

## 付 属 資 料

1 . 郵電省関連資料

2 . 商業省関連資料



## TELECOMMUNICATION SERVICES AND IT IN CAMBODIA

### 1 General

In the telecommunications sector the entire country of 11.7 million people has only approximately 140,000 telephones. 75 % of them are cellular mobile. The telephone density is only 0.3 per 100 people for fixed PSTN and if we also include cellular phones the density is merely 1.2 per 100 people. The telephone service is concentrated mainly in the capital and provincial cities and almost non-existent in the outlying rural areas.

The Fixed PSTN in Phnom Penh is provided by the Ministry of Posts and Telecommunications of Cambodia (MPTC) which at present is both an operator as well as the regulator. The Fixed PSTN in the provincial cities is provided by Camintel a joint venture between the MPTC and Indosat of Indonesia. The Wireless local loop is provided by Shinawatra from Thailand and Cellular mobiles are provided by 4 private companies. The technologies used are AMPS 800 MHz, GSM 900 MHz and GSM 1800 MHz.

The fixed network is still very small, only 25 % of the total network. This is due to the fact that all revenue of the MPTC goes direct to the government treasury and almost zero development fund is made available. We are fortunate to have obtained through bilateral aid a number of networks including switches, cables and fibre optic links from friendly countries namely Japan, France and Germany. And these are the only major expansion projects in MPTC in the past 7 years.

Outside Phnom Penh, in the 23 provincial cities the fixed telephony service is provided by Camintel. The links between those cities provided by Camintel use Palapa satellite. The single fibre optic link from Northwest to Southeast of the country which is a donation from Germany serves only 5 provinces along the route.

The Wireless local loop service provided by Shinawatra operates in Phnom Penh plus some 7 provinces. As it is a wireless technology they can reach areas beyond those covered by the wire service provided by MPTC and Camintel.

Between the 4 cellular mobile operators they have about 105,000 subscribers. The links to the provinces are either via microwave radio or satellite. The growth of Cellular mobile service has been very high mainly due to the nature of the service, i.e. being the contemporary technology, and the inability of the MPTC in providing the fixed service for the reasons mentioned above.

In international gateway service has just been fully transferred to the MPTC from Telstra. A second international gateway operator has been licensed a few years back and will start their operation in November this year.

In the field of internet, Cambodia has two ISP's with a total of about 3,500 internet users in the country. The prices of internet are still relatively high, \$2-\$3 per hour because the leased line costs on the international links are also high. We, the regulator, have been making voice over IP illegal in order to protect the international gateway service which pays heavy licence fees to the government. As the technology in VOIP is getting more and more sophisticated we are currently facing quite a hard problem in eradicating the use of voice over IP.

## 2 Information Technology

IT in Cambodia is yet to develop significantly. There are 3 main factors for the lack of good development up to now :

- The shortage of computers and local area network (LAN) systems in the government offices, in companies and in schools.
- The lack of good communication infrastructure, namely data network that connects different offices in Phnom Penh as well as between the different cities
- The shortage of skilled personnel.

The solutions to the above lie in :

- Provision of computers and LAN systems in government offices.
- Systems development for the implementation of the tasks that are automated or computerised.
- Provision of computers in schools and institute teaching programs at schools.
- Provision of the missing components in the communication infrastructures, namely laying more copper cable in cities, installing fibre optic cable in cities and between cities, provision of point to multipoint radio systems that support data in cities and rural areas, provision of data switches in cities and district nodes.
- Training of data managers, web designers, and computer programmers.

Ministry of Posts and Telecommunications  
Phnom Penh  
October 2000

# INVESTMENT REQUIREMENTS FOR POSTS & TELECOMMUNICATIONS, 2001 - 2005

| N°                           | PROJECT NAME                                                      | Total Project Cost<br>(Million USD) | Year of Implementation |      |      |      |      |      | Funding Sources |
|------------------------------|-------------------------------------------------------------------|-------------------------------------|------------------------|------|------|------|------|------|-----------------|
|                              |                                                                   |                                     | 2000                   | 2001 | 2002 | 2003 | 2004 | 2005 |                 |
| (1)                          | (2)                                                               | (3)                                 | (4)                    | (5)  | (6)  | (7)  | (8)  | (9)  | (10)            |
| <b>Annex 1 : Regulations</b> |                                                                   |                                     |                        |      |      |      |      |      |                 |
| 1                            | Telecommunications Act                                            |                                     |                        |      |      |      |      |      | Govt.           |
| 2                            | Posts Act                                                         |                                     |                        |      |      |      |      |      | Govt.           |
| 3                            | National Radio Regulations & Frequency Allocation Table           |                                     |                        |      |      |      |      |      | Govt.           |
| 4                            | Regulation of Universal Service Obligation(USO)                   |                                     |                        |      |      |      |      |      | Govt.           |
| 5                            | Communiqué of E - x Service                                       |                                     |                        |      |      |      |      |      | Govt.           |
| 6                            | Internet Regulations                                              |                                     |                        |      |      |      |      |      | Govt.           |
| 7                            | Int'l Accounting Rate Reform according to ITU and WTO Obbjectives |                                     |                        |      |      |      |      |      | Govt.           |
| 8                            | Developing the IT master plan for Cambodia                        |                                     |                        |      |      |      |      |      | Govt.           |

## Annex 2 : Posts, Telecommunications & PIP

[illegible]

| (1)                          | (2)                                                   | (3)   | (4) | (5) | (6) | (7) | (8) | (9) | (10)  |
|------------------------------|-------------------------------------------------------|-------|-----|-----|-----|-----|-----|-----|-------|
| 13                           | Extension on domestic and Int'l Money Order           | 0,12  |     |     |     |     |     |     | Govt. |
| 14                           | Improve quality of service and new services           | 0,2   |     |     |     |     |     |     | Govt. |
| 15                           | Examination of mail content by using X-Ray            | 0,04  |     |     |     |     |     |     | Govt. |
| 16                           | Direct mail                                           | 0,05  |     |     |     |     |     |     | Govt. |
| 17                           | Stamp agents in Phnom Penh and Provinces              | 0,01  |     |     |     |     |     |     | Govt. |
| 18                           | Express Money Order by Computers                      | 0,24  |     |     |     |     |     |     | Govt. |
| 19                           | Special Parcel Post surface with Thailand and Vietnam | 0,006 |     |     |     |     |     |     | Govt. |
| TOTAL                        |                                                       | 5,07  |     |     |     |     |     |     |       |
| <b>B. Telecommunications</b> |                                                       |       |     |     |     |     |     |     |       |
| 1                            | Rearrange of Subscribers Lines                        | 2     |     |     |     |     |     |     | Govt. |
| 2                            | Outside plant & RSU in P.Penh & Neighbouring P.Penh   | 7,5   |     |     |     |     |     |     | Govt. |
| 3                            | Ring Installation in Phnom Penh                       | 0,28  |     |     |     |     |     |     | Govt. |
| 4                            | Data Communication System Installation                | 3     |     |     |     |     |     |     | Govt. |
| 5                            | Intelligent Network ( IN ) Installation               | 2     |     |     |     |     |     |     | Govt. |
| 6                            | Installation of Prepaid Calling Card System           | 2     |     |     |     |     |     |     | Govt. |

| (1)                                    | (2)                                                     | (3)  | (4) | (5) | (6) | (7) | (8) | (9) | (10)    |
|----------------------------------------|---------------------------------------------------------|------|-----|-----|-----|-----|-----|-----|---------|
| 7                                      | Billing System Upgrading                                | 1    |     |     |     |     |     |     | Govt.   |
| 8                                      | Construction of Training Centre                         | 7,9  |     |     |     |     |     |     | Japan   |
| 9                                      | Upgrading of HF Control System & Maps Scanning          | 1,5  |     |     |     |     |     |     | Govt.   |
| <b>F/O Transmission Links</b>          |                                                         |      |     |     |     |     |     |     |         |
| 10                                     | Kg. Cham - Kg Thom - Siem Reap -Sisophon <i>FFW</i>     | 10   |     |     |     |     |     |     | Germany |
| 11                                     | Upgrading Network Capacities of Poi Pet-Bavet           | 0,6  |     |     |     |     |     |     | Govt.   |
| 12                                     | Kg. Cham-Kandal-Takeo-Kampot-Sihanoukville <i>Japan</i> | 10   |     |     |     |     |     |     | Germany |
| 13                                     | Kg. Cham - Kratié - Stung Treng - Lao border            | 20   |     |     |     |     |     |     | Germany |
| 14                                     | Kg. Cham-Prey Veng-Neak Loeung ( Prey Veng )            | 4    |     |     |     |     |     |     | Govt.   |
| <b>Information Technologies ( IT )</b> |                                                         |      |     |     |     |     |     |     |         |
| 15                                     | Extension of Internet Network Backbone                  | 0,2  |     |     |     |     |     |     | Govt.   |
| 16                                     | Extension of Internet Services to F/O Provinces         | 0,15 |     |     |     |     |     |     | Govt.   |
| 17                                     | Computerized Networking System Installation             | 0,1  |     |     |     |     |     |     | Govt.   |
| 18                                     | E - x Service <i>FFW</i>                                | 0,05 |     |     |     |     |     |     | Govt.   |
| 19                                     | E - Government Network <i>FFW</i>                       | 0,05 |     |     |     |     |     |     | Govt.   |



| (1)                                 | (2)                                                                                       | (3)           | (4) | (5) | (6) | (7) | (8) | (9) | (10)  |
|-------------------------------------|-------------------------------------------------------------------------------------------|---------------|-----|-----|-----|-----|-----|-----|-------|
| <b>Microwave Links</b>              |                                                                                           |               |     |     |     |     |     |     |       |
| 20                                  | Microwave Installation in Provinces                                                       | 10            |     |     |     |     |     |     | Govt. |
| 21                                  | Wireless Phone PHS and WLL Installation in Kg. Cham, Kandal, Takeo, Kampot, Sihanoukville | 11,7          |     |     |     |     |     |     | Japan |
| 22                                  | Coastal VHF System Installation                                                           | 2             |     |     |     |     |     |     | Govt. |
| <b>Installation of Switches</b>     |                                                                                           |               |     |     |     |     |     |     |       |
| <b><u>Phnom Penh</u></b>            |                                                                                           |               |     |     |     |     |     |     |       |
| 23                                  | National Trunk Exchange                                                                   | 1,6           |     |     |     |     |     |     | Govt. |
| 24                                  | Local Exchange                                                                            | 24            |     |     |     |     |     |     | Govt. |
| <b><u>Provinces</u></b>             |                                                                                           |               |     |     |     |     |     |     |       |
| 25                                  | Remote Switching Unit Centre ( RSU )                                                      | 40            |     |     |     |     |     |     | Govt. |
| 26                                  | Operating & Maintenance for Transmission & Switching Centre                               | 2             |     |     |     |     |     |     | Govt. |
| <b>TOTAL</b>                        |                                                                                           | <b>163,63</b> |     |     |     |     |     |     |       |
| <b>GRAND TOTAL ( Millions USD )</b> |                                                                                           | <b>168,70</b> |     |     |     |     |     |     |       |

C. Public Investment Programme ( PIP )

| PIP<br>N°              | Project Name                              | Responsible<br>Agency | Period of<br>Implementati<br>on | Total<br>Projec<br>t Cost | Level of Investment |       |      | Excessi<br>ve<br>Funds<br>for next<br>years | Fundings<br>Source |
|------------------------|-------------------------------------------|-----------------------|---------------------------------|---------------------------|---------------------|-------|------|---------------------------------------------|--------------------|
|                        |                                           |                       |                                 |                           | 2000                | 2001  | 2002 |                                             |                    |
| 419                    | Rural Telecommunications Network          | MPTC                  | 2000 - 2000                     | 2,50                      | 2,50                | -     | -    | -                                           | France             |
| 294                    | Wireless Network System ( PHS & WLL )     | MPTC                  | 2000 - 2001                     | 12,60                     | 5,85                | 6,75  | -    | -                                           | Japan              |
| 418                    | Capacities Upgrading of F/O Network       | MPTC                  | 2000 - 2000                     | 0,74                      | 0,74                | -     | -    | -                                           |                    |
| 355                    | Construction of Training Center           | MPTC                  | 2000 - 2004                     | 7,90                      | 0,45                | 1,00  | 1,22 | 5,23                                        | Japan              |
| 400                    | Transmission Network P.Penh-Lao Border    | MPTC                  | 2000 - 2002                     | 20,00                     | 1,00                | 10,00 | 9,00 | -                                           |                    |
| 295                    | F/O Network P.Penh-Siemreap-Sisophon      | MPTC                  | 2000 - 2002                     | 20,00                     | 3,38                | 6,92  | 9,70 | -                                           |                    |
| 401                    | Transmission Network P.Penh-Sihanoukville | MPTC                  | 2000 - 2002                     | 10,00                     | 2,80                | 2,00  | 5,20 | -                                           | Germany            |
| 447                    | Equipping Main Switch                     | MPTC                  | 2000 - 2000                     | 3,152                     | 3,152               | -     | -    | -                                           |                    |
| TOTAL ( Millions USD ) |                                           |                       |                                 | 76,89                     |                     |       |      |                                             |                    |

Annex 3 : Human Resources Requirements

| N°    | YEAR<br>GRADE                                                 | Current Situation |          | Human Resources |          |       |          |       |          |       |          |       |          |
|-------|---------------------------------------------------------------|-------------------|----------|-----------------|----------|-------|----------|-------|----------|-------|----------|-------|----------|
|       |                                                               | Year 2000         |          | 2001            |          | 2002  |          | 2003  |          | 2004  |          | 2005  |          |
|       |                                                               | Posts             | Tele com | Posts           | Tele com | Posts | Tele com | Posts | Tele com | Posts | Tele com | Posts | Tele com |
| 1     | Engineers ( Telecom., Electronic, Electricity,Architecture..) | 0                 | 74       | 1               | 84       | 2     | 94       | 3     | 104      | 3     | 114      | 3     | 124      |
| 2     | Other Degrees ( Economic, Law, ... )                          | 39                | 46       | 41              | 66       | 43    | 86       | 45    | 106      | 47    | 126      | 49    | 146      |
| 3     | Technicians                                                   | 43                | 120      | 48              | 145      | 48    | 170      | 53    | 195      | 53    | 220      | 58    | 245      |
| 4     | Workers                                                       | 66                | 177      | 71              | 201      | 76    | 231      | 81    | 261      | 86    | 291      | 91    | 321      |
| TOTAL |                                                               | 148               | 417      | 161             | 496      | 169   | 581      | 182   | 666      | 189   | 751      | 201   | 836      |

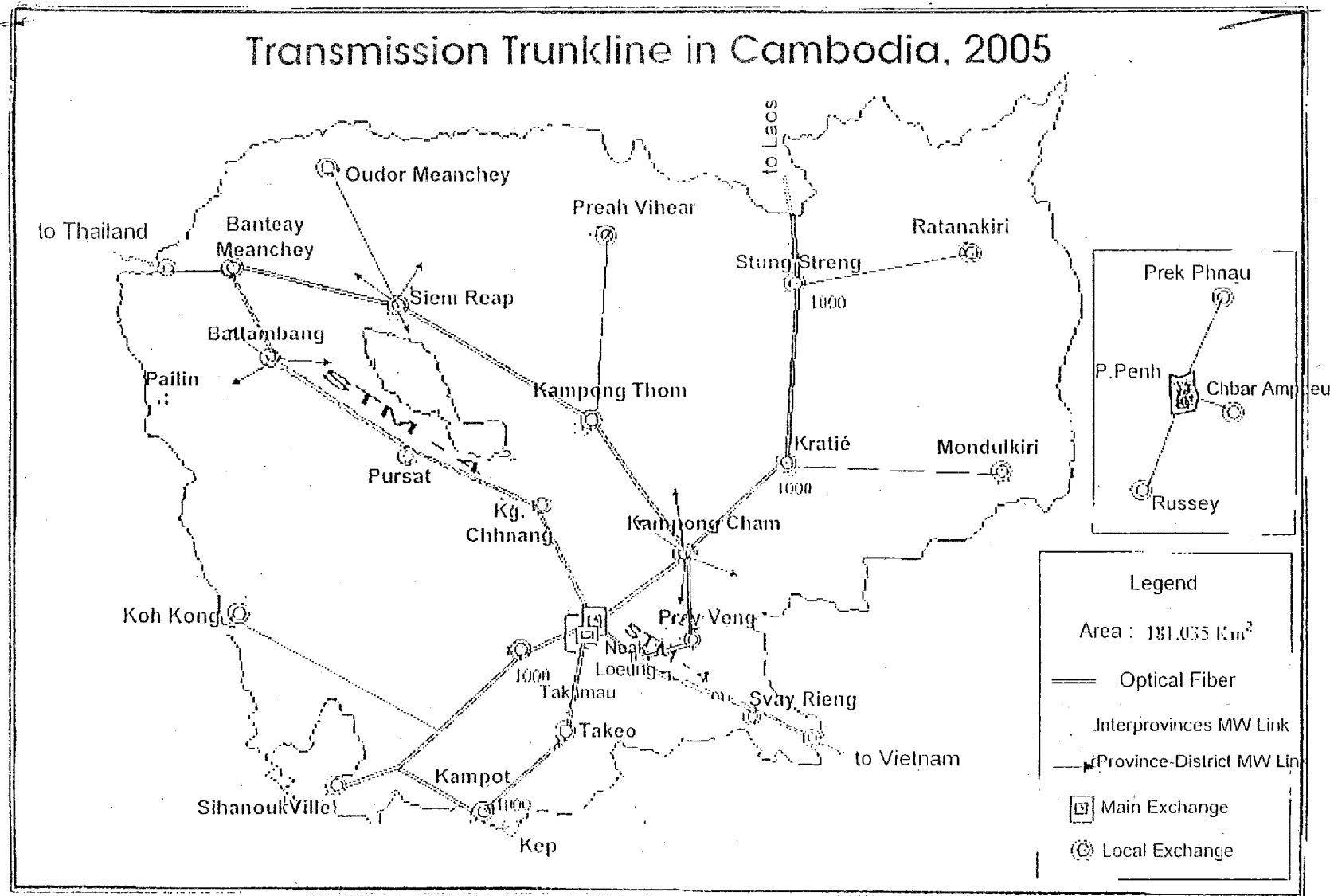
## TELEPHONE CONNECTION PROGRAMME IN CAMBODIA

| YEAR          | 2001       | 2002       | 2003       | 2004       | 2005       |
|---------------|------------|------------|------------|------------|------------|
| POPULATION    |            |            |            |            |            |
| Whole Country | 12.301.191 | 12.607.491 | 12.921.418 | 13.243.161 | 13.572.916 |
| Phnom Penh    | 1.074.407  | 1.101.160  | 1.128.579  | 1.156.680  | 1.185.482  |
| Provinces     | 11.226.784 | 11.506.331 | 11.792.839 | 12.086.480 | 12.387.434 |

| YEAR                       | 2001    | 2002    | 2003    | 2004    | 2005    |
|----------------------------|---------|---------|---------|---------|---------|
| SUBSCRIBERS                |         |         |         |         |         |
| Whole Country              | 208.900 | 261.400 | 316.400 | 373.400 | 431.400 |
| Fixed Phone                | 52.700  | 70.200  | 90.200  | 112.200 | 135.200 |
| Mobile Phone               | 156.200 | 191.200 | 226.200 | 261.200 | 296.200 |
| Phnom Penh ( Fixed Phone ) | 37.700  | 45.700  | 53.700  | 61.700  | 69.700  |
| Provinces ( Fixed Phone )  | 15.000  | 24.500  | 36.500  | 50.500  | 65.500  |

| YEAR                       | 2001  | 2002  | 2003  | 2004  | 2005  |
|----------------------------|-------|-------|-------|-------|-------|
| TELEDENSITY                |       |       |       |       |       |
| Whole Country              | 1,70% | 2,07% | 2,45% | 2,82% | 3,18% |
| Fixed Phone                | 0,43% | 0,56% | 0,70% | 0,85% | 1,00% |
| Mobile Phone               | 1,27% | 1,52% | 1,75% | 1,97% | 2,18% |
| Phnom Penh ( Fixed Phone ) | 3,51% | 4,15% | 4,76% | 5,33% | 5,88% |
| Provinces ( Fixed Phone )  | 0,13% | 0,21% | 0,31% | 0,42% | 0,53% |

Source : Ministry of Posts and Telecommunications, Ministry of Planning (National Institute of Statistics )



## SUMMARY SHEET FOR COOPERATION PROGRAM

### I. BASIC INFORMATION

#### 1. Priority Area

IMPROVEMENT OF SOCIAL AND ECONOMIC INFRASTRUCTURE

#### 2. Development Issues

NATION-WIDE COMMUNICATION NETWORK DEVELOPMENT

#### 3. Name of Cooperation Program

IMPROVEMENT OF TELECOMMUNICATION NETWORK

### II. SUMMARY

#### 1. Present Conditions of the Concerned Sector and Existing Problems to be Tackled (Justification of Cooperation Program)

- MPTC is a government ministry with the function of Posts and Telecom Operations, Policy making and Regulations.
- As a less developing country with a teledensity of 0.24 subscribers per 100 inhabitants, the Kingdom of Cambodia is among countries with the lowest telephone penetration rates countries in the world. Most of the telephone subscribers are concentrated in Phnom Penh (90%) because of lack of Telecom Investment in rural areas<sup>1</sup>. So telecommunication network in rural areas will need to be expanded to reduce the gap of telephone and internet services between cities and provinces.
- Created in 1979, MPTC Training Centre consists of one building for classrooms and very limited residential accommodations : no laboratory, no hall. It lacks the basic equipment for a regular telecommunication training system and no international assistance. Over the last 20 years (1980-2000), MPTC Training Centre trained about 500 people of the skilled worker level with a one-year program and about 130 technicians level with a two-year program. Most of them are now MPTC staffs but their knowledge and skills are out of date and not high enough to meet the requirements of a modern technology.
- JICA's feasibility study on the Improvement of Telecom in Phnom Penh City and MPTC Master Plan made by ITU, both emphasize firstly the importance of human resource development at the basic level as well as at the technician level.

#### 2. Objectives of the Cooperation Program and Relations of Each Composing Projects to the Program

- Promote social and economic welfare<sup>2</sup> and stability of lives to ordinary people in rural areas with basic telephone services, long distance services and internet services.
- Promote business and economic activities in rural areas of Cambodia.

<sup>1</sup> No telephone systems in all districts centres. Telephone penetration in provinces is extremely low ( 0.04 subscribers per 100 inhabitants )

<sup>2</sup> Enable emergency calls from every district to hospitals or governmental offices in case of disaster, crime, accident and so on.

- The aim of the assistance is to provide essential training to maintain and to make the best use of donated telecommunications facilities and also to establish sufficient number of capable engineers and technicians for telecommunication development.

- The MPTC Master Plan describes a proposal for the establishment of full-scale Training Centre to be newly built. But still the times is premature for constructing a full-scale Training Centre, MPTC wishes to get the start of enhancing MPTC Centre, making the possible use of existing training rooms under the Project-Type Technical Cooperation by Japanese Government.

3. Expected Achievement (The level and improved situations to be realized at the target year should be described with indicative indexes.)

- Nine thousand (9,000) telephone lines will be supplied to six central provincials cities and 32 districts of Cambodia to match its telephone demand by WLL and to make a long-distance dial basis services by Optical Fiber Cable Transmission. Telephone density ( Telephone lines per 100 inhabitant) in Provinces will be increased from 0.04 to 0.13 at the target year.

- Support the annual average training of approximately 300 students per year at the target year.

#### 4. Target Year and Target Region

| No. | Project Title                                                                   | Scheme            | <u>Reasons</u>                                                                                                                                                                                    |
|-----|---------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Development of Rural Telecommunication Network (WLL) in Central Provinces       | Grant Aid         | - To provide telephone and internet services to rural areas                                                                                                                                       |
| 2   | Enhancement of MPTC Training Institute                                          | PTTC              | - To establish and to forward a 1-year and a 3-year program for MPTC staff in the field of Digital switching, Digital transmission, Information Technology, Outside plant and customer terminals. |
| 3   | Study on the Formulation of Strategic Development Plan of Infrastructure for IT | Development Study | Effective information infrastructure is the key to level up the Cambodia economy.                                                                                                                 |

5. Relevant Cooperation Program with Other Donors' Assistance (if any)

- German Grand Aid project Rural Telecommunication I ((F/O) transmission system) covering Banteay Meanchey, Battambang, Pursat, Kampong Chhnang, Phnom Penh, Neak Loeung and

Svay Rieng was completed in June 1999.

- German Grant Aid project Rural Telecommunication II

Project area is not defined yet

6. Plan of Operation (including on-going projects) -

| Japanese ODA Scheme                      | Project Title                                                                                             | Operational Year (Japanese Fiscal Year) |      |      |      |      |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------|------|------|------|------|
|                                          |                                                                                                           | 2000                                    | 2001 | 2002 | 2003 | 2004 |
| Project-Type<br>Technical<br>Cooperation | Enhancement of MPTC Training Institute                                                                    |                                         |      |      |      |      |
| Grant Aid                                | Development of Rural Telecommunication Network (WLL) in Central Provinces                                 |                                         |      |      |      |      |
| Development Study                        | Study on the Formulation of Strategic Development Plan for IT (New)                                       |                                         |      |      |      |      |
| Expert (L)                               | Telecommunication Network Plan (On-going)                                                                 |                                         |      |      |      |      |
| Expert (S)                               | Rural Telecommunication Technology ( On-going )                                                           | -                                       |      |      |      |      |
| JOCV                                     | Telephone Switching Work                                                                                  |                                         |      |      |      |      |
| JOCV                                     | Telephone Line Work                                                                                       |                                         |      |      |      |      |
| Relevant Cooperation Program             | Improvement of Telecommunication Network in Phnom Penh City (Phase1&2)<br>Japan Grand Aid, Completed 1998 |                                         |      |      |      |      |
|                                          | Rural Telecommunication I<br>F/O Transmission System<br>German Grand Aid, Completed 1999                  |                                         |      |      |      |      |
|                                          | Rural Telecommunication II<br>German Grand Aid<br>(On-going)                                              |                                         |      |      |      |      |
|                                          |                                                                                                           |                                         |      |      |      |      |

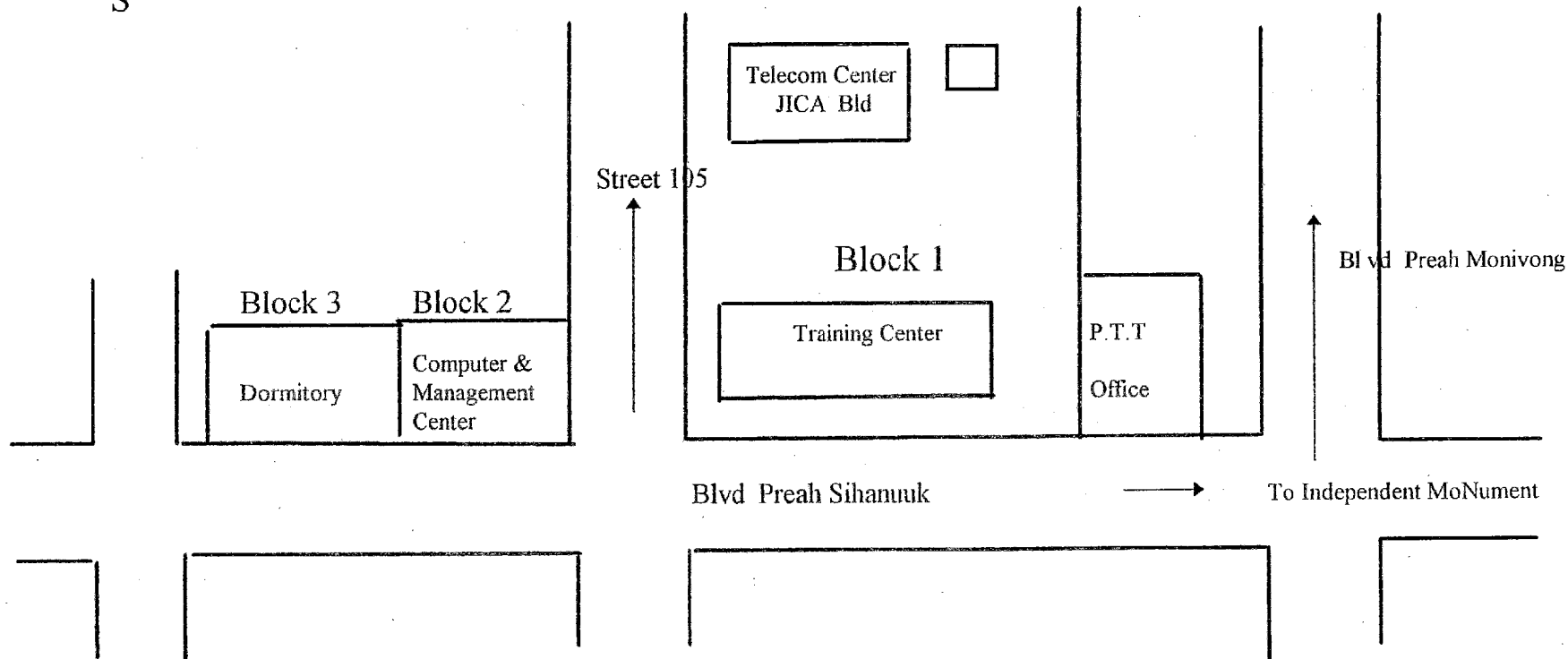
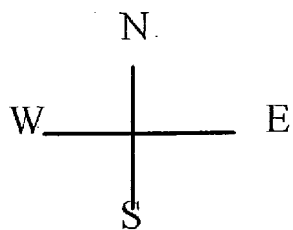
7. Correspondent (please describe the name, position and contact no. of the person who prepared this sheet)

| Name      | Position        | Department           | Contact Tel. No |
|-----------|-----------------|----------------------|-----------------|
| CHHOR RAN | Chief of        | Department of        | 012 855 174     |
|           | Planning Bureau | Planning and Finance | 023 723 423     |

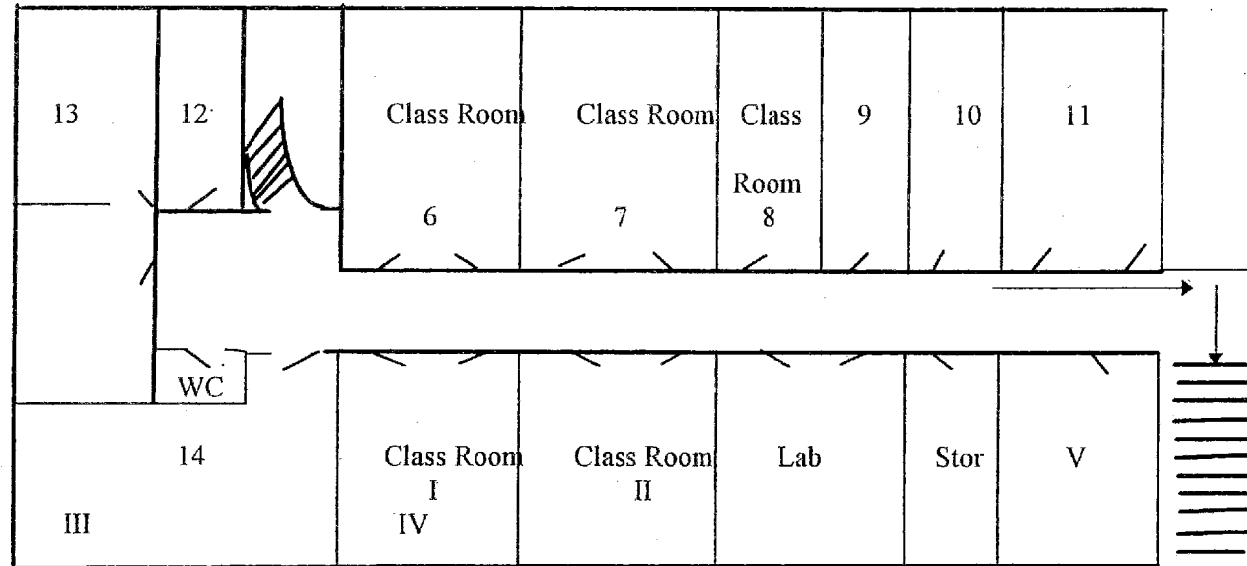


MPTC Training Centre  
( Former ENAPOSTEL )

- 1 - Personal : 14 ( Wemen 7 )
- 2 - Teachers / Trainer :
  - 2-1 - Tecnical 9
  - 2-2 - Postal Service 7
  - 2-3 - Langage 4
  - 2-4 - Computer 4
  - 2-5 - Management 3
  - 2-6 - Basic ( Math , Physic )
- 3 - Training Materral :
  - 3-1 - Lab / Practices
  - 3-2 - Librarie : 1
  - 3-3 - Lab / Listening English : 15 Console
  - 3-4 - Computer and Network : 15 PC
- Traditional
- 4 - Activities and Results of training
  - 4-1 - From 1979 - 1998 :
    - 4- 1-1 - spesilizeed workers :277 Certificates
    - 4-1-2 - Technic Primary level 1121Diplomas
    - 4-1-3 - Technic Secondary level 208 Diplomas
  - 4-2 - Awarded in 1999 :
    - 4-2-1 - Technic Primary level : 23 Diplomas
    - 4-2-2 - Technic secondary level : 65 Diplomas
- 5- Computer and Management Training : Opened 03.Feb 97 - 10 Oct.00
  - 5-1 - Accounting : 46 Certificates
  - 5-2 - English : 140 -
  - 5-3 - Computer : 169 -
  - 5-4 - Management : 14 - 2.



# Block 1 - Floor 1



POST & TELECOMMUNICATION TRAINING CENTRE  
CURRICULUM FOR 2 YEARS OF SWITCHING TECHNICIAN

| No | SUBJECTS                                                                                                                                                                                                                              | 1ST<br>YEAR                                         |                                                      | 2AND<br>YEAR                                       |                                        | TOTAL |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------------|----------------------------------------------------|----------------------------------------|-------|
|    |                                                                                                                                                                                                                                       | 1                                                   | 2                                                    | 1                                                  | 2                                      |       |
|    |                                                                                                                                                                                                                                       | NUMBER OF HOURS                                     |                                                      |                                                    |                                        |       |
| 01 | MATHEMATICS<br>- Arithmetics & Calculator<br>- Algebra<br>- Decibel<br>- Trigonometry<br>- Logarithms<br>- Statistics & Probability<br>- Binary numbers                                                                               | 75<br>(10)<br>(25)<br>(15)<br>(25)<br><br><br>(25)  | 85<br><br>(25)<br>(35)<br><br><br>(20)               | 50<br><br><br><br>(30)<br>(20)<br><br>(15)<br>(20) | 35<br><br><br><br><br><br><br><br><br> | 245   |
| 02 | PHYSICS<br>- Heat<br>- Movement<br>- Mechanics<br>- Sound<br>- Light & Optics<br>- Nuclear physics                                                                                                                                    | 80<br>(10)<br>(10)<br>(20)<br>(10)<br>(20)<br>(10)  |                                                      |                                                    |                                        | 80    |
| 03 | ENGLISH LANGUAGE                                                                                                                                                                                                                      | 75                                                  | 65                                                   | 65                                                 | 55                                     | 260   |
| 04 | ELECTRICITY<br>- Phases , Frequency<br>- Magnetism<br>- D C theory<br>- A C theory<br>- Transformers<br>- Power Supplies Including UPS's                                                                                              | 130<br>(10)<br>(10)<br>(30)<br>(40)<br>(20)<br>(20) | 50<br><br><br><br><br><br>                           |                                                    |                                        | 130   |
| 05 | ELECTRONICS I<br>- Semiconductor<br>- Diode : kind , characteristics ,function<br>- Transistor : kind , characteristics , function<br>- Analogue circuits<br>- Digital circuits<br>- Microprocessor                                   | 60<br>(10)<br>(10)<br>(40)<br><br><br>(15)          | 90<br><br><br><br>(65)<br>(10)<br><br>               |                                                    |                                        | 150   |
| 06 | ENGINEERING DRAWING                                                                                                                                                                                                                   | 40                                                  |                                                      |                                                    |                                        | 40    |
| 07 | TELECOMMUNICATIONS<br>- Signals : spectra & frequency conversion<br>- Analog mod & det (AM , FM , PM)<br>- Discrete transmissions ( Sampling , PAM , PPM)<br>- F D M & T D M<br>- Quantizing , Coding & PCM<br>- Interference & Noise | 40<br><br><br><br><br><br>(10)                      | (90)<br>(15)<br>(20)<br>(10)<br>(10)<br>(25)<br>(10) |                                                    |                                        | 90    |

|    |                                                                                                                                                                                                              |                                                                       |                                                                     |     |     |     |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------|-----|-----|-----|
| 08 | COMMUNICATION NETWORKS I<br>- Network classifications<br>- Public service<br>- Private service<br>- Network configuration<br>- Future service                                                                | 28<br>45<br>( 5 )<br>( 10 )<br>( 10 )<br>( 15 )<br>( 5 )              |                                                                     |     | 45  |     |
| 09 | TELECOMMUNICATIONS II<br>- Radio communication systems<br>- Transmission systems<br>- Outside plant systems<br>- Satellite communications systems<br>- Data communication systems<br>- ISDN                  | 55 (40)<br>( 10 )<br>( 10 ) 15<br>( 10 )<br>( 5 )<br>( 10 )<br>( 10 ) |                                                                     |     | 55  |     |
| 10 | COMPUTER SCIENCES                                                                                                                                                                                            | 50                                                                    | 50                                                                  | 25  | 125 |     |
| 11 | WORK SHOPS                                                                                                                                                                                                   | 50                                                                    | 40                                                                  | 40  | 30  | 160 |
| 12 | ELECTRONICS II<br>- Analogue circuits II<br>- Digital circuits<br>- Microcomputers                                                                                                                           | 80<br>( 35 )<br>( 30 )<br>( 15 )                                      | 40<br><br>( 30 )<br>( 10 )                                          |     | 120 |     |
| 13 | COMMUNICATION NETWORKS II<br>- Network hierarchy<br>- Network plant<br>- Numbering plan<br>- Routing plan<br>- Signalling plan<br>- Charging plan                                                            |                                                                       | 80                                                                  |     | 80  |     |
| 14 | SWITCHING TECHNIQUE I<br>- Analogue switching<br>- Digital switching / Structure Ericsson & Alcatel                                                                                                          |                                                                       | 40                                                                  |     | 40  |     |
| 15 | SWITCHING TECHNIQUE II<br>- Common control equipment<br>- I/O equipment / Signalling<br>- Main switching equipment<br>- Trunk line equipment<br>- Subscriber line equipment<br>- Test equipment (switch ATM) |                                                                       | 155<br>( 40 )<br>( 25 )<br>( 50 )<br><br>( 40 )<br>( 40 )<br>( 15 ) | 55  | 210 |     |
| 16 | SAFETY & ACCIDENT PRECAUTIONS                                                                                                                                                                                |                                                                       | 30                                                                  |     | 30  |     |
| 17 | SWITCHING TECHNIQUE III<br>- Line signalling<br>- Regular signalling<br>- CCITT Signalling systems<br>- Charging / Signalling                                                                                |                                                                       |                                                                     | 110 | 110 |     |

|       |                                                                                                                                                                           |         |         |      |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|------|
| 18    | SWITCHING TECHNIQUE IV<br>- System software<br>- HLDC                                                                                                                     |         | 90      | 90   |
| 19    | COMMUNICATION NETWORKS III<br>- Traffic theory<br>- Traffic measurement<br>- Circuit calculation<br>- Trunking diagram<br>- Traffic estimation<br>- Equipment calculation |         | 80      | 80   |
| 20    | SWITCHING TECHNIQUE V<br>- ATM switching<br>- Optical switching                                                                                                           |         | 30      | 30   |
| 21    | MANAGEMENT                                                                                                                                                                |         | 50      | 50   |
| TOTAL |                                                                                                                                                                           | 565 555 | 550 560 | 2230 |

ISDN FOR INTEGRATED SERVICE DIGITAL NETWORK.  
CMOC FOR CENTRALIZED MAINTENANCE & OPERATION CENTER.  
CCITT FOR INTERNATIONAL CONSULTATIVE COMMITTEE FOR TELEPHONY  
AND TELEGRAPHY.  
ATM FOR AUTOMATIC TRANSMISSION MEASURING.  
HLDC FOR HIGH LEVEL DATA LINK CONTROL PROCEDURE.

POST & TELECOMMUNICATION TRAINING CENTRE  
 CURRICULUM FOR 2 YEARS TRAINING OF RADIO  
 TRANSMISSION TECHNICIANS

| N <sup>o</sup> | SUBJECTS                                                                                                                                                                                                                                 | 1ST YEAR                                                  |                            | 2ND YEAR           |                    | TOTAL |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------|--------------------|--------------------|-------|
|                |                                                                                                                                                                                                                                          | 1                                                         | 2                          | 1                  | 2                  |       |
|                |                                                                                                                                                                                                                                          | NUMBER OF HOURS                                           |                            |                    |                    |       |
| 01             | MATHEMATICS<br>- Arithmetics & Calculator<br>- Algebra<br>- Decibel<br>- Trigonometry<br>- Logarithms<br>- Statistics & Probability & Binary numbers                                                                                     | 60<br>75<br>(10)<br>(25)<br>(15)<br>(25)<br>(25)          | 85<br>(25)<br>(35)<br>(25) | 40<br>(20)<br>(20) | 40<br>(20)<br>(20) | 240   |
| 02             | PHYSICS<br>- Heat<br>- Movement<br>- Mechanics<br>- Sound<br>- Light & Optics<br>- Nuclear physics                                                                                                                                       | 84<br>80<br>(10)<br>(10)<br>(20)<br>(10)<br>(20)<br>(10)  |                            |                    |                    | 80    |
| 03             | ENGLISH LANGUAGE                                                                                                                                                                                                                         | 75                                                        | 65                         | 75                 | 55                 | 270   |
| 04             | ELECTRICITY<br>- Phases , Frequency<br>- Magnetism<br>- D C theory<br>- A C theory<br>- Transformers & Machines<br>- Power Supplies Including UPS's                                                                                      | 85<br>130<br>(10)<br>(10)<br>(35)<br>(35)<br>(20)<br>(20) |                            |                    |                    | 130   |
| 05             | ELECTRONICS I<br>- Semiconductor<br>- Diode : kind , characteristics ,function<br>- Transistor : kind , characteristics , function<br>- Analogue circuits I<br>- Digital circuits<br>- Microprocessors                                   | 54<br>60<br>(10)<br>(10)<br>(40)                          | 90<br>(65)<br>(10)<br>(15) |                    |                    | 150   |
| 06             | ENGINEERING DRAWING                                                                                                                                                                                                                      | 40                                                        |                            |                    |                    | 40    |
| 07             | TELECOMMUNICATIONS I<br>- Signals : spectra & frequency conversion<br>- Analog mod & det (Am , Fm , Pm)<br>- Discrete transmissions ( Sampling , Pam , Ppm )<br>- F d m & T d m<br>- Quantizing , Coding & PCM<br>- Interference & Noise | 90<br>(15)<br>(20)<br>(10)<br>(10)<br>(25)<br>(10)        |                            |                    |                    | 90    |
| 08             | COMMUNICATION NETWORKS I<br>- Network classifications<br>- Public service<br>- Private service<br>- Network configuration<br>- Future service                                                                                            | 28<br>45<br>(5)<br>(10)<br>(10)<br>(15)<br>(5)            |                            |                    |                    | 45    |

|    |                                          |      |      |      |     |     |
|----|------------------------------------------|------|------|------|-----|-----|
| 09 | TELECOMMUNICATIONS II                    | 50   |      |      | 50  |     |
|    | - Data communication systems             | (10) |      |      |     |     |
|    | - Principle of switching                 | (10) |      |      |     |     |
|    | - Outside plant systems                  | (15) |      |      |     |     |
| 10 | COMPUTER SCIENCES                        | 50   | 45   | 25   | 120 |     |
| 11 | WORK SHOPS                               | 50   | 40   | 30   | 30  | 150 |
| 12 | ELECTRONICS II                           | 80   | 40   |      | 120 |     |
|    | - Analogue circuits II                   | (35) |      |      |     |     |
|    | - Digital circuits                       | (30) | (30) |      |     |     |
|    | - Microcomputers                         | (15) | (10) |      |     |     |
| 13 | MICROWAVES                               |      | 80   |      | 80  |     |
|    | - Propagation                            |      | (10) |      |     |     |
|    | - Line parameters & Smith chart          |      | (20) |      |     |     |
|    | - Line elements                          |      | (20) |      |     |     |
|    | - Antenna                                |      | (20) |      |     |     |
|    | - Microwave Electronics                  |      | (10) |      |     |     |
| 14 | TELECOMMUNICATIONS III                   |      | 50   | 30   | 80  |     |
|    | - Digital transmission systems           |      | (10) |      |     |     |
|    | - Quality evaluation & Error performance |      | (20) |      |     |     |
|    | - Digital modulations : ASK .... QAM     |      | (20) |      |     |     |
|    | - Frames structure                       |      |      | (30) |     |     |
| 15 | DIGITAL MULTIPLEX SYSTEMS                |      | 100  |      | 100 |     |
|    | - Primary multiplexer                    |      |      |      |     |     |
|    | - DSMX 2 / 8                             |      |      |      |     |     |
|    | - DSMX 2 / 34                            |      |      |      |     |     |
|    | - DSMX 34 / 140                          |      |      |      |     |     |
|    | - DSMX 64k / 2                           |      |      |      |     |     |
|    | - Modems 300 - 9600 kbit / s             |      |      |      |     |     |
|    | - DDF                                    |      |      |      |     |     |
| 16 | MICROWAVE SYSTEMS                        |      |      | 150  | 150 |     |
|    | - Configuration                          |      |      |      |     |     |
|    | - Hop calculation                        |      |      |      |     |     |
|    | - DRS 34 / 2000 Equipment                |      |      |      |     |     |
|    | - DRS 34 / 7000 Equipment                |      |      |      |     |     |
|    | - EOW systems                            |      |      |      |     |     |
|    | - Protection Switching                   |      |      |      |     |     |
|    | - Power Supply                           |      |      |      |     |     |
|    | - Towers                                 |      |      |      |     |     |
|    | - Passive Reflectors                     |      |      |      |     |     |
| 17 | RADIO COMMUNICATION SYSTEMS              |      | 100  | 120  | 100 |     |
|    | - Radio transmitters                     |      |      |      |     |     |
|    | - Radio receivers                        |      |      |      |     |     |
|    | - HF systems                             |      |      |      |     |     |
|    | - VHF / UHF systems                      |      |      |      |     |     |
|    | - Cellular telephone systems             |      |      |      |     |     |
| 18 | SATELLITE COMMUNICATIONS                 |      |      | 50   | 50  |     |



|       |                                                                                                                                                                                                   |          |         |         |      |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------|---------|------|
| 19    | OPTICAL FIBER SYSTEMS<br>- Optical fiber MM , SM<br>- Optical transmitters<br>- Optical receivers<br>- OLTE , OLRE ( 2 , 8 , 34 , 140 )<br>- FDP , patchcords , pig tails<br>- Splicing of fibers | Inavutna |         | 100     | 100  |
| 20    | MANAGEMENT                                                                                                                                                                                        |          |         | 50      | 50   |
| 21    | SAFETY & ACCIDENT PREVENTION                                                                                                                                                                      |          |         | 30      | 30   |
| TOTAL |                                                                                                                                                                                                   |          | 555 550 | 560 560 | 2225 |

C X FOR DIGITAL SYSTEM MULTIPLEXING  
 DRS FOR DIGITAL RADIO SYSTEM  
 EOW FOR ENGINEERING ORDER WIRE  
 OLTE FOR OPTICAL LINE TERMINAL EQUIPMENT  
 OLRE FOR OPTICAL LINE REGENERATOR EQUIPMENT  
 DDF FOR DIGITAL DISTRIBUTION FRAME  
 MM FOR MULTI MODE  
 SM FOR SINGLE MODE

**POST & TELECOMMUNICATION TRAINING CENTRE CURRICULUM  
FOR 1 YEARS AND HALF (3 Semesters) OF OUTSIDE PLANT SKILLED WORKER**

| No   | SUBJECTS                                                                                                                                                                                                                                                                                                                                                                                                   | 1 <sup>ST</sup> YEAR                                       |                        | 2 <sup>nd</sup> YEAR |   | TOTAL |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------|----------------------|---|-------|
|      |                                                                                                                                                                                                                                                                                                                                                                                                            | 1                                                          | 2                      | 1                    | 2 |       |
|      |                                                                                                                                                                                                                                                                                                                                                                                                            | NUMBER                                                     |                        | OF HOURS             |   |       |
| 01 ✓ | MATHEMATICS<br>- Arithmetics & Calculator<br>- Algebra<br>- Decibel<br>- Trigonometry                                                                                                                                                                                                                                                                                                                      | 80<br>(20)<br>(60)                                         | 50<br><br>(15)<br>(35) |                      |   | 130   |
| 02 ✓ | PHYSICS<br>- Heat<br>- Movement<br>- Mechanics<br>- Sound                                                                                                                                                                                                                                                                                                                                                  | 75<br>(15)<br>(15)<br>(25)<br>(15)                         |                        |                      |   | 75    |
| 03 ✓ | ELECTRICITY<br>- Magnetism<br>- D C theory<br>- A C theory<br>- Transformers<br>- Phases, frequency                                                                                                                                                                                                                                                                                                        | 75<br>(15)<br>(30)<br>(30)                                 | 45<br><br>(30)<br>(15) |                      |   | 120   |
| 04 ✓ | OUTSIDE PLANT MATERIAL<br>- Cable: direct buried, duct, aerial, indoor<br>- Closures: heat shrink cable, xyvulkanizing, universal<br>- Distribution points: MDF, CCC, DP indoor box<br>- Duct system: manholes, pull boxes, pipes, duct liners<br>- Protection: earthing / grounding arrestors<br>- Poles: crossarm, guys<br>- Electronic equipment: RSU, line concentrator<br>- Maintenance & measurement | 100                                                        | 60                     |                      |   | 160   |
| 05 ✓ | EXTERNAL PLANT PLANNING<br>- Local cable network: component design, calculation<br>- Exchange and RSU location<br>- Short, medium, long term plans<br>- OP symbols and drawings                                                                                                                                                                                                                            | 70<br><br><br>Im mtha.<br>9:05/84.4.200.<br>Exp. 2-0<br>FS | 70<br><br><br>75       |                      |   | 215   |
| 06 ✓ | INSTALLATION WORKS & SUPERVISION<br>- Planning<br>- Civil work<br>- Cable work<br>- Assembly units<br>- Measurements<br>- Construction test<br>- Acceptance test                                                                                                                                                                                                                                           | 85                                                         | 70                     |                      |   | 155   |
| 07 ✓ | OPTICAL FIBER SYSTEMS<br>- Optical fibers MM, SM<br>- Optical transmitters<br>- Optical receivers<br>- OLTE, OLRE (2,8,34,140)<br>- FDP, patch cords, pig tails<br>- Splicing of fibers<br>- Installation, maintenance & measurement                                                                                                                                                                       |                                                            |                        | 95                   |   | 95    |

|                             |                                                                                                             |     |     |      |
|-----------------------------|-------------------------------------------------------------------------------------------------------------|-----|-----|------|
| 08 ✓                        | SUBSCRIBER TERMINALS<br>- Telephone sets<br>- PBX<br>- Telefax<br>- Telex<br>- Modems<br>- Public telephone | 60  | 110 | 170  |
| 09                          | IN-SERVICE PRACTICE ( WORKSHOPS )                                                                           | 140 | 160 | 300  |
| 10                          | SAFETY & ACCIDENT PRECAUTIONS                                                                               |     | 40  | 40   |
| 11 ✓                        | ENGLISH LANGUAGE                                                                                            | 75  | 65  | 205  |
| TOTAL FOR EACH SEMESTER     |                                                                                                             | 565 | 555 | 545  |
| TOTAL FOR ONE YEAR AND HALF |                                                                                                             |     |     | 1665 |

CCC For Cross Connection cabinet  
 DP Distribution point  
 MDF Main Distribution Frame  
 MM Multi Mode  
 OLRE Optical line Regenerator Equipment  
 OLTE Optical Line Terminal Equipment  
 PBX For Private Branch Exchange  
 RSU Remote Switching Unit  
 SM Single Mode