Remodelling and maintenance of Kanpur Central yard

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Synopsis:

In endeavor of carrying more passengers and goods to cater to the demands of economic growth, the lengths of trains are increased day-by-day. This requires increase in platform lengths and remodeling of yards to accommodate longer train length on platform. Often the challenge posed by space constraint, operational requirements and cost, it is difficult to meet all parameters at the same time. While increasing length of platform 1, 2 & 3 at Kanpur and to provide connectivity for 3rd and 4th line, crossovers and diamonds remained in platform area. It reduced the berthing length of train on platform in spite of sufficient length for more than 24 coach trains. With over 325 trains and traffic in 20 directions that are dealt at Kanpur, the present paper tries to analyze the traffic pattern and strives to attain a solution to multipronged problem of layout at Kanpur. This paper also dwells with certain important aspects of construction and maintenance of yards and discusses about some peculiar problems faced by P.way engineers and their innovative solutions.

1.0 Introduction:

" Yards are the heart that pumps the flow of commerce along the tracks."

Yards are one of the most vital assets that facilitate interchange of goods and passengers. They are required for operational as well as commercial reasons. A number of activities take place in yards like coach water filling, cleaning of coaches, changing crew etc. yards range from simple halt stations to much more complicated ones where several operational and commercial activities take place. The Design, construction and maintenance of station yards pose one of the most challenging jobs for all P.Way engineers. Several aspects of design, construction and maintenance of yards are often at cross-purpose and they need a thoughtful and balanced approach to meet the desired ends particularly at big yards where a number of activities take place at the same time. Kanpur is one of the busiest railway station yards of Indian railways. With changing requirements and introduction of longer trains, the platforms of Kanpur central were extended but required re-designing of yard could not be done. This led to introduction of new problems that adversely affected train operation and also passenger safety and other passenger amenities. Re-designing and re-modelling of Kanpur yard was extremely challenging, as it is a very important junction where traffic is dealt in 20 directions viz:

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S.No	Direction of traffic	No.of directions
1	CNB-PNK bi-directional North line	2
2	PNK-CNB bi-directional South line	2
3	CNB-PNK 3rd line	1
4	PNK-CNB 4th line	1
5	CNB-Anwarganj	2
6	CNB- New Coaching complex	2
7	CNB- old coaching complex	2
8	CNBI-CNB UP Line	1
9	CNB-CNBI DN Line	1
10	CNB- CPB north line	2
11	CNB – CPB South line	2
12	CNB- CPC yard 5th line	2
	Total	20

327 passenger trains and 25 goods trains are handled everyday from Kanpur central. Primary maintenance of 9 trains and secondary maintenance of 17 trains are done in old and new two coaching complexes at Kanpur.

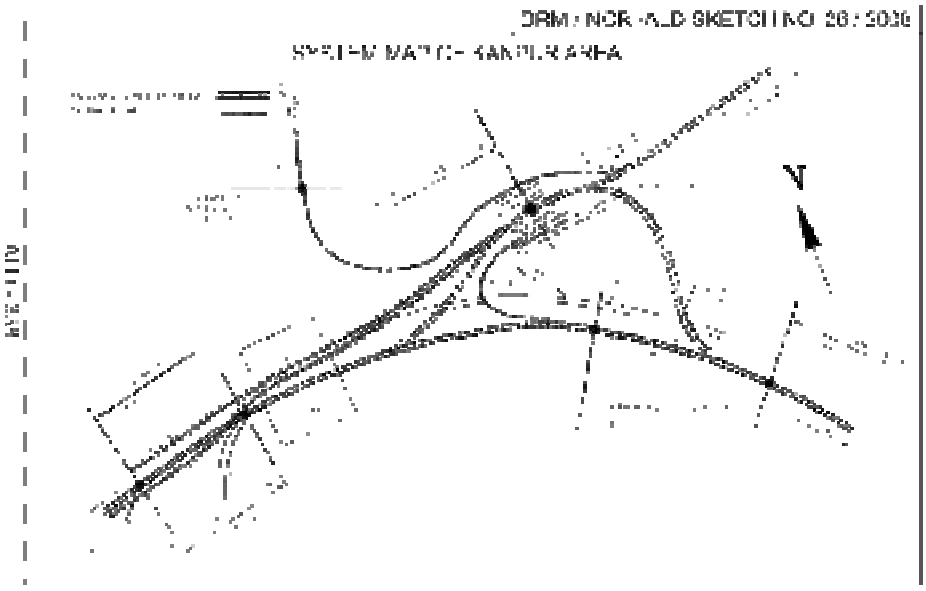

Fig.1: System Map of Kanpur Area

2.0 Problem in Layout:

The movement pattern in Kanpur yard is such that connectivity of all platforms is required for following:

a. Old coaching complex
b. New coaching complex
c. 3rd line (UP direction towards Panki)
d. 4th Line (DN direction from Panki)
e. North and South main lines towards Panki
f. North and South lines towards Lucknow
g. UP and DN main lines towards Allahabad
h. Movements towards Anwarganj

To provide these operational flexibilities, cris cross movements are made possible by several cross-overs and 6 nos 1 in 10 diamonds. Of late, due to introduction of longer trains of 24 coaches, extension of platforms have been done but to retain certain connectivity, crossovers are present in platform area particularly on platform no 1, 2 & 3.

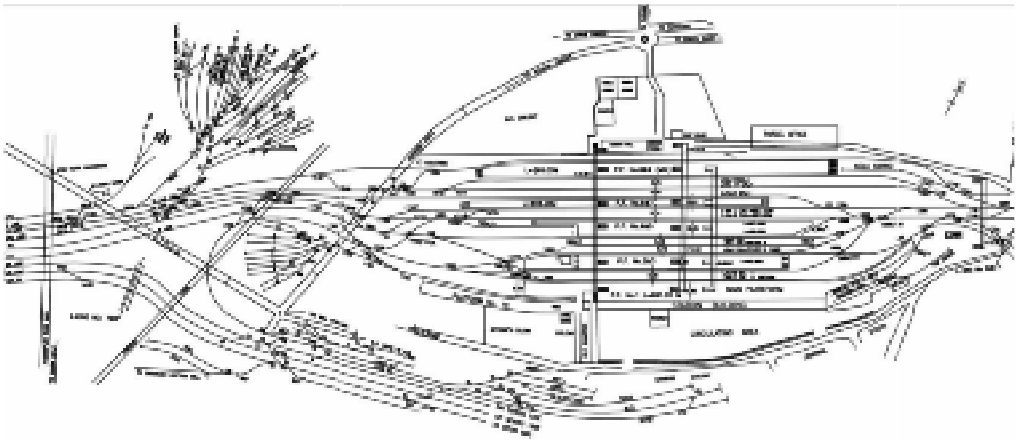

Fig.2: Yard Diagram of Kanpur Central

From layout as shown above it can be seen that a crossover in west side of PF-1 takes off towards north and joins track of line no.5. In between it cuts across tracks of platform no's 2 & 3 where single slip 1 in 10 diamonds are provided. This chord is required to give access to platform no 1, 2 & 3 to 3rd line and 4th line via crossover no 183 between North and 3rd line. Most of the M/E/passenger trains in Kanpur Central are received and dispatched via 3rd and 4th line thus this chord becomes very important for connecting 3rd and 4th lines to PF 1,2 &3.

Fig.3: Cross over from platform 1 with diamonds along PF 2&3 for connectivity to 3rd and 4th lines

Similarly, on the East end of Kanpur yard, turnout no 145 falls in platform zone on PF-1 and 149 B is present 60.73m inside platform 3.

The presence of these crossovers and related Signals and track circuits do not allow many simultaneous movements. For UP trains at PF-1 there are two paths i.e. via starter & via intermediate starter. Intermediate starter is 113m inside PF-1. If a 24-coach train is to depart via starter then it can only be dispatched through South line or North line but not from 3rd or 4th line. If the train has to depart from 3rd and 4th line then it has to go via intermediate starter. On doing so the 24 coach trains occupy the track circuit area of PF 2 & 3 and thus all movements on PF 2 & 3 are stopped.

Length of PF 2 & 3 are 578m & 565m which is sufficient for 24 coach trains but Starter signals of PF 2 & 3 towards west end are situated 102m & 100m inside PF respectively due to presence of crossovers thereby rendering berthing space of only 476m and 465m on PF 2 & 3 respectively. Due to presence of crossover no 149 towards east end on PF-3 the berthing space is further reduced by 60.73m leaving berthing space of only 404.27m. To accommodate longer trains and also keep track circuit of PF 1& 2 towards HWH end clear for receiving and dispatch of trains, the balance part of train stands on non-PF area along the crossover no 149 creating unsafe conditions for alighting and entraining of passengers. A photo to appreciate the position better is shown in fig.4.

Fig.4 : Train standing on platform 3 at Kanpur with 6 coaches outside platform along crossover 149

3.0 Analysis of Layout:

To solve above problems, a comprehensive review of yard layout with respect to operational requirements was done. Towards west end, cross movement is required to provide connectivity of trains from PF 1 & 10 to North and south lines on the one hand while on the other hand all platforms are connected to old coaching complex located on the south west of Kanpur central. This is achieved by diamond no 175B/179A and 168B/170A along with other crossovers. Platforms are to be connected to both Allahabad and Lucknow side that require cross movement. Diamond no's 129B/135 and 146A/147 provide this facility for PF 1, 2 & 3.

To remove constraints as discussed above and to execute this work it has been planned in 3 phases as it involves complex activity of remodeling along with running of heavy train traffic from busy station of Kanpur central.

3.1 Phase I:

On the west side of Kanpur central yard, it was found that if a crossover is provided between point no. 179B on south line and 183 A on north line then the trains coming from platform no's 1, 2 & 3 through diamond no 175B/179A gets access to 3rd and 4th lines through crossover no 183 between north and south lines. Presently this connectivity was through cross over no 180 which is towards east of point 179B and thus can not be used for trains coming from PF 1, 2 & 3. The space available between T/O no 179B and 183A is 110m with track center of 4.56m which makes it feasible. Providing this new cross over between south and north lines makes the intermediate leg from PF 1 to line no. 5

redundant and it can be removed along with removal of 2 non standard 1 in 10 diamonds in front of PF 2 & 3. Thus by shifting location of just one crossover a very major constraint in train operation is removed.

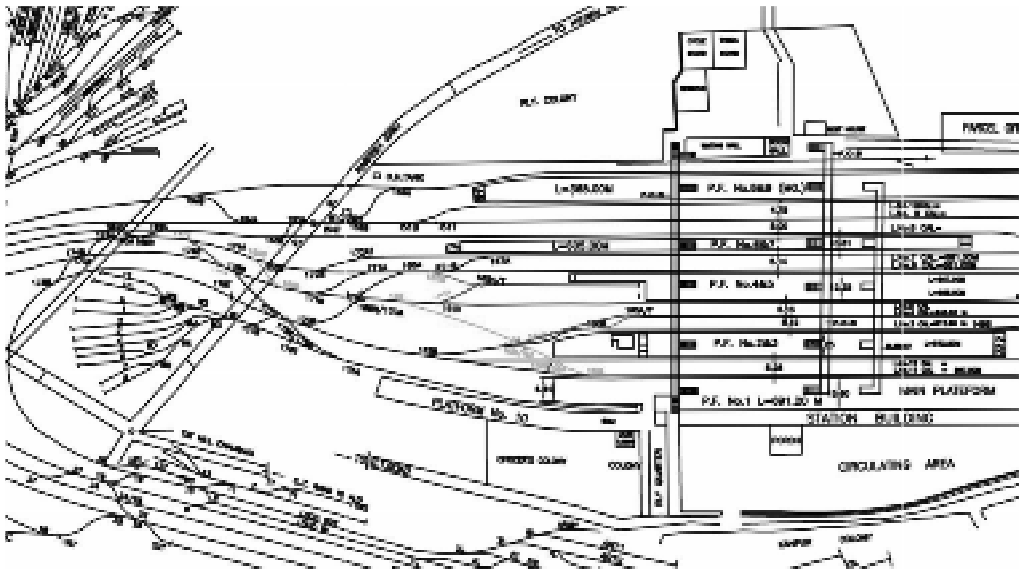

Fig.5: Phase-I :Remodeling of west yard

Removing this leg enhances available platform lengths of platform no 1 & 2 by 120.5m and 102m respectively. Removal of this leg creates space for shifting of crossover no 160 by side of track on platform no 3 towards further west, thus releasing 99.91m on platform 3. The length of platforms and no. of coaches that can be accommodated after execution of phase-1 work can be summed up as under:

S. No.	PF No.	Overall length of platform available	Length of platform available for berthing	No. of coaches on platform	Increase in available length	Revised length of available platform length	Revised no. of coaches on platform
1	1	677	449	20	120.5	569.5	25
2	2	578	476	21	102	578	25
3	3	565	404	18	100	504	22

This part of work has been sanctioned on Out of turn basis in GM LS 2015-16 and is under execution.