

RIGHT PADDLE REPAIR METHODS FOR IMPROVING TRAFFIC SAFETY AT TRAIN RAILWAY TRACKS

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ABSTRACT

Problems that often occur at level crossings with railroads are the high number of traffic accidents, namely accidents between trains and vehicles, two-wheeled vehicles that fall due to inadequate railroad infrastructure, and the condition of road pavements at level crossings that are not stable. This study is focused on handling pavement damage at railroad crossings, especially at the JPL 67 location, which is located on the East Java Province road, UPT area. Road and Bridge Management (PJJ) Surabaya, namely Jalan Departemen Krian – Mojokerto Regency (link. 153) Km. 30. At the level crossing of JPL 67, two-wheeled motor vehicle accidents often occur. There is a significant difference in elevation between the highway and the railroad, causing damage to the pavement. The problem is tried to be overcome by conducting a study by UPT. PJJ Surabaya. This study aims to obtain the right road handling method according to the character of the load on level crossings, namely dynamic loads on train vibrations. Several road handlings trials have been carried out from January 2022 to June 2022, using several pavement materials. The study found that CTB with a cement composition can make the pavement at level crossings last longer.

Keywords: Level Crossing; Train; Highway; Accident; Road Damage.

1. Introduction

The JPL 67 railroad crossing is one of the level crossings [1][2][3] in the UPT area. Road and Bridge Management (PJJ) Surabaya. UPT. PJJ Surabaya covers the City of Surabaya, Sidoarjo Regency, Gresik Regency and Lamongan Regency, where there are 6 (six) crossings of a highway with railroad tracks. The JPL 67 level crossing was used as the research location, based on considering the frequent occurrence of traffic accidents [4][5][6] and the high traffic volume at this point. The intensity of train travel with dynamic loads damages the road surface [7] at the JPL 67 crossing and further increases the incidence of accidents, which are generally experienced by two-wheeled motorized vehicles. Based on this, UPT. PJJ Surabaya took the initiative to find the right method of repairing road damage to be applied at crossing a railroad plot. The right handling method is expected to reduce the number of accidents at the JPL 67 crossing with a zero-accident target.

2. Method

The location of the study is at the JPL 67 level crossing, which is located in Sidoarjo Regency, Krian - Boundary Road, Mojokerto Regency (link 153) Km. 30. The repair of road surface damage at the JPL 67 level crossing has been carried out several times since March 2022. Various materials and methods have been tried to find the road repair method that best suits the character of the level crossing at this point.

2.1. Repair Using Cement Treated Base (CTB) mixed in site and Hot Rolled Sheet (HRS)

Repair of damaged pavement at the crossing of the JPL 67 railroad using CTB [8][9][10] and cold mixed asphalt was performed in March 2022. Repairs were in the form of reconditioning the holes using CTB, then coated with HRS (Hot Rolled Sheet)[11][12]. The method is carried out based on the consideration that the road at the railroad crossing requires high flexibility, with a foundation that is strong enough to withstand vibrations from the dynamic load of the train. The CTB mixture used is directly made at the road repair site.



Figure 1. Initial condition of road pavement at JPL 67



Figure 2. Repair with CTB and HRS at JPL 67



Figure 3. CTB (mixed in site) and Cold Mixed Overlay Results

Due to the demand for speedy handling of road damage and unfavorable weather conditions, the reconditioning for potholes using CTB is not preceded by patching. Repairing damaged roads in the JPL 67 plot of road crossing using this material and method is less efficient because road damage occurs quickly in a not-too-long time (2 months).

2.2. Repair Using Cold Mixed Asphalt

In early June 2022, the pavement damage was carried out again at the crossing of the JPL 67 railroad using Cold Mixed Asphalt material. Material selection is based on weather considerations, which still often rain, and the speed of handling road damage is needed.



Figure 4. Initial condition of road pavement at JPL 67



Figure 5. Cold Mixed Overlay at JPL 67



Figure 6. Cold Mixed Asphalt Overlaying Results

Cold-mixed asphalt is used because of the demands on the speed of handling road damage and unfavorable weather conditions. Repairing road damage at the JPL 67 plot of road crossing using cold mixed asphalt is not very effective and efficient because the damage to the pavement occurred again in a relatively short time (2 weeks).

2.3. Repair Using CTB (mixed off site) and HRS

In mid-June 2022, repairs were carried out on the damage to the pavement at the crossing of a plot of the JPL 67 railway using CTB and HRS. The method used is the same as the previous road pavement repair: closing the holes using CTB, then coating using HRS. However, there are differences in the manufacture of CTB mixtures, namely, mixing class A aggregates and cement is carried out outside the road handling site, not on site anymore. The proportion of cement used in the CTB mixture was increased, with the aim that the strength of the structure could be higher and stronger to receive vibrations from the dynamic load of the train.



Figure 7. Initial condition of road pavement at JPL 67



Figure 8. Repair with CTB and HRS at JPL 67



Figure 9. Overlay Results with CTB dan HRS

Before closing the potholes with CTB, patching is done first so that the sides of this intersection are neat. Repairing road damage at the JPL 67 plot of road crossing using CTB mixed outside the site and coated with HRS is more durable. Until the time of this writing, there has been no further damage.

3. Conclusions

Evaluation of the results of several methods of handling road damage at the level crossing of JPL 67 is as follows:

1. Road damage at railroad crossings generally occurs in the space belonging to the railroad. Hence, the dynamic load effect from the movement of trains affects the pavement condition at level crossings.
2. Pavement at the location of level crossings with railroads requires flexible pavement but has a rigid undercoat
3. The use of mixed Cement Treated Base (CTB) outside the location of level crossings is more effective than the use of mixed CTB on site and immediately used to cover potholes. The usage of CTB is probably due to the dynamic load on the railroad tracks that propagates to the pavement, so the CTB that is suitable for use is the one that is close to the cement setting time.
4. Repairing damaged roads at level crossings with railroads requires supervision from the personnel of the Director General of Railways so that the road pavement repair actions taken do not interfere with the function of the railroad tracks.

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