

CHAPTER III

THEORETICAL BASIS

3.1. Road Safety Inspection

Road safety inspection (IJK) is a systematic inspection of a road or road segment to identify hazards and deficiencies that can cause accidents on existing roads. The hazards and shortcomings referred to are the potential causes of accidents caused by the deterioration of the physical condition of the road and or its complement and the deterioration of the road and surrounding environment conditions (Directorate General of Highways, 2011). Road safety inspection itself is used to support security and safety programs in traffic as regulated by law 22 of 2009 concerning road traffic and transportation.

The principles of road safety inspections are pro-active. Some safety principles in carrying out road safety inspections include maintaining road functions (preventing misuse of infrastructure), uniformity (preventing excessive variation in the type of road use, speed and direction), ease (ease of road users in interacting with road elements) and accommodating shortcomings in the road through engineering road conditions and the surrounding environment (Directorate General of Highways, 2011). The scope of road safety inspection checks, namely:

1. The geometric scope of the road inspection includes cross-section, visibility, superelevation, stationing, bend widening, centrifugal force, horizontal alignment and alignment coordination.
2. The scope of inspection of road equipment includes traffic signs, markers, road lighting, traffic signal devices, and traffic safety devices.
3. The visual inspection of the damage to road structures includes road surface levelness, road surface hardness, road surface damage, road shoulder conditions, and road median conditions.

Each scope of road safety inspection checks can be seen in the checklist taken in PD T-17 -2005 "Road Safety Audit" which includes eleven checklists with the focus of each inspection in the operational phase of the road in table 3.1.

Table 3.1 List of Checks in Road operational understanding

| No | Checklist | Focus of Examination |
|----|-------------------------|--|
| 1 | General Road Conditions | <ul style="list-style-type: none"> • Class / function of the road • Median and Separator • Roadside • Kerb Height • Drainage • Speed • Lanscape • Parking • Bus stops |
| 2 | Road Alignment | <ul style="list-style-type: none"> • Visibility • Speed of plan • Driver Expectations • Lane goes ahead • Ascent line • The width of the road • Roadside |

| | | |
|----|---------------------------------------|---|
| 3 | Crossing | <ul style="list-style-type: none"> • Alignment • Warning sign • Marking and crossing signs • Layout • Visibility • Side free space |
| 4 | Additional Lane / Turn Direction Lane | <ul style="list-style-type: none"> • Line width • Taper • Sign • Visibility |
| 5 | Motorized Traffic | <ul style="list-style-type: none"> • Crossing trails • Guard Rail • Bus stop location • Facilities for people with disabilities • Bike Lane • Signs and markers |
| 6 | Railroad crossing | <ul style="list-style-type: none"> • Railroad tracks • Visibility • Signs and speed-reducing devices |
| 7 | Bus / Vehicle Stop | <ul style="list-style-type: none"> • Bay bus • Vehicle parking |
| 8 | Lighting Conditions | <ul style="list-style-type: none"> • Street lighting • Glare |
| 9 | Signs and Road Markings | <ul style="list-style-type: none"> • Traffic control lights • Traffic control sign • Markings and delineation |
| 10 | Street Complementary Buildings | <ul style="list-style-type: none"> • Electric poles and telephone poles • Collision barrier • Bridge • Box control, box culvert, direction boards and billboards |
| 11 | Road Surface Condition | <ul style="list-style-type: none"> • Pavement damage • Skid resistance • Puddle • Avalanche |

(Sumber : Pedoman Audit Keselamatan Jalan, Departemen Pekerjaan Umum, 2005)

3.2. Road Safety

Road safety is related to the culture of road user traffic and the technical aspects of road construction after being operated. Roads to be built must consider the elements of road safety that will affect accident prevention and victim reduction in the event of an accident (Directorate General of Highways, 2011).

To improve road safety a strategy is needed to develop and improve road safety adjusted to the level of development and the problem of traffic accidents in an area, which is outlined in the 5 pillars of the safety system in Presidential Instruction No. 4 of 2013 concerning the Road Safety Action Decade Program, namely:

1. Road Safety Management

What needs to be done to support road safety management is to strengthen institutional capacity, form a coordinating body, develop national road safety strategies, create realistic long-term targets and develop a traffic accident data system.

2. The Road to Peace

What needs to be done in supporting the safe road is to increase safety awareness in planning and design, introduce a road safety audit process,

regularly assess road safety, expand accident-prone locations handling programs and create safety priorities at road works locations.

3. Safety Vehicles

What needs to be done in supporting safety vehicles is to harmonize global standards, implement a new car assessment program, equip all new cars with safety features and encourage company managers to buy, operate and maintain safe vehicles.

4. Safe Road Users.

What needs to be done to support safe road users is to encourage road safety legislation, maintain or enhance law enforcement efforts, increase public awareness of risk factors, create work activities that can reduce injuries caused by road traffic and improve driving license procedures.

5. Post-Accident Response

Things that need to be done in supporting the post-accident response include developing a hospital treatment system, developing a national emergency telephone number and providing rehabilitation and assistance to victims of injuries caused by road crashes.

From each of the five pillars determined, each pillar is coordinated and is the responsibility of the parties appointed by the president, as shown in table 3.2.

Table 3.2 Responsible for Five Safe Pillars

| Pillars | Person in charge | Responsible |
|---------|--|--|
| 1 | Minister of National Development Planning / Head of National Development Planning Agency | Encourage coordination among stakeholders and create sectoral partnerships to ensure the effectiveness and sustainability of the development and planning of road safety strategies and carry out evaluations to ensure the implementation of road safety has been carried out effectively and efficiently |
| 2 | Minister of Public Works | Providing road infrastructure that is more secure by making improvements starting from the planning, design, construction and road operations |
| 3 | Minister of Transportation | Ensure that each vehicle used on the road reaches safety standards |
| 4 | Chief of Police of the Republic of Indonesia | Improving the behavior of road users through road safety education, improving the quality of the driving license test system and legal movements on the road and developing a data collection system traffic accident |
| 5 | Minister of Health | Improving pre-accident handling includes the promotion and improvement of driver health in special circumstances/situations and post-accident handling with integrated emergency response system (SPGDT) |

(Sumber : Instruksi Presiden RI, Program Dekade Aksi Keselamatan Jalan, 2013)

3.3. Transportation System Approach

In transportation, there is an element of movement and physical movement occurs over people or goods with or without means of transportation to other places. While the system is a group of elements or subsystems that work together to achieve certain goals. If there is an element or subsystem that is not functioning, it will affect the continuity of the system as a whole or even make it not function at all. A transportation system is a form of attachment between passengers, goods, infrastructure, and facilities that interact in the context of the movement of people or goods covered by the order, both naturally and artificially. So, the transportation system approach is an approach to the combination of several interrelated components or objects in each activity where transportation is only a means of connecting to support activities and for each problem that exists in a plan or technique analysis of interrelated factors is needed.

3.4. Highway Equipment

According to Article 25 of Law No. 22 of 2009 concerning road transport traffic, every road used for public traffic must be equipped with road equipment.

The characteristics of road equipment must be following road specifications and applicable laws or regulations, namely:

1. Traffic Signs

The regulation about the Minister of Transportation of the Republic of Indonesia number 13 of 2014 concerning traffic signs states that the placement of traffic signs must take into account aspects of road user comfort such as distance, placement, height, type of signs and size of signs. The specifications of traffic signs are conventional traffic signs and electronic traffic signs. Conventional traffic signs are signs with a material that can reflect light or retro-reflective. Electronic traffic signs are signs whose information can be regulated electronically.

2. Road Markings

According to the Regulation of the Minister of Transportation of the Republic of Indonesia Number 34 of 2014 concerning Road, Markings states that road markings must carry out and ensure that road markers following their functions include placement, maintenance, and deletion activities.

3. Street Lighting Lights

According to Minister of Public Works Regulation No. 19 of 2011 regarding Road Technical Requirements and Road Technical Planning Criteria states that the street lighting specifications are related to several places that require special attention in road lighting planning between the following locations:

- a. The width of the space belonging to the road varies in one segment of the road.
 - b. Places where the horizontal curve is sharp.
 - c. Spacious places such as intersections, interchanges, parking lots, etc.
 - d. Trees and narrow median widths.
 - e. Narrow/long bridges, overpasses, and underground roads.
 - f. Road environment that has a lot of interference with the road.
4. Traffic Signal Giving Tool

A traffic signal sign (APILL) is a light that controls the traffic flow that is installed at a crossroads, pedestrian crossing, and other traffic flow points. These lights are indicative of when the vehicle must start and stop alternately from various directions of traffic. Traffic control at crossroads is intended to regulate the movement of vehicles in each group of vehicle movements so that they can move alternately so as not to interfere with existing flows. This lamp uses a color that is universally recognized; to indicate stop is red, be careful yellow and green which means it can walk. traffic signaling tool installation requirements, namely:

- a) Minimum flow of traffic using an average of more than 750 vehicles/hour for 8 hours a day;
- b) or the average waiting/delay time of the vehicle at the intersection has been

beyond 30 seconds;

c) or intersections are used by an average of more than 175 walkers

feet/hour for 8 hours;

d) or frequent accidents at the intersection concerned;

e) or is a combination of the causes mentioned above.

3.5. Traffic accident

A traffic accident is an unexpected and accidental road event involving a vehicle with or without other road users resulting in human casualties and/or property loss (Article 1 Number 24 of Law Number 22 Year 2009 concerning Road Traffic and Transportation). There are several main factors when a traffic accident occurs, namely:

a. Human Factors

The human factor is the most dominant in an accident. Almost all accidents are preceded by violations of traffic signs. Violations can occur because of deliberately violating, ignorance of the meaning of the rules that apply or do not see the provisions imposed or pretending not to know. Besides humans as road users are often negligent and even reckless in driving a vehicle, not a few numbers of traffic accidents are caused by bringing vehicles in a state of

drunkenness, drowsiness and easily provoked by other road users who might be able to provoke a passion for racing.

b. Vehicle Factors

The most frequent vehicle factor is the negligence of maintenance performed on the vehicle. For example, such as brake failure and steering jams.

c. Road Factor

Road factors are related to speed, road plans, road geometrics, road safety fences, the presence or absence of road medians, visibility and road surface conditions. Damaged or perforated roads are very dangerous for road users.

d. Environmental or weather factors

Environmental or weather factors related to rain will affect the work of the vehicle such as braking distances becoming more distant, roads becoming slippery, visibility becoming shorter when it rains heavily. Smoke and fog can also interfere with visibility, especially in mountainous areas.

Generally, there is an interaction between these factors when an accident occurs, in the form of:

1. Interaction between vehicles and roads is an issue in the geometric design of roads. This is the main consideration of road designers.
2. Interaction between humans and vehicles is the relationship (interface) of humans and machines. This is a major consideration in the motor vehicle industry.
3. The interaction between humans and roads is an issue in the field of human factors. This is still not widely discussed in technical guidelines. Road engineers often ignore the fact that they make roads that humans will use.
4. Interaction between the environment and the road where the road is built on the environment itself so that the road will always interact with the environment. Weather conditions such as temperature and humidity will affect the performance, strength, and stability of the road.

From these factors, human factors are the main factors that dominate the occurrence of traffic accidents but the road and environmental factors along with vehicle factors cannot be underestimated as contributing factors to accidents.

To improve road safety in general, efforts are needed to reduce or prevent traffic accidents that can harm victims and material, both through efforts to educate road users who have safety insights, create roads and their environment that are safe, and vehicles that have a high level of safety (road network safety management, 2011).