Methodology of Mechanized construction of Formation

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Synopsis: -

Earthen formation is an inevitable part of Railway Engineering. Maintenance of various track parameters largely depend upon the characteristics of the under lying subsoil as well as the material and methodology used for such formation. A little effort taken at the construction stage will go a long way in having a trouble free formation during service. The formation plays a vital role in the longitivity of the health of a railway line. Whatever may be the conditions of the remaining elements of a track, if the formations are not designed after a proper analysis and constructed using suitable techniques, it will lead to such a track which will be difficult to maintain for the open line engineers, for years to come. Two assets, which are rare to-day but was in plenty in olden days, had dictated the method of forming the formation; these two assets being time and man power. Now we are deficient in both.

This has led to a large scale mechanization in the construction of formation. However it is necessary that we are not stuck, with only those machineries and techniques with which we have gained experience. The expectation from Construction engineers is much more than, what it was, in the earlier days. The speed of trains is expected to be higher. Heavier axle loads are to be carried. Longer trains which lead to higher fatigue are to be run. At the same time, the maintenance aspects are expected to be lesser. After all, it is the era of fit and forget!! Even though these better standards are expected, the time of construction is expected to be reduced.

Keeping these expectations in view, we have to move forward, to get a stable sturdy and long lasting formation, within a short period of the span of construction. RDSO has been formulating from time to time, various guidelines towards this end. However, it is noted that we are not able to keep pace with the developments happening internationally or even in local market. Manual methods of construction cannot achieve the desired quality of earthwork. Hence deployment of modern equipments such as earthmover, motor graders, scraper, dumpers, mobile water sprinklers, vibratory rollers have become inevitable. In order to avoid time and consequent cost over runs, it would be advantageous to deploy modern machineries in executing earthwork for Railway formation.

It is in this connection that the standards of construction of National Highways come in to picture. The NHAI was able to use more modern machineries as well as techniques for the construction of their formations. There may be other organizations as well, who are able to make use of the latest techniques. We may have to adopt some of these machineries and techniques to construct a better formation in a shorter period. There should be a mechanism in the Railways to constantly interact with other organizations in this field and upgrade our knowledge utilizing their experience in constructing the formation. Otherwise the Railways may lag behind by at least ten years in utilizing the latest machineries & techniques, thus keeping themselves in a perennially disadvantageous position.

Advanced Machineries recommended to be deployed in making Railway formation to keep pace with present scenario :-

Type of machineries and their functions.

1. Heavy duty Hydraulic Excavators (Chain Mounted)

- Functionally used for earthwork in cutting (formation) and also used for cutting of unsuitable subsoil before laying embankment.
- The advantage of chain mounted excavator is that it can traverse on marshy ground.

2. Chain Mounted Dozer.

- Functionally this machine is used to level the ground also for spreading the dumped earth to proper level.
- This machine also used to clear the vegetation before deposit of earth in formation.

3 Grader cum Leveller

- The Grader is used for achieving proper level and cross slopes in each layer
- Due to cross slopes,accumlation of water on top of formation is avoided
- The grader is also used to trim the sides of embankment to the desired angle/slope

4.**Vibratory Roller**

- The conventional roller will take considerable time to achieve desired compaction due to increase number of passes, whereas using of vibromax ensures better compaction with lesser passes thereby saving time.
- These type of rollers are mainly suitable for granular soils.

5.**Sheepfoot Roller**

- These rollers are suitable for clayey and cohesive soils.

6. **Baby Vibromax**

- This is a most handy and useful machinery to ensure proper compaction at the sides of retaining wall and on the approaches of bridges.

- These rollers can be advantageously used at the top edges of the embankments.

7. **Water Sprinklers**

- In olden days water used to be added in the borrow pits or over formation to obtain OMC, with water hoses which never used to confirm uniform watering.
- By using the above sprinkler arrangement, optimum / uniform quantity of water is added to each layer due to the provision of control valve.

7. **Heavy Capacity Dumpers.**

- Earlier the maximum capacity of dumpers used to be 3 to 4 Cum.
- These heavy capacity dumpers are capable of carrying thrice the capacity of conventional dumpers, thereby reducing construction time considerably.

Advantages of deploying machineries:-

- Formation can be built faster and so cost overrun on account of delay is avoided. Target can be complied.

- Formation is built with best quality which allows better standard of maintainability and in turn enhances the longevity of track parameters. This greatly avoids development of kinks and hogging in rails and paves way for the track maintained to the high standard and thus minimizes the damage to rolling stock also.

- Better and quality formation made of mechanized method can withstand higher axle load and higher speeds to cater the present requirement and planning, since the track laid on such formation will remain stable under increased stresses caused by higher axle load and higher speed potential.

Conclusion:-

By deploying machineries considerable reduction in project time is achieved. In addition, this will result into substantial benefits to achieve the projected goal of running higher axle /High speed trains so as to keep pace with other modes of transportation and to meet the challenges.