

Letter No. NHIII/Misc/129/74, dated the 12th July, 1974 from the Director General (Road Development) Ministry of Shipping & Transport (Roads Wings), New Delhi to all State Governments dealing with Roads

Subject : Application of Network Techniques for Roads construction projects

The need for applying Network Technique for proper management of road construction projects has been receiving the attention of this Ministry for some time. On the basis of detailed studies carried out, it has been concluded that the desirable size for a project should be for a length of 30 kms. On this basis, a network for various activities involved right from the conception of the project to the stage of completion has been prepared and is enclosed together with a covering note. The State Governments are requested to communicate their views on these immediately and in any case within a couple of weeks.

NOTE ON THE 'APPLICATION OF NETWORK TECHNIQUE' TO PLANNING AND PROGRAMMING OF HIGHWAY CONSTRUCTION.

1. GENERAL

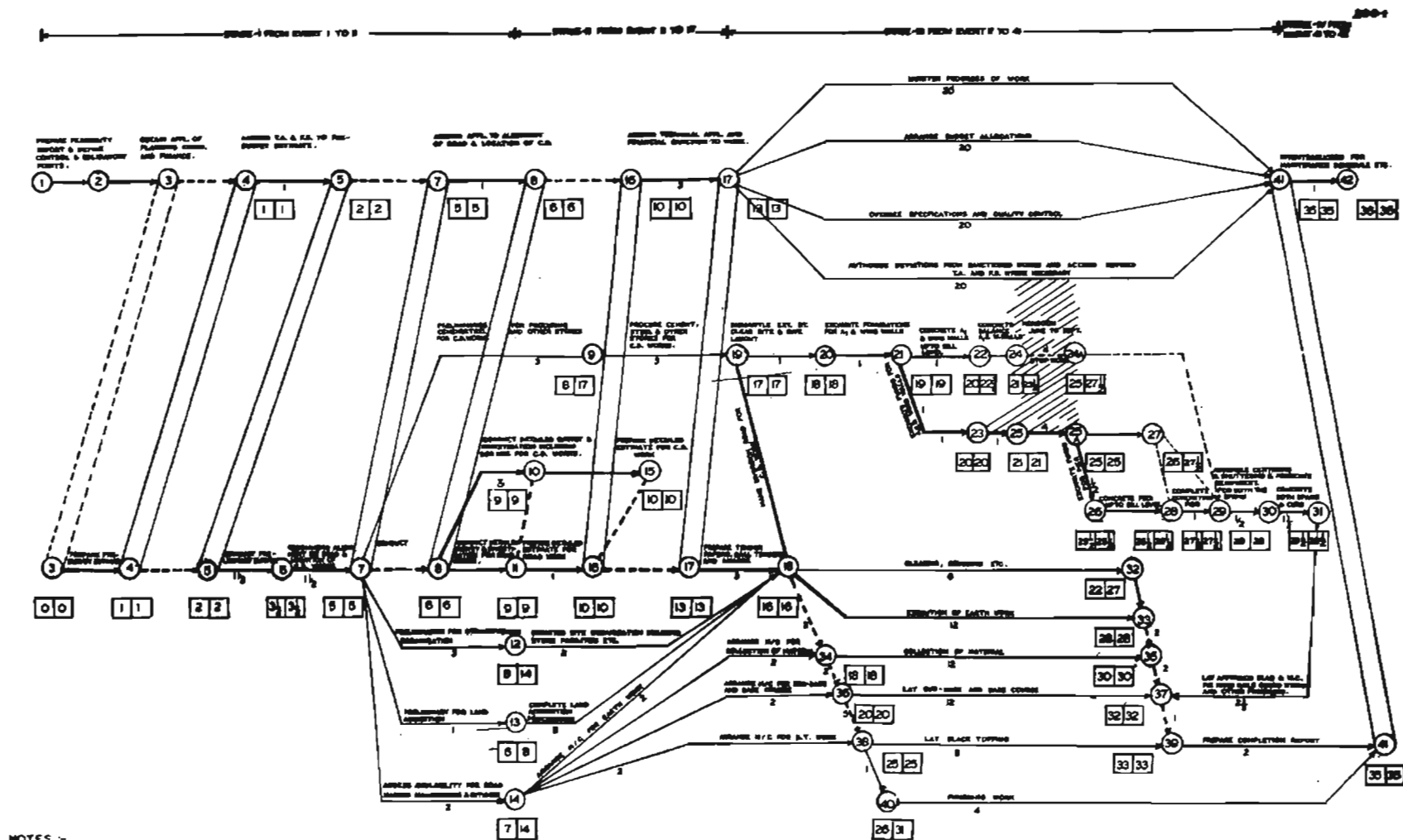
- 1.1. The field of highway planning and construction has become complex and sophisticated with the increasing emphasis on quality of travel and the demand for speedy safe transportation. A typical highway scheme involves many engineering and technical skills in design, deployment of machinery and programming of construction functions. These technical aspects must be dovetailed with the numerous administrative matters ranging from obtaining approval to allocation of funds. During execution of a road or bridge project, expensive machines are being used.
- 1.2. Restraints of season, availability of resources multiplicity of contractors and peculiar site conditions are some of the vital factors affecting a highway project. Without careful programming, speedy execution of these projects with the optimum utilisation of machines, material and manpower is well nigh impossible.
- 1.3. Without a programme, the construction manager will not be in a position to know when certain interdependent or independent work should be started. The result is that co-ordination of various activities is not possible and there will be no control either on the completion date, funds or materials.

2. VIABLE LENGTH OF A ROAD PROJECT

- 2.1. On National Highways, mostly improvement programmes in the nature of upgrading, single lane to two lanes are being tackled presently. The improvement scheme envisaged above include inter alia widening formation, realignments, improvements to junctions etc. An attempt has been made to arrive at the length of a project involving all the improvement described above, which will facilitate systematic execution and would ensure full utilisation of machinery deployed on the work.
- 2.2. Of the expensive machines used in road construction, bituminous hot mix plants, complementary items, rank amongst the foremost. The usage charge of a hot mix plant is of the order of Rs. 300/- hour. Once the machine is put into operation, continuous mixing and discharge of mix should be ensured. Even if mix is not prepared inside the plant, the machine will have to run idle in order to have temperature control. It is thus seen that in a highway project involving strengthening of pavement with B.M. a hot mix plant more or less controls the programming of construction. Judging from its output and the command distance, it has been found that a length of 30 km. would be the ideal unit for such project. This length, could be paved in one working season of the year. With this as the base, the other construction activities have been suitably phased taking into consideration the working seasons available and utilising all the machines like road rollers and tippers to the full extent. According to the programme thus drawn a length of 30 km of improvements is proposed to be completed in a period of 20 months. The activities have been so phased that once a particular activity has been completed in a length of 30 km. the machinery pertaining to that activity would move to the next project of the same length and start working. Thus, care has been taken to continue the work smoothly in lengths of 30 km, without any idling of machines. This work of 30 km could be handled by a construction division supported by two-sub-divisions.

3. NETWORK ANALYSIS FOR THE TYPICAL HIGHWAY PROJECT

- 3.1. Although the Network Techniques have not been widely employed in our road construction programmes, it merits consideration as it has been found world-wide appreciation and projects in developed countries are managed through this method with consequent saving in time, cost and material. That technique refers to programming of a project with schematic diagram that depicts the sequencing as well as inter-relationship between component parts of a project. With this method, it is possible to determine what operations actually control completion dates. Thus it is possible to give principal attention to these controlling operations. Such activities are termed critical and the 'critical path' represents the sequential chain of activities which connects the start and completion of the project and whose summated duration form the largest time path through the project. Construction planning by Network, Technique, is however, not a magic method of precise forecasting. But it does certainly compel and planned schedule of work to be done in a clear perspective and it focusses the attention of various critical and non-critical paths, thereby enabling management to take suitable measures on all areas of criticality.
- 3.2. With the above background, a network has been prepared for the optimum size of the project arrived earlier. All the main items of highway construction have been brought on the network and critical path has been shown with thick lines. The coordination of activities between the State PWD, the Ministry of Shipping and Transport (Roads Wing) and the Ministry of Finance have been borne in mind and the network based on the Fragnet concept has been adopted for the project. It will be seen therefrom that activities such as surveys and investigations, preparation of project and sanction at the preliminary stage and activities such as Earthwork, W.B.M. and bituminous courses on the execution stage are the critical activities and hence, call for principal attention.
- 3.3. It will be seen from the enclosed network that the work of "laying blacktopping" (Event No. 39 to 40) is intended to be completed in eight months. As the bituminous work cannot be done during the monsoon period, the same should start



WIDENING & STRENGTHENING 30km OF NATIONAL HIGHWAY

NET-WORK TECHNIQUE APPLIED TO HIGHWAY PLANNING & CONSTRUCTION

only after the monsoon i.e. in October and completed by June of the following year. The subsequent monsoon period should be utilised in shifting the plant from one location to the other. Similarly, the preceding monsoon period can be conveniently utilised, for the activities covered by the event Nos. 11 to 17 as such activities can be done during the monsoon period without any hindrance.