after completion of each capsule by the ULBs, subject to training having met its objectives as independently assessed by the National Institute of Urban Affairs (NIUA) or its nominee. If gaps are identified by the NIUA, the training entity will have to conduct the re-training at its cost. The NIUA will be the strategic partner of the MoHUA in capacity building and will provide single window services to the MoHUA/States/ULBs.

The NIUA will be involved in disseminating information on training modules, documenting best practices, monitoring the progress of training, and, most important, evaluating the benefits of training after completion of each training capsule of four months. This evaluation will be done for all the individual municipal functionaries over the one-year long training period and results will be shared with the training entities to make them review their training methods and modules, if necessary, to make the training more appropriate and relevant for the municipal functionaries. For example, functionaries will self-assess the training in the standard formats prescribed after completion of the three-day training program by the

training entities in the classroom. Again on their return from the work place after four months, the functionaries will undertake self-assessment. In addition, their supervisors will also make an assessment about the improvement in skills, knowledge and attitudes of the trainees. The self-assessment and supervisor assessment will inform the NIUA and the training entity about (i) impact of the training on the skills, knowledge and attitude of individual functionaries over their existing levels (baseline), and (ii) improvements in tasks-related performance. Importantly, the learnings gained from such a real-time evaluation will be used by the NIUA to disseminate lessons learnt and to design future activities for ULBs/States.

The NIUA will examine and approve, in consultation with National Mission Director, the roll-out of other components of the CCBP (e.g. workshops, seminars, visits, etc). The NIUA will also prepare an Annual Capacity Building Report in order to make mid-course correction in the Capacity Building Plan. For this purpose, adequate technical and human resources will be provided to NIUA from the Mission funds. The funding for the individual capacity building will be from the State A&OE/CBUD Funds.

2.3.2 *Institutional Capacity Building*

The aim is to improve institutional outcomes e.g. accountability and transparency, service delivery, citizen empowerment, resource mobilization by bringing in external experts and professionals. The external resources can be brought in two ways: (i) outsourcing of functions, and (ii) outsourcing of functionaries. In outsourcing of functionaries, human resource agencies supply human resources, while in outsourcing of functions an activity/job is given to an external company, organization or institution. In both these options, payments are linked to achievement of objectives and outcomes. The following functions will be outsourced and funded through the A&OE Funds/CCBP/CBUD as decided by the National Mission Director.

(i) Empanelling of handholding agencies and/or consulting firms for preparation of Smart City Proposal for the Smart Cities selection competition.

(ii) Empanelling of handholding agencies and/or consulting firms for complete end-to-end assistance in AMRUT for the preparation of State Level Implementation Plan (SLIP), Project Development (e.g. design, estimation) and Management.

(iii) Assisting in implementing the reform agenda focusing on outcomes, as given in AMRUT Reforms and identified indicators in the CCBP toolkit15.

(iv) Providing human resources and all other kinds of support to the Special Purpose Vehicles (SPVs) to be established under the Smart City Mission by providing professionals and managers.

(v) Mobilize external resources and improve internal resource generation of the ULBs. For instance, facilitate access to municipal bonds by credit rating ULBs, providing assistance to ULBs to monetize land and prepare Tax Increment Financing (TIF) proposals, obtain private funding, etc.

(vi) Develop multi-layer GIS maps connected to data (attribute tables) in order to enable ULBs to use GIS for decision-making.

(vii) Assist the States/ULBs to revise Laws and Rules (e.g. land pooling) for implementing the AMRUT Reform Agenda.

(viii) This is not an exhaustive list and new items will be added as the Missions are implemented.

There are several structures existing at the State and ULB levels, such as Project Management Units (PMUs), Project Implementation Units (PIUs), Reform and Performance Management Cells (RPMCs), etc. At present, only the RPMC will be supported by the Mission. They will perform the functions given in the CCBP toolkit, but focus on, (a) assisting the Mission Director in preparing the State Annual Action Plan (SAAP), Reform implementation so that at least 70% Reforms are achieved in order to qualify for the Reform incentive, and (b) visit all the Mission cities to assist them in implementation of reforms prescribed in the AMRUT.

The Urban Management Cells (UMCs) will also be supported by the Mission and they will report to the State Mission Director. In addition to their tasks given in the CCBP toolkit they will focus on, (i) coordinating and building cooperation between the ITIs, empanelled training agencies and ULBs for individual training programmes, (ii) carrying out training of trainers, (iii) providing task oriented coaching for the full year to the municipal functionaries in collaboration with empanelled agencies, and (iv) fostering partnership and networking between empanelled training institutions and ITIs. The States/ULBs will submit a Capacity Development Plan in prescribed forms along with the SAAP for approval by the MoHUA.

3 ADDRESSING KNOWLEDGE GAP IN ROAD SECTOR

3.1 The road departments and public transport providers need to look at good practices from within India and other developing/developed countries where roads have been developed as inclusive spaces serving needs of all road user groups particularly pedestrians and cyclists, apart from motorists. Subsequently, standards that comply with such realities need to be evolved. This can be done using visioning exercises, sample focus group discussions and community based interviews, and thereby building capacity of both civic agencies and communities in the process.

3.2 The Skills, Knowledge and Attitude (SKA) of various functionaries in the urban local bodies and road departments responsible for urban roads have to be enhanced by way of improving their overall technical knowledge (road engineering, safe and inclusive designing, traffic engineering and transport planning for all road user groups including public transport users, non-motorized transport users and para-transit users) and managerial ability for efficient delivery of road infrastructure projects and subsequent operations and maintenance management. In urban areas, they have also to regularly interact with other departments such as traffic police, utilities, transport corporations, metro rail authorities. It is essential that these functionaries:

- are acquainted with fundamentals of inclusive transport planning and traffic engineering.
- are acquainted with best national/international practices in implementation of road and bridge works.

- acquire both theoretical and practical knowledge in core areas of planning, design, social and environment safeguards, safety planning and engineering measures, construction and maintenance of road projects.
- can effectively associate with and oversee the tasks entrusted to consultants.
- can manage efficient and effective delivery of projects by the contractors.
- are sensitive to the concerns and needs of all types of road users and local communities served by the road.
- are aware of, and can enforce, standards in the planning, design, implementation, construction, operation and monitoring of transport infrastructure.
- keep up the momentum towards enhanced governance (accountability, efficiency and transparency) and redressal of grievances raised by contractors and the community.
- can manage post-implementation audits for universal accessibility and continued safety requirements both by third party and trained in-house auditors to pro-actively conduct audits.

3.3 Side by side of skill development of road departments, attention is equally to be focused on skill development of consultants and contractors and their project managers, construction workers and equipment operators.

3.4 The technicians, foremen and supervisors form the backbone of the road construction sector for implementation on the ground. However, unorganised nature of the industry have inhibited the institutionalisation of the role of these supervisory cadre staff, and affected the productivity of construction workers and equipment operators. This weak link will require special attention for successful execution of works designed by the engineering professionals.

4 SPECIAL AREAS OF FOCUS

The topics for the capacity building module for road development need to include the following special areas:

- Urban space planning: Visioning and planning for road space, two-way communication between transport and planning authorities. Evaluate Master Plan for the city in the context of the requirements at the Regional and Sub-regional levels for which they have the responsibility. Consideration for road width, junctions, parking, open spaces, plantation, over/underground services, pedestrianised areas, on-street vending, loading/unloading, bus/ metro stations.
- Facility planning: The specific requirements of access (e.g. to parking, bus/ metro stations, shops, pedestrian facilities) and circulation of vehicular and pedestrian traffic (e.g. entry/exit, safe passage and cross over). Creating safe and inclusive designs for safeguarding pedestrians and cyclists and other vulnerable user groups.

- Conducting road safety and accessibility audits and scientific crash investigations
- Setting up institutional mechanisms to ensure integrated planning and coordination with other infrastructure and service providers like water, sewage, electricity, traffic police and telecom departments.
- Re-thinking on road space allocation and use by creating dedicated infrastructure for public transport, non-motorized transport and para transit.
- Traffic Management: Layout and spacing of junctions based on geometry and regulated movements (e.g. to provide for adequate length for merge, weave and diverge), geometric design of junctions (e.g. from the considerations of lane balance and lane drop), restricting certain movements (e.g. one-way, no right turn, no free left turn), signal plans (e.g. dynamic demand-based signal stages, cycle time, green time allocation) and linking of signals (e.g. ensuring 'green wave' at certain speed of travel across the linked signals), vehicle actuated signals (e.g. by providing buried loop detectors to sense the presence and demand for green time), signing and marking plans and integrating the pedestrian facilities with road facilities.
- Intelligent Transportation System: CCTV monitoring of real time traffic, providing real time feed to the enforcing agencies for traffic management and control interventions, enabling control room interventions for making dynamic changes in signal plans to manage congestion in certain specified area.
- Community engagement: Awareness raising with local residents and community consultation for development of plans for the streets.

These could be further refined and customized to meet the needs and relevance of the agencies/individuals being trained.

5 CORE COMPETENCE

5.1 Except for some states, there is lack of core competence in road departments. Road Departments in the states should have a strong Design Directorate with minimum of five wings with capacity for in-house design and monitoring of outputs of the task outsourced to private consultants and individual experts:

(a) Traffic Engineering and Transport Planning
(b) Pavement and Safety Engineering Design
(c) Bridge Structures Design
(d) Social and Environment Safeguards
(e) Accessibility and Mobility Standards

5.2 The Design Directorate should have at least 4 to 5 professionals at various levels with specialized qualifications in each discipline. Those who do not possess minimum of M. Tech qualifications should be provided with long-term courses in relevant discipline

with support of national/international academic institutions. These engineers should be considered as recognized professionals in their niche area. Proper infrastructure – hardwares, software, office equipments, etc. and office space would, of course, need to be planned and provided.

5.3 Apart from undertaking in-house design, the various specialists of the Design Directorate should also be utilised for proof checking and overseeing the work of design consultants. Needless to add that currently, this is an area of some concern and is a contributory factor in change of work scope during execution and avoidable disputes and even genuine claims raised by the contractors. Designs have to be optimal to suit the condition of soil and anticipated traffic so that both over design and under design are avoided and value for money invested is achieved. There is also need to improve the system of topographic, soil, material, geotechnical and hydraulic surveys and investigations besides scientific traffic surveys, designs and preparation of bid documents.

5.4 For road projects proposed to be undertaken through private financing on Public-Private Partnership approaches, it would be expedient to engage a financial expert agency to support the department in financial appraisal of the project and assessing the likely attractiveness of the project by the prospective concessionaires including viability gap funding requirements.

6 INVOLVING KEY STAKEHOLDERS

There needs to be a strong emphasis on the continuous involvement of all relevant stakeholder-groups (all persons including those with reduced mobility and disabilities, city-consultants, local/ regional authorities, etc.) from the very start of the project. Towards this goal, a two-pronged approach is required.

(a) **Establish a system of effective stakeholder involvement and communication:** Create platforms for educating, sharing ideas and information and learning from each-other's experiences with the stakeholders, in all the phases of creating and maintaining inclusive transport systems. The stakeholders will include users, planners, architects, engineers, contractors, civic agencies, and Government departments that construct and maintain public facilities and outdoor environment. Raise awareness among the local and regional decision-makers of the link between accessibility and energy-efficiency in transport, by initiating communication among all relevant local and regional stakeholders to improve accessibility.

(b) **Establish a structure of systematic and effective approach for comprehensive design including universal accessibility in planning, implementation, and evaluation:** Piecemeal implementation will not be effective until the intermediate links are established. For example, the efficacy of an accessible BRT or Metro system will be incomplete, if people cannot access the footpaths, roads and intermediate pedestrian infrastructure to reach these facilities. A seamless trip chain is necessary to close the loop.

7 SKILL DEVELOPMENT AND TRAINING STRATEGY

7.1 Target Groups

The target groups for training and skill development should be municipal bodies and road departments responsible for urban roads, consultants normally engaged for DPRs for roads, bridges, flyovers and for supervision of works.

7.2 Training Strategy

The training strategy should cover the following aspects:

(i) **All road departments:** Urban Local Bodies and road departments for urban roads within their jurisdiction and communities.

(ii) **Institutional framework:** Strengthening and networking of existing training and academic institutions, collaboration with international agencies.

(iii) **Project cycle:** Traffic and Transportation Studies, Planning, Design, DPR preparation, Procurement, Construction, Operation and Maintenance, Evaluation.

(iv) **Type of training:** Induction training at entry, training for in-service engineers, refresher courses, short-term and long-term specialized courses on a range of subjects like road design, inclusive planning, stakeholder management, standards and codes, best practices, etc.. Also, crash training on innovations – like new technologies and international practices where these are required to be introduced to provide value for money and achieve efficiency in use of resources.

(v) **Level of officers:** At all levels (junior, middle, senior and top management cadre). Special attention for supervisory cadre. Training modules to be specially designed for each level.

(vi) **Different aspects:** Transportation studies, traffic assessment, access standards, project preparation, alignment selection, scope of work, cost-benefit and financial appraisal (particularly for toll-based projects),procurement procedures, construction management, specifications and quality assurance, legal, land management, contract administration, dispute resolution, negotiation skills, social and environment aspects, GIS, GPS, IT-enabled services, ITS technologies, safety, financial management, asset management, personality development, communication skills, team work. In general identifying the gaps in SKA of the target audience and designing the training curriculum in context to their needs.

(vii) **System of incentives:** For department officers, promotion could be linked to participation in skill development and training programmes. Minimum participation in predefined training modules should be crossed before promotion to AE, EE and SE levels.

(viii) **User Interface and Sensitization:** Many commuters face both attitudinal

and physical problems while using public transport. It should be mandatory to provide regular and refresher trainings to all staff that come in direct touch with the people. This should include training in topics like courtesy, cleanliness, gender sensitivity, trauma response and safety.

(ix) **Enforcement:** Non-compliance and/or faulty implementation create hazards and must be prevented. Currently, it is not mandatory for all state departments to enforce standards. Tender and contract documents must include specific instructions and training modules to ensure that codes of practice including universal accessibility are followed as per design.

8 ACCESSIBILITY AUDITS

8.1 Accessibility audits are an important means of ensuring codes of practice on access for persons with disabilities and reduced mobility. They must cover all stage of the process of planning, design, construction, maintenance, monitoring and evaluation. Audits provide valuable guidance from the perspective of identifying deficiencies in road/street and pedestrian infrastructure and developing strategies to overcome them in the most effective and practical way.

8.2 Transport networks keep changing and evolving based on user requirements, climatic conditions and infrastructure depreciation in real time. Regular monitoring of all systems and services within this framework is imperative to maximize its efficacy. Any shortfall in implementation and maintenance and/or lack of understanding on the part of implementing agencies, civic bodies, user groups and other service providers will compromise the accessibility of this network. There has to be a commitment to invest time, funds and technology in capacity building, maintenance, monitoring and operational activities.

8.3 A strategic planning effort involving all relevant stakeholders (persons with reduced mobility, persons with disabilities, government departments, consultants including planners, architects, engineers, implementing and maintaining agencies including contractors and vendors) is needed. It provides local stakeholders with the understanding of the attitudinal, social and physical challenges that confront persons with disabilities of different ages and gender, and, need for creating seamless travel chains. Conducted by a team of qualified access auditors, design professionals (architect, transport planner and urban planner), persons with diverse disabilities and senior citizens, it provides information for effective implementation of the audit recommendations.

8.4 Training of professionals and practitioners will result in:

- Improving credibility, efficiency, and in undertaking accessibility audits effectiveness of the work.
- Fulfilling the needs of changing society.
- Avoiding costly corrections by taking into account the accessibility requirements right from the start.

9 TECHNICIANS AND SUPERVISORS

9.1 Skill development of these important functionaries whether working in the domain of contractors or the road departments has to be undertaken because they perform the vital supervisory and quality control functions. The fundamentals and basics are generally unknown to them. It is thus imperative to evolve a meticulous system and approach in which these field level functionaries are prepared formally in terms of their understanding the theoretical concepts and field operations to strike maximum correlation between the two.

9.2 It is proposed that school pass outs and school drop outs in particular may be trained as site supervisors under well-defined short duration modules of 12-16 weeks comprising theoretical concepts and field training (latter through collaboration with industry). These supervisors may be trained in various fields, such as:

(i) Embankment, sub-grade, sub-base and unbound base course
(ii) Bituminous and concrete construction
(iii) Construction of culverts and bridges
(iv) Maintenance operations
(v) Management of traffic during and post construction
(vi) Inventory data collection
(vii) Utility relocation activities
(viii) Horticulture and afforestation
(ix) Pedestrian accessibility, safety standards and user sensitization

9.3 The Technicians may be trained under longer modules, say 20-24 weeks. The possible areas could be:

(i) Soil and sub-surface investigation and sampling
(ii) Topographical surveys
(iii) Traffic surveys
(iv) Quantity calculations and preparing BOQ
(v) Quality control and laboratory testing

9.4 A system of mandatory engagement of these trained supervisors and technicians by contractors and consultants is necessary to optimise benefits. Hence, to make the classroom environment lively and interactive, some training techniques are to introduce group activities to re-inforce session outcomes and learning, use of audio-visual tools like videos and charts to engage the trainees, simulation exercise where the trainees are blind folded or are required to use a wheelchair to cross road or move on to a footpath, etc.

9.5 In many cities, in response to the need to step up pace of execution, supervision, design consultants and supervision consultants have been engaged to work for the road department. There is clearly a need for updating of knowledge and skill development of the key personnel being engaged by the consulting firms for urban roads and especially making

them to place universal access and inclusivity at the heart of road design. This will help in enhancing the quality and reliability of their services.

10 SKILL DEVELOPMENT AND TRAINING PLAN

10.1 Training Plan

Each urban local body and other road departments should identify one full time training coordinator at the headquarters. The training coordinator should be provided with suitable support staff and office equipment. He should work under the directions of a top level Engineer. He should have a complete list of all officers at various levels together with their brief particulars regarding qualifications as also period and area of training received in the last three years. This list should be updated on regular basis to identify the officers who have not been provided training till date. A long term training plan should be prepared which may also include Study Leave for selected individuals to undergo long-term M. Tech. Courses in various disciplines of transport planning, traffic engineering and highway engineering. Such a training plan should be prepared under the overall leadership and guidance of the Administrator of the Urban Local Body.

10.2 Induction Training

At the entry level, every staff member should be given a comprehensive foundation course on various responsibilities and duties expected from him in the organisation. The duration of such training may be 10-12 weeks, out of which four weeks should be for mentoring and apprentice under a senior Engineer of the department. Such training may include visits to prestigious project sites.

10.3 In-service Training

Training and skill enhancement has to be a continuous exercise. Therefore, the training plan should include periodic training of all in-service staff at various levels so that they are abreast of the latest know-how and state-of-art technologies. The requirement for specialization and skill development of officers in core processes of traffic studies, planning, design, preparation of sound DPR, economic and financial appraisal, social and environment concerns, contract management, standards and specifications, quality control, financial management, safety and access audit, IT and GIS related services, etc. should receive regular attention. The training plan should include study tours of projects in India and abroad by a group of officers.

11 FUNDS

Sufficient funds must be budgeted by the urban local bodies for skill development and training of staff. The quality of output of the skilled staff and efficient delivery of project would more than offset the expenditure incurred towards skill development. It is recommended that the urban local bodies and other road departments may earmark a provision of 0.25 per cent

of the project cost in each estimate towards skill development and training of staff so as to cover course fees, travel to training centres, per diem allowance and expenses of training institutions in imparting training to the officers. This would help create a pool of talented engineers and other staff within the road departments.

12 TRAINING INFRASTRUCTURE AND INSTITUTIONAL ARCHITECTURE

12.1 Some states already have training institution or centre for providing training to its technical personnel. Other states may also consider setting up a training institute at state level. The state level training institutions may be utilised by these urban bodies for training of engineers responsible for urban roads.

12.2 Develop and utilize the technical training resource reservoirs available in the Centres of Excellence created by the Ministry of Housing and Urban Affairs, Institute of Urban Transport, Schools of Planning and Architecture (Department of Transport Planning), IITs, NITs and other engineering colleges for supporting the state level training centres.

12.3 Among the prime training institutions in the country, mention may be made of the Indian Academy of Highway Engineers earlier known as the National Institute for Training of Highway Engineers (NITHE), the Central Public Works Department Training Academy at Ghaziabad, Institute of Urban Transport (IUT) and the Central Road Research Institute (CRRI) at the national level. The IAHE is a collaborative institute of the Central and State Governments. A brief activity profile of IAHE is given in **Box 1**.

Box 1: Indian Academy of Highway Engineers (IAHE)

- Established in 1983. Campus in NOIDA. Collaborative institute of the Central and State Governments.
- Initiative of Ministry of Road Transport and Highways.
- An apex institution of excellence for skill development and training of highway engineers in road sector – both at entry level and during service.
- Mission: Bring in efficiency and value for money in planning, design, construction and maintenance of roads in the country and inculcate leadership quality, professionalism and commitment to excellence among the highway engineers.
- Organizes training for government, contractors and consultants at both national and state levels, also conducts programmes in various states.
- Also imparts training to highway engineers from SAARC and African countries.
- Has an excellent infrastructure: lecture halls, seminar halls, auditorium, hostel, Board room, office block, canteen, recreation facilities, library, computer lab, soil testing lab, staff quarters (spread over an area of around 10 acres).

12.4 Apart from national institutions, there is need to identify international training agencies. Officers both at senior and junior level should be exposed to best international practices by enabling them to visit prestigious projects not only within the country but also abroad. The external agencies like the World Bank, ADB and other international forums can provide technical assistance support in this effort.

12.5 Distance education and e-learning are other IT-enabled tools that can be utilized in this sector also.

12.6 The training institutions should be in regular contact with the IUT, IRC, CRRI and the academia in indentifying the new engineering technologies and innovations and other business processes that need to be introduced for their transfer on the ground. The IRC Committee on Urban Roads, Streets and Transport Committee can act as a focal point for such interaction.

13 TRAINING AREAS, MODULES AND COURSE MATERIAL

13.1 There are several areas for training to which the officers need to be exposed. It needs to be realized that the area and depth of training will differ for level of staff (supervisors, junior level, middle level and senior level engineers). Indicative lists of possible areas for skill enhancement of engineers are given in **Annex-1**. Some outside support should be sought in preparing a comprehensive document identifying areas of training for:

- Staff at senior, middle and junior level
- Supervisors, Surveyors, Junior Engineers, Lab. Assistants
- Junior Engineers and Assistant Engineers at Entry Level

13.2 Such a document should also provide a brief course content for each topic of training and indicative duration for various levels of staff. As an illustration, **Box 2** provides indicative course contents for training of SEs/EEs in construction supervision during project implementation. Another document should be prepared covering course material for each training module. This should include list of reading references and relevant IRC codes, standards, manuals and guidelines for each module.

Box 2: Construction Supervision (Project Implementation)

(Indicative Course Contents)

- Contract documents: International and National Competitive Bidding
- Role of Employer, Engineer and Contractor, Contract Administration
- Encumbrances at site, social and environment concerns
- Specifications and standards
- Quality control, testing procedures, recording of results
- Safety of workers and traffic management at construction sites
- Quantity measurements and checks, recording of measurements
- Variation Orders, fixing of rates, cost control
- Liquidated Damages, Updating of Programme, Extension of Time
- Termination of Contract
- Dispute Resolution Mechanisms
- Processing of Running Bills and Final Payments
- Supervision during Defects Liability Period
- Accessibility Audits
- Case studies

14 FACULTY AND INSTITUTION

The course contents should be divided into each day schedule for the duration of training for each proposed course. The source of training material also needs to be identified for ease of reference by both the faculty and the trainees. Training material for each module should be a combination of audio-visuals and basic knowledge concepts. The possible faculty and the training institution should also be identified.

15 DOCUMENTATION AND DISSEMINATION

15.1 It is recognised that providing functionaries of road departments, contractors, consultants and administrators with the guidelines and manuals on important aspects relating to inclusive and equitable planning, road safety, techno-economic feasibilities, project preparation, procurement, construction, contract administration, access standards and sensitization etc. will be quite useful in improving orderly delivery and thereby adding to the capacity and capabilities of the stakeholders in the road sector. A list of identified manuals together with aims and objectives are given in **Table 1**.

Table 1 Proposed Manuals for Urban Roads and Streets

S. No.	Subject of Manual	Aims and Objectives
1.	Manual for Urban Roads and Streets	This Manual prepared by IRC gives a brief coverage of various aspects of road infrastructure in urban areas.
2.	Manual and Guidelines for Preparation of Feasibility and Detailed Project Reports	Laying down guidelines, checklists, procedures and framework for safe, sound and cost effective project preparation, so as to provide working guidelines for the Road Agencies and Consultants; strengthening institutional capacity within Road departments for clearly defining scope of project and TOR preparation, effective supervision of Feasibility Report (FR)/Detailed Project Report (DPR) preparation, managing peer review and proof- checking, ensuring accuracy of geotechnical investigations, soil, material and topographical surveys together with traffic studies, site verification of FR/DPR.
3.	Manual of Procedures, Guidelines and Environmental Protection Framework	Preparing a Manual containing: (i) Details of required clearances and approvals along with the authority competent to grant such clearances/approvals and process involved; (ii) Procedures, formats, stages

		and guidelines for securing environmental and forest clearances; (iii) Compiling the details of existing guidelines, formats, procedure along with checklist for seeking other clearances in connection with the activities covered in the scope hereto; (iv) Preparing a standard 'Environmental Protection Framework' providing guidance to departmental functionaries and consultants for preparing project details and design incorporating environmental friendly measures and presenting the details in formats prescribed by authorities; and (v) other relevant details and information.
4.	Manual and Guidelines of Procedures regarding Land Acquisition and Relocation of Utilities	The land acquisition and utility relocation processes are time consuming, complex and highly cost intensive. A considerable amount of effort, time and other resources are required in completion of these preconstruction activities. Manual will provide guidance to functionaries to efficiently complete their respective actions expediting the project preparation and project construction.
5.	Manual and Framework of Community Participation in Projects relating to Urban Roads and Streets	This will enable active, effective and meaningful participation of stakeholders at various project stages relating to improvements, maintenance and operation of existing roads. Issues such as gender safety, universal access and use of road space for community events and activities should be adequately reflected.
6.	Manual of Engineering Measures to Enhance Safety on Roads and Streets	This is expected to provide necessary guidance in planning and implementation of road safety (especially taking into account the needs of pedestrians, cyclists, and two wheeler users) and traffic engineering measures.
7.	Manual of Procurement of Works and Services for Roads and Bridges, Construction Management and Contract Administration	Rationalisation and simplification of existing guidelines and procedures, wherever necessary and feasible; Making the entire procurement process transparent and consistent with national

		policies and guidelines and international best practices.
8.	Manual of Guidelines for Construction of Road Bridges and Flyovers	The objective is to provide municipal and other engineers with sufficient insight of current trends and suitability of various options.
9.	Manual of Maintenance and Rehabilitation of Bridges and Flyovers	The objective is to provide an overview of current trend and better options available with regard to maintenance and rehabilitation, technology options and new trends in the industry and their applicability. The Manual would, inter-alia include inspection, maintenance and rectification/rehabilitation of any distressed component of the bridges and flyovers, and a checklist for each activity of inspection, maintenance and any required rectifications.
10.	Manual on Toll Plaza Lay Outs, Toll Collection Systems and Traffic Management at Plazas	To make available necessary guidance in relation to location, layout, space planning, construction and operation of modern toll plazas, electronic toll collection.
11.	Manual and Guidelines for Maintenance and Asset Management of Roads	To provide guidance on data collection, planning, prioritizing and implementation of maintenance measures.
12.	Manual on ITS technologies	To provide guidance on traffic management and incident management on road network in metropolitan cities.
13.	Harmonized Guidelines and Space Standards for Barrier Free Built Environment for Persons with Disability and Elderly Persons (March, 2016, Ministry of Urban Development)	To provide guidance on pedestrian accessibility standards.
14	"Streets for All" Toolkit developed by WRI Sustainable Cities	The "Streets for All" initiative is a sustained community movement towards the provision of better and safer walking and cycling infrastructure in cities. It provides a platform for engagement between government, media, NGOs, technocrats and the community, in order to jointly develop workable solutions to improve the safety and mobility conditions on streets. "Streets for All" could be a weekly,

		bi-weekly, or monthly open streets event when select streets are closed to private vehicles for several hours. Usually held on Sundays, streets are opened up for the exclusive use of pedestrians, cyclists, and other users of Non-Motorised Transport (NMT). The "Streets For All" Toolkit provides detailed steps for planning, operating, implementing and evaluating these open streets events.
15.	Universal Accessibility Guidelines for Pedestrian, Non-motorized Vehicle and Public Transport Infrastructure	Aim at improving accessibility for everyone for those who use the walking, cycling environment and public transport system. These Guidelines utilize principles of universal design to improve access to pedestrian and public transport systems for all users.

15.2 Apart from the above documents, there are several codes, manuals, guidelines of the Indian Roads Congress on various engineering aspects of urban road infrastructure. Arrangements may be made to disseminate all such documents through workshops at regular intervals among the staff of the urban local bodies and road departments.

Annex-1

Possible Areas for Skill Enhancement in the Road Sector

(Engineers of Urban Local Bodies and Road Departments in Urban Areas)

1. Current issues in highway sector development, financing and administration.
2. Urbanisation trends, importance of urban transport and urban road infrastructure, concept of Master Plan and Transit Oriented Development for cities, Mobility Planning Concepts, Urban Space Planning, Facility Planning, Challenges arising from mixed land use, mixed functions of roads and mixed traffic conditions.
3. Planning of urban road network, hierarchy of roads and streets.
4. Bus Rapid Transit Corridors and Planning of Road Alignment and Cross-Section to accommodate BRT corridors.
5. Principles of traffic flow and capacity, service level benchmarks and congestion management for urban roads.
6. Planning of road infrastructure for VRUs and NMT. Traffic and Transportation Studies of Cities – Case Studies.
7. Universal Accessibility Guidelines for Pedestrian, Non-motorized Vehicle and Public Transport Infrastructure.
8. ITS technologies in traffic management, incident management and road safety.
9. Feasibility reports and detailed project reports for road projects (DPRs), case studies.
10. Project management by road departments and supervision consultants, case studies.
11. Contract administration and procurement procedures.
12. FIDIC conditions of contract and standard bidding documents.
13. Energy and environment issues in highway sector. Environment management plan, land management and land acquisition and resettlement and rehabilitation policies for roads.
14. Engineering measures for improving road safety, road signs, pavement markings, crash barriers. Road safety measures at construction sites.
15. Highway legislations: States Highways Act, Motor Vehicles Act, Land Acquisition Act.
16. Pavement design – flexible and rigid pavements, national/international practices, case studies.
17. Construction and maintenance of flexible pavements.
18. Construction and maintenance of rigid pavements.
19. Design and construction of high embankments, ground improvement techniques, case studies.

20. Soil reinforcement structures – design and construction, case studies.
21. Geo-technical and landslide investigations for highway projects in hill towns; case studies.
22. Geometric design of urban roads, pedestrian facilities, cycle tracks, service roads, walkways.
23. Bridge standards and design of foundations, substructures, superstructures, bridge design softwares, case studies.
24. Design of Signalized and Non-Signalized Intersections, Rotaries.
25. Modern trends in design and construction of flyovers and interchanges; case studies.
26. Advance analysis and design of bridges.
27. Urban drainage system.
28. Maintenance of roads – planning, norms, financing and institutional issues. Concept of road assets.
29. Maintenance of roads – technical aspects, operational capacity issues and performance based and item rates maintenance contracts.
30. Road maintenance management systems, pavement evaluation techniques, PMS, HDM-4.
31. Bridge inspection and diagnosis of distresses observed, performance evaluation, rehabilitation and strengthening of bridges, Bridge Management System (BMS).
32. Corridor management; engineering and non-engineering aspects, service to road users, overloading control.
33. Access standards and Sensitization regarding user groups.
34. Streets for All- creative, inclusive and sustainable urban road spaces.
35. Planning, design and operation of expressways in urban areas.
36. Disaster Resilient Measures for roads and bridges.
37. Dispute Resolution Mechanism in contracts.
38. Quality control tests in field and laboratories, soil and material characteristics.
39. Axle load, traffic data, O-D traffic surveys, traffic forecasting techniques.
40. New materials and construction and climate resilient technologies.
41. Construction equipment and its management for road projects.
42. World Bank and ADB guidelines and procedures for procuring and implementing road projects.
43. Use of ICT, GIS and GPS in road sector.
44. Specifications for Road and Bridge Works and Standard Data Book.
45. Public Private Partnerships (PPP) in road sector, BOT and its variants, Hybrid, EPC contracts, SPVs, financial structuring, experiences in Centre and States, Model Concession Agreement for PPP projects case studies.

46. Cost-benefit and commercial analysis of road projects, case studies. Road user costs, quantifying benefits of augmenting road capacity, reducing congestion. Energy Efficiency.
47. Concept of tolls, willingness to pay, open and closed system of tolls, design of toll complexes, electronic toll collection, violation detection.
48. Ethics, Transparency and governance in delivery of road projects.
49. Stress management, organizational behaviour, managerial skills.
50. Team working, leadership, values, work culture.

(The Official amendments to this document would be published by the IRC in its periodical, 'Indian Highways' which shall be considered as effective and as part of the Code/Guidelines/Manual, etc. from the date specified therein)