Co-deployment of Fiber Communication Facilities along Expressway in China

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1. Overview of Expressway in Mainland of China

Highway Network in China

By the end of 2017:
- 4.77 million km highway
- 136,500 km expressway

Vehicles and Drivers

by the end of September 2018
- Number of Motor Vehicle: 322 million
  - Automobile: 235 million
- Number of Licensed Driver: 403 million
Reasons for rapid development

- **Market driven**
  - Implement market economy
  - Open construction market
  - Social financing, bank loans
  - Repayment of loan with toll collections

- **Long-term planning**
  - Three national expressway plans

- **Early implementation**
  - Easy routing and low land price

China National Trunk Highway Plan, issued in 1992

National Expressway Network Plan, issued in 2004

National Expressway Network Plan, issued in 2013
2. Cooperation and Co-deployment between the Communications and the Highway Sector

The Chinese highway department did not jointly deploy the communications system before 1988

- Telecommunication lines are generally arranged along existing highways
- Construction of cross-border telecommunication Lines along highways right of way with permission from highway sector
- Or communications companies choose routes in other areas
No expressway communication system before 1990

- **Shanghai-Jiading Expressway**
  - Length is 20.5 km
  - Construction started on 21 December 1984
  - Open to traffic in 1988

- **Shenyang-Dalian Expressway**
  - Construction of two sections started in 1984
  - 131 km section completed and opened to traffic in 1988
  - Full line opening in 1990

These expressways were designed before 1984. There was no consideration about communication line along expressway at this stage.
Beijing-Tianjin-Tanggu Expressway (BTT Expressway)

- Beijing to Tianjin opened in 1990, Full line opened in 1993
- This is the first time in China that a complete communication system was designed in the expressway
- But it was just designed for the expressway use, so only a four-hole communication pipeline was built.
- Communication trunk uses coaxial cables
The beginning of co-deployment of FOC

- Jinan-Qingdao Expressway
  - Road design began in 1986, construction started in 1990
  - The design of the communication system began in 1987
  - This is the first time to put forward the construction of trunk communication system based on optical cable and the application of program-controlled switch in expressway
(1) Argument in 1988

**MOPT:**
- Communication pipeline under expressways should be constructed and managed by the telecommunication administration.
- The highway department should rent the communication system of the telecommunication department for the highway management.

**MOT:**
- The transport department is in charge of infrastructure construction and management in the scope of highway land. Highway communication system is a part of Highway Infrastructure.
- Moreover, in the future, the traffic service needs a large capacity and perfect communication system, and the highway department needs to build its own.
(2) Coordination:
- **MOT and MOPT coordinated and reached agreement**
  - The communication pipeline in the highway right-of-way will be built by the expressway construction project.
  - The telecommunications sector puts forward pipeline requirements along the highway based on its planning and needs.
  - In addition to the need for expressways, the highway sector should increase the number of communication pipelines used for the telecommunications sector.
(3) Co-deployment

- **Jinan-Qingdao Expressway**
  - The local telecom and the transportation department have reached an agreement that the expressway can design and build a trunk line communication system
  - The expressway construction started in 1990

- **MOT issued Notice in 1992, “Design and construction standard for expressway traffic management and safety”**

- Provision for expressway communication:
  - The design of expressways must include the communication system, and that communication pipelines and highway works should be carried out at the same time
  - Increasing the number of communication pipelines for the telecommunications department
3. Regulations and Technical Specifications Promote Co-deployment of Fiber Cable Along Expressway

Regulations and Standards of MOT Support the Construction of Communication Pipelines

- **Documentation requirement for the design of highway (MOT)**

  - In 1995: document must clearly indicate the location, quantity, form, etc., of all types of facilities, such as monitoring, toll collection, communication, etc.

  - In 2007: design document must include

    - ... communication pipeline design and implementation plans
    
    - ... Fiber cable distribution diagram, Summary of the number of communications civil works, Design drawing of Communication Pipeline and its laying, etc.
• **Technical Standards for Highway Engineering (MOT)**

  - JTJ001-1997: highway communication system, ......should be set up according to the corresponding regulations

  - JTJ001-2003: Expressway communication pipeline should be designed according to Long-term Planning; 4 lane Expressway should be built 4 or more communication pipelines, and 6-8 lane Expressway should be built 6 or more communication pipelines”

  - JTJ001-2014: The capacity of expressway Communication Pipeline laying should take into account the demand of expressway communication, the demand of social lease and the requirement of capacity expansion”

  - How many communication pipelines can be constructed according to market demand without restriction

• **General specification of freeway traffic engineering (MOT)**

  - JTG D80-2006: The provisions of the communication system include the adoption of standards, system composition, network structure, communication pipeline and other aspects
MII Opens Communication Pipeline Market to Promote Development

- **Telecommunication Regulations** (*issued in 2000, revised in 2016*)
  - The State Council stipulates that the communication infrastructure shall be coordinated with other departments
  - Licensing of the basic telecommunication services
    - The communication pipeline is included in the scope of basic telecommunication service

- **Notice on Strengthening the Construction Coordination of Route and Optical Cable Lines** (*MII in 1999*)
  - The municipal communication pipeline belongs to the social public facilities, the telecommunication department lays the optical fiber cable line may use, in order to avoid the duplicate construction and the cross construction
• **Regulations on the Administration of International Communication facilities Construction (MII in 2000)**
  - The construction of international communication facilities must be approved by the Ministry of Information Industry

• **Opinions on the problems related to the Construction of Communication Pipelines (MII in 2001)**
  - The communication pipeline belongs to the basic telecommunication service
  - The MII and the provincial communications administrations shall be responsible for the overall planning and management of the construction of communications pipelines.

• **Telecommunication Service Catalogue (MII in 2003)**
  - Basic telecommunication service does not include communication pipeline

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**The Market of Communication Pipeline is Opened**
4. General Situation of Co-deployment of Optical Cable

- Most of expressways build communication pipeline
  - Most of which were 6-12 holes and some 24 holes
  - 2-3 communication tubes or holes were used by the transport sectors
  - The others are rented to the communications company
  - Use PVC and HDPE pipes instead of concrete communication pipe block after 1995

- A complete expressway optical cable trunk communication system has been built
  - road section network
  - provincial trunk communication system
  - national communication trunk network
Provincial Expressway Communication system

National Expressway Communication Network Topology Diagram
Cooperation between Basic Telecom Operators and Expressway Operators

- **Leased communication pipeline**
  - Basic Telecom and Cable TV companies use Expressway Communication pipeline to build their own communication trunk lines

- **Joint construction communication pipeline**
  - Telecom companies work with local governments to joint build communications pipelines

- **Set up a company specializing in communications pipelines**
  - Local governments co-ordinate the establishment of franchises
    - Beijing Information Infrastructure Construction Co., Ltd (BIIC), Expressway shares 12% of BICC
  - Expressway operators set up companies to operate communication pipelines
    - Beijing, jiangxi, Fujian, etc.

- **Private Enterprises invest in expressway communication pipeline construction and operation**
Benefit-cost of Co-deployment

- **Saving the Investment**
  - 24-hole expressway communication pipeline: 250,000 yuan/km
  - Pipeline construction by telcom company: 0.5-1 million yuan/km
    - The savings include: land requisition, part of the construction costs, occupation costs, storage costs, etc.

- **Routing selection**
  - Resolve the difficulties of routing by using road communication pipelines or co-deployments
    - Difficulties of routing in developed and densely populated areas
    - Difficulties of routing in Mountain and special geological areas

- **Reducing the risk of damage**
  - Expressway communication pipelines are built in the central separation zone of expressway

- **Increased the income**
  - Expressway operating company
  - Information infrastructure chartered company
Future co-deployment of fiber optic cables

The expressway network related to Belt and Road has been completed more than 80% (from NDRC)

- **Co-deployment in general highway construction**
  - Now, a large number of first and second class highway construction include communications pipelines. But highway engineering standard and specifications don't specify this.

- **Laws and Regulations**
  - At present, there are no laws and regulations that the communication pipeline should be constructed in general highway at the same time.
  - There is only one notice joint issued by the MOT and the MII.

- **Project management problems**
  - Whether the co-deployment of communication pipeline within the range of highway Land should be included in Low grade highway engineering?
    - The expressway is clear, but general highway is not clear.
  - Who is responsible for the co-deployment project planning, design and bidding.
Experience and Summary

- Co-deployment of fiber cable system is very economical. China's expressway has implemented simultaneous construction of the communications pipeline and system

- It promoted the co-deployment of the optical cable system that the coordination and policy of government departments in the early stage of the construction

- National regulations, standards and technical requirements provide supports for co-deployment in engineering design and construction

- The government should institutionalize co-deployment of the highway and communications sectors by means of regulations, standards and technical requirements
THANK YOU

Q&A