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SEQUENCING FOR REMODELING OF DIMAPUR YARD IN CONNECTION WITH DOUBLING PROJECT FROM LUMDING TO FURKATING

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Abstract— Railway yard remodeling during doubling of an existing railway section requires coordinated execution of track, platform, civil, signalling, electrical and traffic-related works while maintaining safe railway operation. This paper presents a case study of the sequencing of engineering activities for remodeling of Dimapur Yard in connection with the Lumding–Furkating doubling project of Northeast Frontier Railway. The study uses the project-specific planning information contained in the M.Tech. dissertation, including yard configuration, material requirements, activity dependencies, line and platform availability, traffic-block constraints and CPM-oriented milestones. The proposed sequence follows a progressive release-of-space strategy: goods handling is shifted to an alternative facility, proposed Lines 4 and 5 are developed and connected, obsolete track is dismantled, Line 3 is cleared, major platform and civil works are undertaken, existing FOBs and PF-2 are removed, proposed Line 3 is linked, and balance works are completed during planned block stages. The quantified activity network gives an earliest finish of D+242 for activities A1–A10; A11 remains unquantified. The results show that physical construction duration alone is insufficient for planning a live railway yard. The controlling considerations are alternative operating capacity, release of work fronts, line and platform availability, traffic blocks, OHE/S&T interfaces and safe passenger movement. The study demonstrates how a transparent dependency-based schedule can support constructability review and project control for complex railway yard remodeling.

Keywords— Dimapur Yard, railway yard remodeling, doubling project, track construction, sequencing, Critical Path Method, traffic block, line availability, platform availability

I. INTRODUCTION

A. Background and Problem

Railway yard remodeling is a constrained construction problem because new infrastructure must be created within an operating railway. In the Dimapur case, the yard forms part of the Lumding–Furkating doubling project and is therefore an interface between corridor-level capacity enhancement and station operations. The project corridor covers a new broad-gauge electrified double line between Dhansiri (including) at km 241.000 and Naojan (excluding) at km 285.860, a total length of 44.860 km. Dimapur is located at km 260.194. The source records an existing yard with five berthing lines, two shunting necks, two private sidings, two passenger platforms and one goods-handling platform. The proposed arrangement retains the principal yard facilities while providing two high-level passenger platforms and a revised turnout/crossing arrangement.

B. Need for Sequencing

The principal challenge is not simply to determine how long an activity takes, but to determine when it

can safely be performed. Construction space, operating lines, passenger access, traffic blocks, OHE and S&T interfaces and facility shifting are interdependent. The thesis therefore treats sequencing as a project-control problem in which each work front is released progressively. An existing facility is first shifted or suspended, an alternative arrangement is established, the obsolete facility is removed, and the released space becomes the next construction front.

C. Objectives

The objectives are to identify the engineering activities involved in Dimapur Yard remodeling; establish the reasons for their order; relate activities to line, platform and work-front availability; assess the quantified sequence using a CPM-oriented network; and identify resource, safety and operational considerations that should be incorporated into a detailed programme.

D. Scope and Data Basis

The paper is based primarily on the supplied M.Tech. thesis and its project-specific planning information. The thesis identifies the EPC document as the controlling project-specific source for activities, tentative durations, availability information and remarks, while Indian Railway construction and permanent-way manuals provide the technical context. Numerical resource counts and a complete duration for A11 were not available in the supplied material and are therefore not invented.

II. LITERATURE REVIEW

A. Railway Construction and P-Way Context

The thesis reviews the Indian Railway Construction Manual, Indian Railways P-Way Manual, Track Machine Manual, Schedule of Dimensions and the project EPC document. These references establish the construction, permanent-way, dimensional and project-planning context. The literature survey also includes Indian case studies covering yard remodeling, doubling and traffic-facility improvement.

B. Indian Yard Remodeling Experience

Indian examples cited in the thesis include Orai, Kanhan, Kosamba, Ambodala, Vijayawada, Sarla and Arakkonam yards. The reviewed cases repeatedly emphasize accurate existing-condition surveys, turnout and crossover planning, coordinated ESP/SIP/OHE interfaces, Pre-NI/NI and traffic-block planning, and coordination among engineering, S&T, electrical and operating departments. These themes support the Dimapur approach of treating operational constraints as primary sequencing conditions rather than secondary considerations.

C. Scheduling Perspective and Research Gap

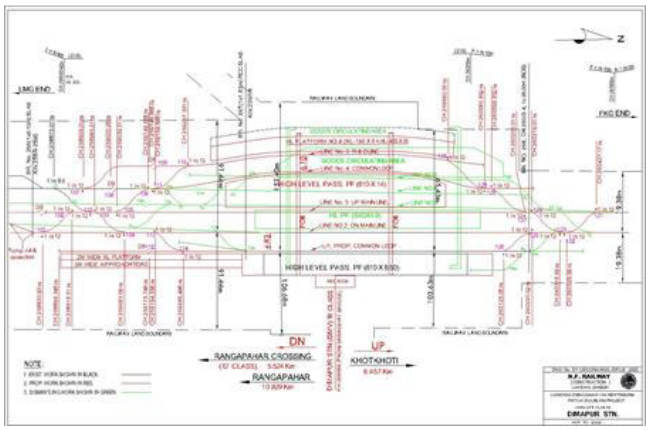
Railway possession scheduling literature demonstrates that construction works compete for limited railway possessions and must be planned around operational constraints. The Dimapur study addresses a more practical engineering-planning problem: the physical remodeling of an operating passenger-and-goods yard during a doubling project. The research gap is the transparent integration of

project-specific yard activities, work-front release, line/platform availability and block constraints into a dependency-based sequence.

III. METHODOLOGY AND PROJECT DETAILS

A. Project and Yard Characteristics

The project comprises a 44.860 km broad-gauge electrified double line from Dhansiri to Naojan. The source states 5.3 m track centre, Absolute Block System, maximum speed of 130 km/h and intended 25-tonne axle loading. Dimapur at km 260.194 is a major station interface. The proposed arrangement includes five berthing lines, two shunting necks, two private sidings, two high-level passenger platforms, 22 sets of 1 in 12 points/crossings, two sets of 1 in 8.5 points/crossings and four derailing switches.



B. Track and Material Requirements

The project material records a total assessed track length of approximately 6,762 m for the relevant Dimapur yard works. The associated assessment gives approximately 13,524 m of rail, 9,533 sleepers and 19,271.7 m³ of ballast. The track structure is based on 60 kg rail and PSC sleepers, with ballast and fittings to the applicable railway specifications. The thesis emphasizes that material quality and inspection must be assured before linking work starts.

C. Sequencing Method

The methodology consists of four stages: (1) identify the physical work packages from the project sequence; (2) identify dependencies created by operating lines, platforms, space release and interfaces; (3) assign the stated activity durations and predecessor relationships to a CPM-oriented network; and (4) interpret the resulting milestones with operational and constructability conditions. This approach keeps project-specific facts separate from assumptions.

IV. RESULTS AND DISCUSSION

A. Principal Activity Sequence

Phase 1 begins with shifting goods handling from Dimapur to Molvom and suspending the existing goods circulating area. Proposed Lines 4 and 5 are then constructed and connected. After the new arrangement is available, the old Lines 4 and 5 are dismantled and Line 3 is suspended and dismantled. This releases the work front for a major package covering Platform 2/3 works, earth filling and surfacing, FOB foundations and columns, girder launching and staircase works, shunting-neck and machine-siding works, Bridge No. 266, encroachment removal and formation preparation. Phase 2 includes removal of two FOBs, suspension and dismantling of old PF-2, linking proposed Line 3 and balance works during BPNI/PNI/NI stages.

B. CPM-Oriented Activity Analysis

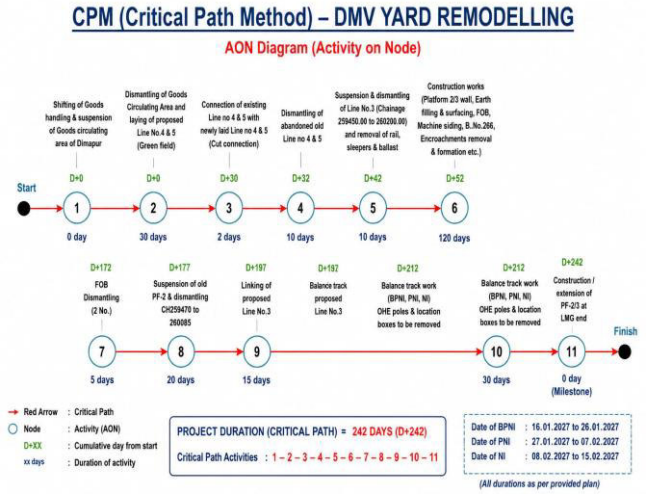
TABLE I. CPM-ORIENTED ACTIVITY DURATIONS AND MILESTONES

Activity	Description	Duration	Predecessor	Earliest Finish
A1	Shifting goods handling	0	—	D
A2	New Lines 4 and 5	30 d	A1	D+30
A3	Cut connection	2 d	A2	D+32
A4	Old Lines 4 and 5 transition/removal	10 d	A3	D+42
A5	Dismantling Line 3	10 d	A4	D+52
A6	Major civil/interface works	120 d	A5	D+172
A7	Dismantling two FOBs	5 d	A6	D+177
A8	Old PF-2 dismantling	20 d	A6	D+197
A9	Proposed Line 3 linking	15 d	A8	D+212
A10	Balance works during blocks	30 d	A9	D+242
A11	PF-2/3 construction or extension	TBD	TBD	TBD

The quantified chain gives D+242 as the earliest finish of A1–A10 under the simplified predecessor relationships. A11 cannot be calculated because its duration and predecessor are not stated. The network also indicates that A7 and A8 originate from A6; their potential concurrency must be verified against actual work-front and passenger-access conditions. Therefore, D+242 is an analytical milestone for the quantified network and not a final approved project completion date.

C. Critical Work Packages

A6 is the principal long-duration package at 120 days. Its scope spans multiple disciplines and work fronts, so a detailed project-control schedule should decompose it into measurable sub-activities. A7 is an obstruction-removal dependency because the FOBs can remain in service during earlier work but must be removed when the proposed Line 3 corridor requires their space. A8 similarly clears the old PF-2 zone for the subsequent Line 3 linking operation.



D. Operational Constraints

The sequence demonstrates that alternative capacity is created before existing capacity is removed. Goods handling is shifted before the goods circulating area is released; new Lines 4 and 5 are connected before old lines are dismantled; Line 3 is cleared only after an alternative arrangement exists; and passenger facilities are maintained in a reduced but usable configuration while PF-2 is out of service. These relationships make line and platform availability, possession limits, safe passenger movement and OHE/S&T interfaces explicit control conditions.

V. RESOURCE AND RISK MANAGEMENT

A. Resource Planning

Resource planning should follow the work front. The thesis identifies labour, track machinery, civil plant, materials, OHE/S&T resources, traffic blocks and safety arrangements as the principal resource groups. Because the supplied material does not provide manpower counts or machine deployment schedules, the paper does not assign unsupported numerical values. The recommended project-control system should load resources against each activity and identify conflicts between concurrent work fronts.

B. Risk Management

The live railway environment creates risks associated with traffic interruption, encroachment removal, facility shifting, platform and FOB works, track dismantling, OHE/S&T interfaces and environmental controls. The thesis recommends a qualitative risk framework because detailed probability and consequence data were not supplied. Each activity should therefore have defined hold points, release conditions, protection arrangements and handback requirements before execution.

C. Traffic Blocks and Interface Control

Traffic blocks should be treated as planned project resources rather than as incidental permissions. Block planning must integrate engineering readiness, operating requirements, inspection, protection and handback. For platform and FOB activities, passenger circulation and alternative access must be confirmed before the work front is released.

VI. CONCLUSIONS

A. Key Findings

The Dimapur Yard case demonstrates that railway yard remodeling during doubling is fundamentally a dependency and interface-management problem. The project sequence is governed by progressive release of space and preservation of sufficient alternative operating capacity. The CPM-oriented analysis of the stated A1–A10 activities produces an earliest finish of D+242, while A11 remains unquantified. The 120-day A6 package is the principal high-level duration block and should be decomposed in detailed scheduling.

B. Recommendations

First, maintain a single integrated programme linking track, civil, OHE, S&T, traffic and passenger-access activities. Second, convert every major block into a readiness checklist covering possession, material, manpower, machinery, protection, inspection and handback. Third, decompose A6 and other multi-front packages into measurable work items. Fourth, update the schedule when A11 duration and predecessor data are approved. Finally, use line/platform availability and safe passenger movement as explicit constraints when testing any alternative sequence.

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