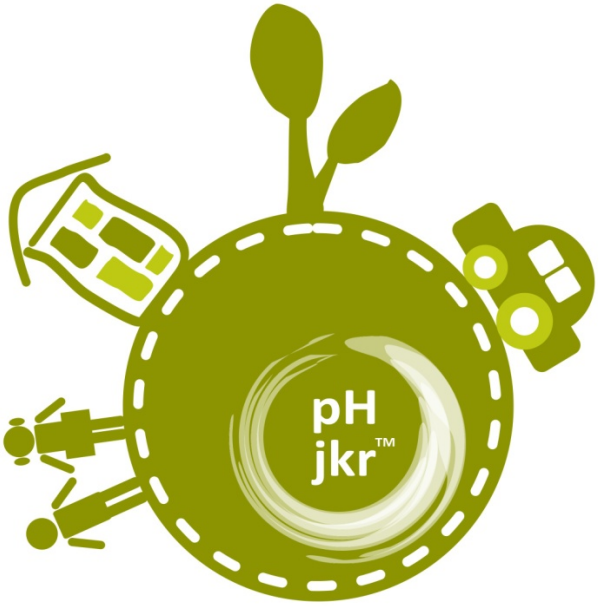


PENARAFAN HIJAU JKR
MANUAL

New & Upgrading of Roads-KJ

Version 2.0

JKR 20801-0017-15

WAY FORWORD

The initiative to provide a sustainable development rating scheme for the use of government projects was developed in order to integrate initiatives made separately by different branches in PWD. The scheme serves as a tool for integrating all the initiatives that has been taken, measured and used as a benchmark in developments implemented by PWD. This will make the initiatives to be more comprehensive and impactful.

Version 1.0 of the Penarafan Hijau JKR (pH JKR) Manual for New Federal Roads category was produced in 2012. However, the usage of this manual was not very rampant as not many projects was deemed suitable. In the year 2013, version 1.0 of pH JKR manual for Upgrading of Roads category, was consequently produced. However, this manual was also minimally used due to the unsuitability of the criteria allocated.

Realising this problem, the pH JKR Committee decided to revisit both manuals and make it more practical and user friendly. In order to achieve this, more designers, project managers and implementers were engaged in the development of this pH JKR Manual Version 2.0. In this version, criteria for new and upgrading of roads were combined and simplified. There is much hope that this effort will enable more users of pH JKR to benefit from its outcomes.

CHAIRMAN

Penarafan Hijau JKR (pH JKR)

ACKNOWLEDGEMENTS

Version 1.0 of the *Penarafan Hijau JKR* (JKR pH) Manual has been completed successfully due to continuous and dynamic efforts of these PWD staff:

COMMITTEE SESSION 2013- 2015

NO.	NAME	DEPARTMENT
1	Ir. Cheong Pui Keng	Caw. Alam Sekitar & Tenaga
2	Hj. Abu Harith bin Shamsuddin	Bah. Senggara Fasiliti Bangunan
3	Farah binti Abdul Samad	Caw. Alam Sekitar & Tenaga
4	Sujatiah binti Tamrin	Caw. Kejuruteraan Jalan dan Geoteknik
5	Ir. Rozina binti Sudin	Caw. Kejuruteraan Elektrik
6	Wan Maziah binti Wan Noh	Caw. Kontrak & Ukur Bahan
7	Anita binti Ibrahim	Caw. Kontrak & Ukur Bahan
8	Ir. Ismail bin Abd Rahman	Caw. Kejuruteraan Awam, Struktur dan Jambatan
9	Ir. Mohd Sufian bin Othman	Caw. Kejuruteraan Mekanikal
10	Ir. Zailani bin Nagin	Caw. Kejuruteraan Mekanikal
11	Hamizan bin Husain	Caw. Kejuruteraan Mekanikal
12	Mohd Sabere bin Sulaiman	Caw. Arkitek
13	Wan Zuhaimie bin Wan Salleh	Caw. Kejuruteraan Jalan dan Geoteknik
14	Azlina binti Aziz	Caw. Arkitek
15	Khairul Amir bin Isahak	Caw. Alam Sekitar & Tenaga
16	Aminuddin bin Suhaimi	Caw. Kejuruteraan Awam, Struktur & Jambatan
17	Mohd Ainor bin Yahya	Caw. Kejuruteraan Elektrik
18	Mohd Fadzly bin Samsudin	Bah. Perkhidmatan Kejuruteraan Senggara
19	Zolfadli bin Omar	Bah. Senggara Fasiliti Jalan
20	Ezzuddin bin Ab Razad	Caw. Alam Sekitar & Tenaga
21	Intan Norshahrah bt. Hj Ibrahim	Caw. Alam Sekitar & Tenaga
22	Siti Khadijah binti A. Rahim	Caw. Alam Sekitar & Tenaga
23	Azizul bin Hashim	Caw. Alam Sekitar & Tenaga
24	Nur Azrinawati binti Ab Rahman	Caw. Alam Sekitar & Tenaga

ACKNOWLEDGEMENTS

Version 2.0 of the *Penarafan Hijau JKR* (JKR pH) Manual is an addition and improvement to the version 1.0. The production of this version was made possible by the efforts of these PWD staff:

2016 SESSION OF THE COMMITTEE

NO.	NAME	DEPARTMENT
1	Puan Hasniah binti Mat Ali	Caw. Jalan
2	En. Anuar bin Ngah	
3	En. Muhammad Taufek bin Ismail	
4	Puan Roziawati binti Razali	
5	Puan Zuliana binti Ramli	
6	Puan Zuriani binti Hamzah	Caw. Jalan Pakar Kej. Jambatan & Jalan
7	Puan Safinas binti Saroji	Caw. Jalan Bhgn. Rekabentuk Jalan Zon Timur (Kejuruteraan Hidrologi)
8	Puan Mardhiyah Syahida binti Berhanuddin	
9	En. Mohd. Ezamudin bin Zulkifli Chan	
10	Pn. Sarini binti Abdullah	Caw. Jalan Bhgn. Pengurusan Projek Timur
11	Puan Naomi Anak Andrew Baling	
12	Puan Syahida binti Omar	
13	Puan Fazleen Hanim binti Ahmad Kamar	Caw. Jalan Bhgn. Pengurusan Projek Utara
14	Tuan Khusairry bin Tuan Abdul Manaf	Caw.Jalan Bah. Rekabentuk Jambatan
15	En. Zaizul Hisham bin Haji Zainol	Caw. Kej. Geoteknik
16	En. Eow Thein Ewe	
17	En. Chandra Mohan a/l Muthusamy	
18	En. Wan Ahmad Taqiuyuddin bin Wan Ngah	
19	En. Hamizan bin Husain	Caw. Kej. Mekanikal
20	En. Mohd. Hairie bin Abdul Halim	
21	En. Shahrul Affendy bin Abu Bakar	Caw. Kej. Elektrik
22	Puan Aiedah @ Noraidah binti Mohd. Nazri	Caw. Kej. Awam dan Struktur Bhgn. Kej. Awam
23	Puan Sri Rahayu binti Nik Saad	Caw. Kej. Awam dan Struktur Bhgn. Kej. Awam Bangunan Struktur
24	Puan Siti Adabiyah binti Sulaiman	Caw. Senggara Fasiliti Jalan
25	Puan Farah binti Abdul Samad	Caw. Alam Sekitar Dan Kecekapan Tenaga
26	Puan Zainon binti Jaini	
27	En. Abdul Halim bin Mat Yani	
28	En. Shahrizal bin Umar	
29	Puan Nurul Hidayah binti Adriyanshah	
30	Puan Nur Adila binti Abidin	
31	Cik Norazlina binti Mohamad Abu	
32	En. Ismail @ Vorarak bin Mustapha	

Well done and thank you to the committee members involved.

1.0 INTRODUCTION

pH JKR is a tool that can be used by government projects to measure the sustainability of a development. It was built based on the operation of the existing government development and also the requirements set by government projects. Therefore, this scheme is friendlier to government developments.

2.0 OBJECTIVES

pH JKR objectives are:

i. To gauge sustainability level achieved by government development projects;
ii. To facilitate improvements to be made from time to time;
iii. To encourage projects to be developed and operated sustainably

3.0 BENEFITS

- ✓ Reducing raw material consumption
- ✓ Reducing the use of fossil fuels
- ✓ Generate Energy
- ✓ Reduce water consumption
- ✓ Reducing greenhouse gas emissions
- ✓ Reduce water pollution
- ✓ Reduce solid waste
- ✓ Conservation of habitats
- ✓ Creating habitat
- ✓ Reduce carbon footprint

4.0 METHODS

Stage 1 ~ Application & Registration (refer to the work process P1)
Stage 2 ~ Assessment of Design (see the working process P2)
Stage 3 ~ Verification of Scoring (see the working process P3)

5.0 RATING CRITERIA

Projects subscribing to this scheme shall be rated based on the following six criteria:

ABB.	CRITERIA
SM	***Sustainable Site Planning & Management***
EW	***Environment & Water***
AE	***Access & Equity***
CA	***Construction Activities***
MR	***Material & Resources***
PT	***Pavement Technologies***
IN	***Innovation***

SM ~ *Sustainable Site Planning & Management*

Most of the project sites have been identified by the government beforehand. The freedom of choice is quite limited. However, sites that have been identified are to be managed and developed in a sustainable manner in order to minimize environmental impact.

EW ~ *Environment & Water*

Earthworks, erosion and sedimentation control and storm water management should be carried out sustainably. Restoration and preservation of the environment should also be taken into account.

AE ~ *Access & Equity*

Safety and facility of road users can be escalated by conducting a safety audit at any stage of development. Road facilities such as pedestrian, bridges and bicycle lanes can also increase the level of road user safety. Rest & Recreation Area and Scenic View Area can enhance more facilities of the road users.

CA ~ *Construction Activities*

Quality of roads can be improved by the use of ISO 9001 for the duration of ongoing development. User safety level also needs to be improved during road maintenance or upgrading.

MR ~ *Material & Resources*

Reduce, reuse and recycling should be monitored in order to reduce natural resources consumption. Efficient use of materials should also be emphasized.

PT ~ *Pavement Technologies*

The latest technology in design and construction of roads which can increase the sustainability of a road should be adopted.

IN ~ Innovation

Initiatives and innovative designs that are in line with the government's mission is encouraged.

6.0 PROJECT SELECTION CRITERIA

Projects fulfilling these criteria are subjected to pH JKR rating scheme.

- Project cost ≥ RM 50 million
- Federal Road
- Site located within the Environmentally Sensitive Areas (ESA) and/or project is subjected to EIA.

7.0 DETAILS OF MARKING

NO	KRITERIA PEMARKAHAN		MAXIMUM POINTS	
			NEW ROAD	UPGRADING ROAD
1.	**SM**	*Sustainable Site Planning & Management*	**16**	**19**
2.	**PT**	*Pavement Technologies*	**9**	**12**
3.	**EW**	*Environment & Water*	**5**	**5**
4.	**AE**	*Access & Equity*	**6**	**6**
5.	**CA**	*Construction Activities*	**20**	**20**
6.	**MR**	*Material & Resources*	**10**	**11**
7.	**IN**	*Innovation*	**5**	**5**
		TOTAL POINTS (CORE)	**71**	**78**
		TOTAL POINTS (ELECTIVE)	**18**	
		TOTAL POINTS (CORE + ELECTIVE)	**89**	**96**

8.0 CERTIFICATION REQUIREMENTS

Please refer to **Appendix A**

9.0 CLASSIFICATION RATING

PERCENTAGE **(%)**	STAR	**PH JKR** RATINGS
40 - 49	★★	Potential Recognition
50 - 69	★★★	Best Management Practices
70 - 84	★★★★	National Excellence
85 - 100	★★★★★	Global Excellence

10.0 MAINTENANCE OF RATINGS

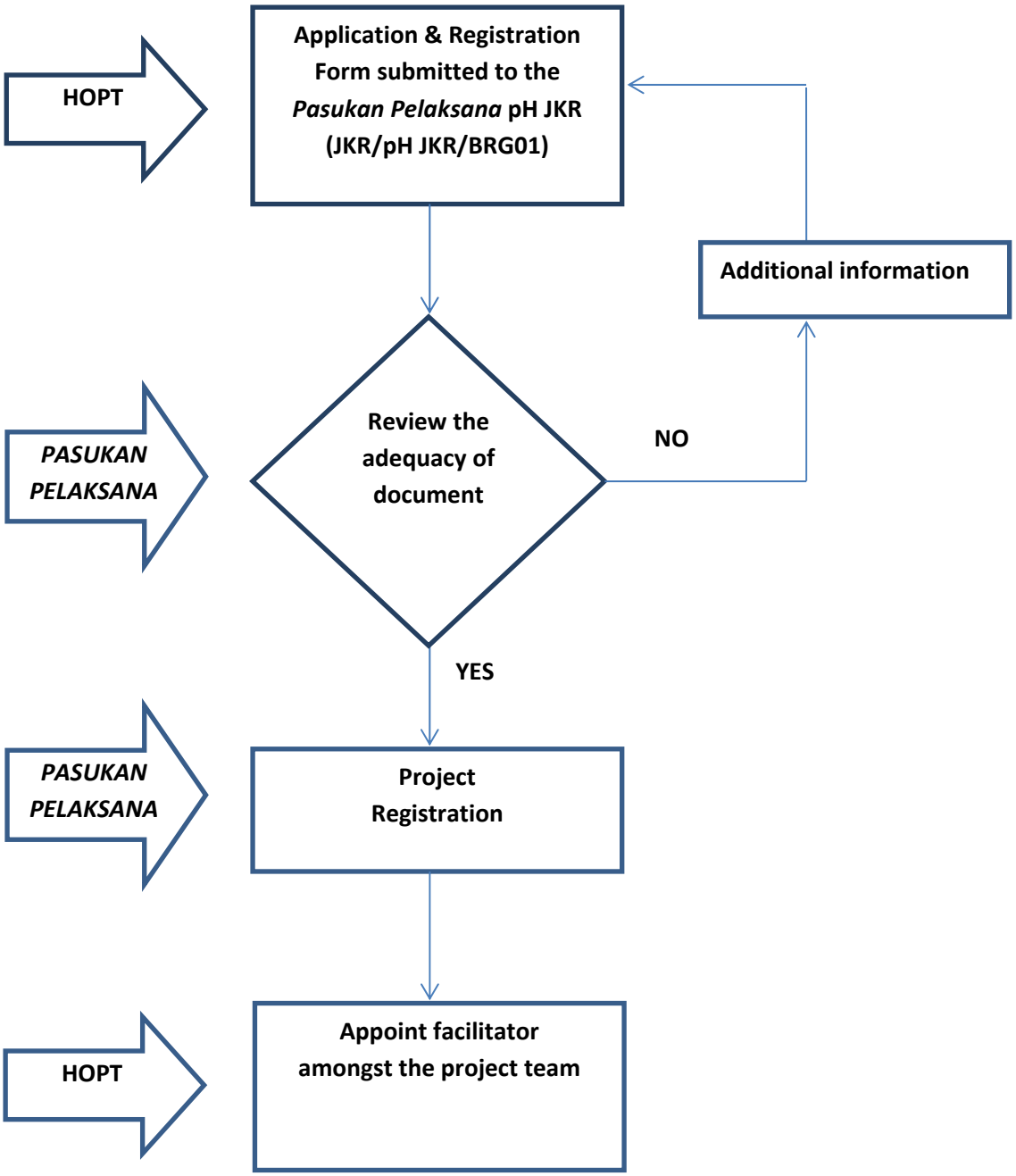
Certification is only valid within **two (2) years** from the date of issuance. Maintenance of the certification should be made every **three (3) years**.

Application for recertification should be made **six (6) months** prior to the date of expiry of the certification validity.

11.0 WORK PROCESS

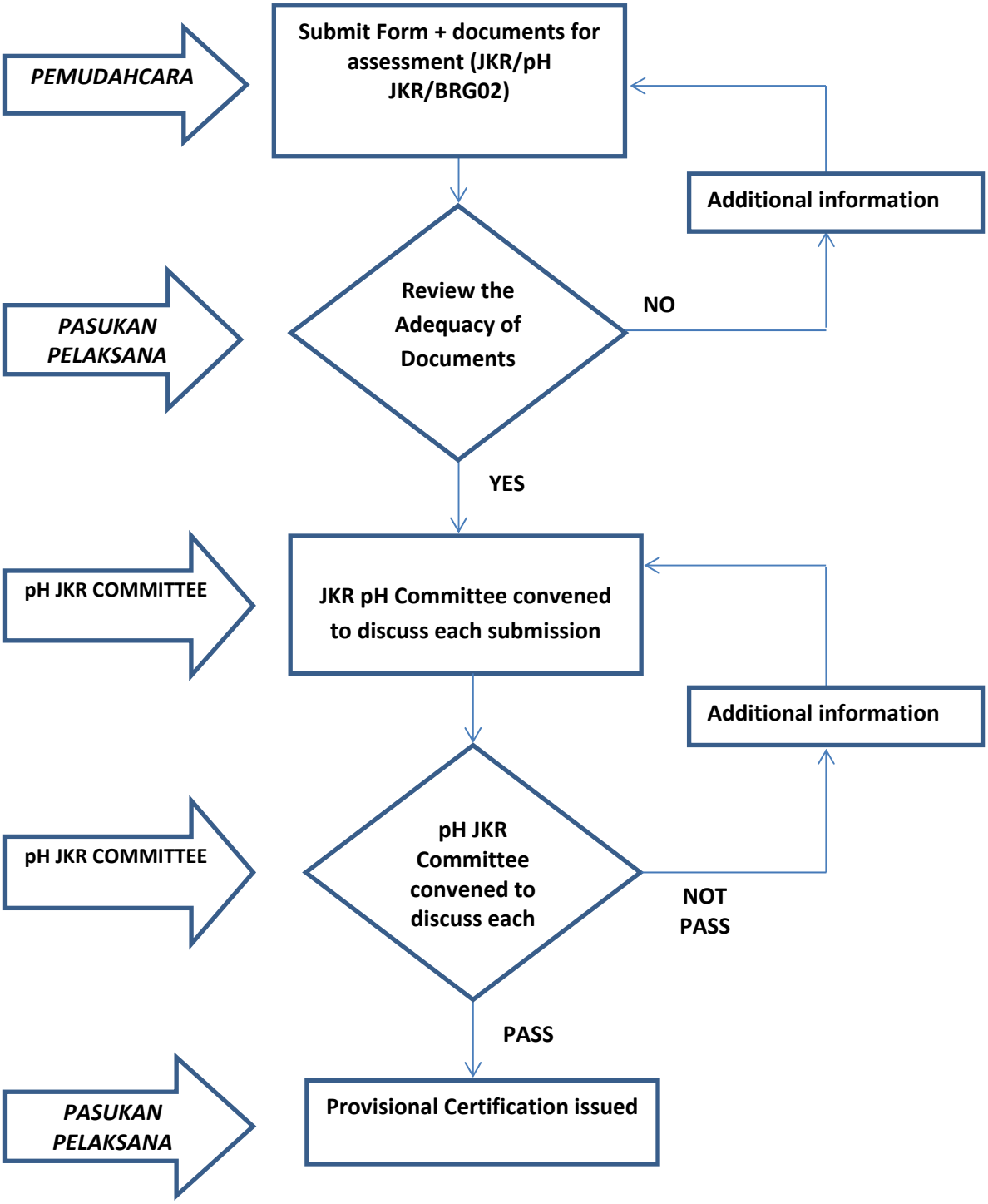
11.1 STAGE 1 (P1)

APPLICATION & REGISTRATION



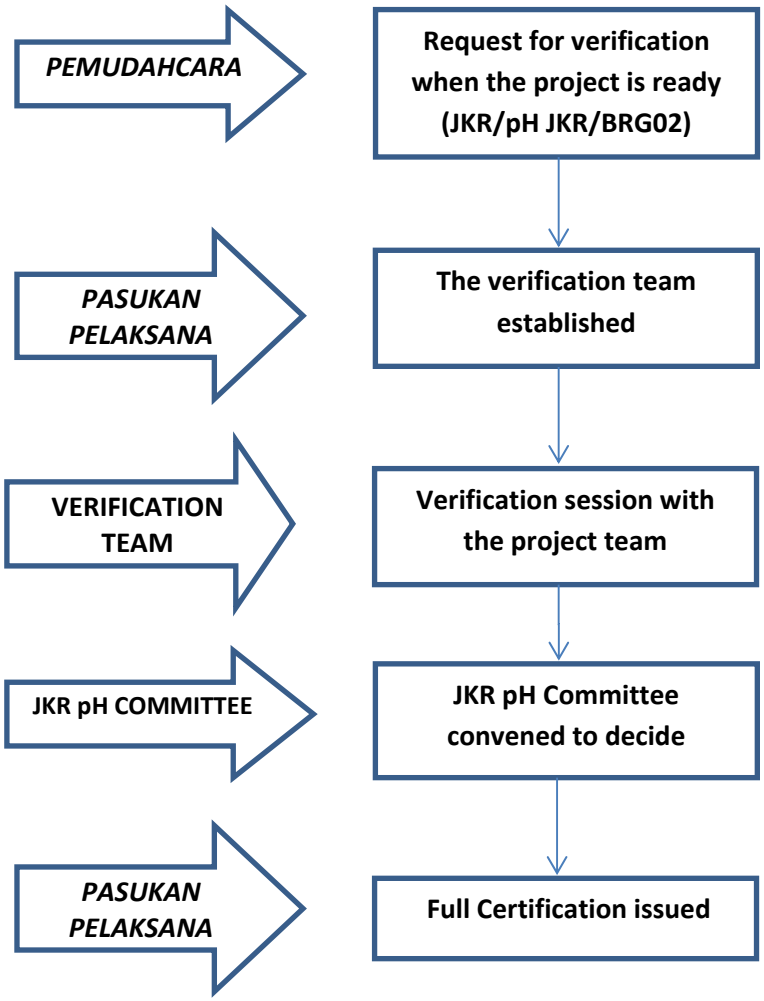
11.2 STAGE 2 (P2)

DESIGN ASSESSMENT



11.3 STAGE 3 (P3)

VERIFICATION OF MARKING



12.0 ROLES & RESPONSIBILITIES

NO.	ROLES / RESPONSIBILITIES	HOPT	HODT	PEMUDAHCARA pH JKR	PASUKAN PELAKSANA pH JKR	COTMITTEE pH JKR	VARIFICATION TEAM
1.	Application for registration of ratings through form JKR / JKR pH / BRG01	✓					
2.	Checking the registration application form JKR / JKR pH / BRG01				✓		
3.	The appointment of a facilitator	✓					
4.	Coordination for the provision of design evaluation forms JKR/pH JKR/BRG02			✓			
5.	Completion of evaluation forms design JKR/pH JKR/BRG02	✓	✓				
6.	Submission of evaluation forms design JKR/pH JKR/BRG02			✓			
7.	Revised design evaluation forms JKR/pH JKR/BRG02				✓		
8.	While design evaluation and rating					✓	
9.	Production while the rating of the project team				✓		
10.	Coordination of the preparation of the application form verification marking JKR/pH JKR/BRG02			✓			
11.	Filling the application form verification marking JKR/pH JKR/BRG02	✓	✓				
12.	Submission of application form verification marking JKR/pH JKR/BRG02			✓			
13.	The establishment of the verification team				✓		
14.	Implementation verification session with the project team						✓
15.	Evaluation and rating					✓	
16.	Rating Certification production to the project team				✓		

13.0 LAMPIRAN A

13.1 LIST OF CONFIRMATION ASSESSMENT (ROAD SECTOR)

Each of the points applied should be confirmed by the relevant experts before points are accounted.

GUIDANCE

ABB.	PENILAI
CKAS	Cawangan Kej.Awam, Struktur dan Jambatan
CJ	Cawangan Jalan
CKG	Cawangan Kejuruteraan Geoteknik
CKM	Cawangan Kej. Mekanikal
CKE	Cawangan Kej. Elektrik
CSFJ	Cawangan Senggara Fasiliti Jalan
CASKT	Cawangan Alam Sekitar & Tenaga

13.2 LIST OF ABBREVIATIONS, TERMS AND DEFINITIONS

There are a number of terms abbreviated to facilitate the assessment of this document. This is also based on the habits of industry.

CBA – Cost–benefit analysis. A systematic process for calculating and comparing benefits and costs of a decision, policy (with particular regard to government policy) or (in general) project.

VE– Value Engineering, a systematic method to improve the "value" of goods or products and services by using an examination of function

EIA- Environmental impact statement, a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.

RSA- Road Safety Audit, the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users.

QMS- Quality management system, is a collection of business processes focused on consistently meeting customer requirements and enhancing their satisfaction

13.3 LIST OF CRITERIA

CODE	CRITERIA	RESPONSIBILITY	ALLOCATION POINTS (AP)	MAXIMUM POINTS (MP)
SM	**SUSTAINABLE SITE PLANNING AND MANAGEMENT**			
SM 1	**REQUIREMENTS FOR ROAD WORKS DESIGN**			
	Traffic Study	CJ	1	New Roadworks: 5
	Axle Load Study	CJ	1	
	Flood records	CJ	1	
	Response to public complaints and requests	CJ	1	
	Cost Benefit Analysis	CJ	1	Upgrading Roadworks: 8
FOR UPGRADING ROAD	As built drawings	CJ	1	
	Accident reports	CSFJ	1	
	Structure replacement	CJ	1	
`SM 2	**ROAD ALIGNMENT**			
	Not more than 6 berms	CJ	1	6
	Cut slope not steeper than 1:1.5 or Rock slope not steeper than 4:1	CKG	1	
	Fill slope not steeper than 1:2	CKG	1	
	Maximum grade less than 7%	CJ	1	
	No reclamation involved	CJ	1	
	Provide added uphill lane (climbing lane) where the length of critical grade exceeds 5%	CJ	1	
	Not in Sensitive Area	CASKT	1	
	Sensitive area with mitigation plan			
SM 3	**SITE VEGETATION**			
	Use non-invasive plant species (example: grass/creeper)	CJ	1	3
	use native plant species only	CJ	1	

	use of grass/creeper for slope protection/unpaved shoulder	CJ	1	
	Hydroseeding with recycled fibrous material (Example: Fibromat, Paddy Straw, Coconut husk, Rice husk)	CJ	1	
	Preservation of existing vegetation	CJ	1	
	Use bio-engineering techniques (example : vetiver grass, creeper and regeneration of natural plant species and material)	CJ	1	
SM 4	**NOISE MITIGATION PLAN**			
	Supply and install noise barrier including maintenance during the construction and defects liability period	CJ	2	2
	To ensure that all equipment and machinery are in proper working condition so as to minimise the amount of noise generated.	CJ		
TOTAL SM		**NEW ROAD**		**16**
		UPGRADING ROAD		**19**

CODE	CRITERIA	RESPONSIBILITY	ALLOCATION POINTS (AP)	MAXIMUM POINTS (MP)
PT	**PAVEMENT TECHNOLOGIES**			
PT 1	**EXISTING PAVEMENT EVALUATION**			
FOR UPGRADING ROAD	Surface Condition Survey	CSFJ	1	3
	Coring & Dynamic Cone Penetrometer test	CSFJ	1	
	Deflection test	CSFJ	1	
	Trial pit & Laboratory test	CSFJ	1	
	Surface Regularity Test	CSFJ	1	

PT 2	**PERMEABLE PAVEMENT**			
	Use of permeable (porous) pavement mix design with higher range of air void (18 -25%)	CJ	1	3
	Drainability shall be sufficient to allow satisfactory drainage of drain water during heavy rainfall.	CJ	1	
	Drainability shall not be less than 10 litre/minute for 54cm2 area, 50mm thickness	CJ	1	
PT 3	**PAVEMENT PERFORMANCE TRACKING**			
	Use a process that allows construction quality measurements and long-term pavement performance measurements to be spatially located and correlated to one another.	CSFJ	2	2
PT 4	**LONG-LIFE PAVEMENT**			
	Meet the requirements of Arahan Teknik Jalan 5/85 (Pindaan 2013). Manual for the structural design of flexible pavement.	CJ	1	4
	Pavement design is in accordance with a design procedure that is formally recognized, adopted and documented by the agency.	CJ	1	
	Rigid Pavement > 40 years design life **OR** Flexible Pavement > 20 Years design life	CJ	2	
TOTAL PT		**NEW ROAD**		**9**
		UPGRADING ROAD		**12**

CODE	CRITERIA	RESPONSIBILITY	ALLOCATION POINTS (AP)	MAXIMUM POINTS (MP)
EW	**ENVIRONMENT & WATER**			
EW 1	**ENVIRONMENTAL MANAGEMENT SYSTEM**			
	ISO 14001:2004 certification for main contractor	CASKT	3	3
EW 2	**STORMWATER MANAGEMENT**			
	Develop a storm water management plan for the site using storm water best management practices (BMP) for flow control in conformance to the Storm water Management Manual for Malaysia (MSMA) and EMS ISO 14001:2004. Demonstrate that the planned BMPs to conform to all applicable 5% above minimum flow control standards set by MSMA and EMS ISO 14001: 2004.	CKAS	1	2
	Develop a storm water management plan for the site using storm water best management practices (BMP) for water quality control in conformance to the Storm water Management Manual for Malaysia (MSMA) and EMS ISO 14001:2004. Demonstrate that the planned BMPs to conform to all applicable 5% above minimum water quality standards set by MSMA and EMS ISO 14001: 2004.		1	
TOTAL EW		**NEW ROAD**		**5**
		UPGRADING ROAD		**5**

CODE	CRITERIA	RESPONSIBILITY	ALLOCATION POINTS (AP)	MAXIMUM POINTS (MP)
AE	**ACCESS & EQUITY**			
AE 1	**SAFETY AUDIT**			
	Road Safety Audit Stage 1-3 (Design Stage)	CJ	1	4
	Road Safety Audit Stage 4 Part I-III (Construction Stage)		1	
	Road Safety Audit Stage 5 (Operational Stage)		1	
	Additional Audit For Traffic Management During Construction		1	
AE 2	**SCENIC VIEWS**			
	Provide at least one access from the project to a designated area for vehicles to exit the traffic stream.	CJ	1	2
	Provide park area for road user to stop and experience the scenic views at strategic location.		1	
TOTAL AE		**NEW ROAD**		**6**
		UPGRADING ROAD		**6**

CA	CONSTRUCTION ACTIVITIES			
CA 1	**REQUIREMENT FOR ROAD WORKS DESIGN**			
	MS ISO 9001: 2008 or (latest version) certification for main contractor.	CJ	3	3
CA 2	**OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM**			
	OHSAS 18001:2007 or (latest version) certification for main contractor	CJ	3	3
CA 3	**CONSTRUCTION WASTE MANAGEMENT PLAN**			

	Create, establish, implement and maintain a formal construction waste management plan during road construction	CASKT	2	4
	Provide a designated location to segregate construction waste on-site		1	
	Appoint the licensed contractor(s) to collect the construction waste		1	
CA 4	**TRAFFIC MANAGEMENT PLAN**			
	Create, establish and implement a formal traffic management plan during road construction	CJ	2	2
CA 5	**SITE ROUTINE MAINTENANCE PLAN**			
	Create, establish, implement and maintain a formal construction waste management plan during road construction	CJ	2	2
CA 6	**HOUSEKEEPING**			
	Establish and implement housekeeping during construction	CJ	2	2
CA 7	**SUSTAINABLE CONSTRUCTION MACHINERIES**			
	Perform scheduled maintenance of construction machineries	CJ	2	4
	Use high performance machineries with low fuel consumption and low air emission.		2	
TOTAL CA		**NEW ROAD**		**20**
		UPGRADING ROAD		**20**

CODE	CRITERIA	RESPONSIBILITY	ALLOCATION POINTS (AP)	MAXIMUM POINTS (MP)
MR	**MATERIAL & RESOURCES**			
MR 1	**MATERIAL REUSE**			

	Reuse at a minimum 30% of existing pavement materials by estimated volume.	CJ	3	5
	Reuse of existing material other than pavement materials		1	
	Earthwork balance		1	
MR 2	**GREEN PRODUCT**			
	Green Products Scoring System (GPSS) of 70% - 100%	CASKT	3	3
	Green Products Scoring System (GPSS) of 50% - 69%		2	
	Green Products Scoring System (GPSS) of 40% - 49%		1	
MR 3	**ROAD INVENTORIES**			
	Provide updated master inventory of material/product after completion of road works.	CFSJ	1	NEW ROAD 1
FOR UPGRADING ROAD	Provide established master inventory of material/product of existing road		1	UPGRADING ROAD 2
MR 4	**EFFICIENT ROAD LIGHTINGS**			
	All systems should be designed to use energy efficient road lightings, while complying to standard and specification for road lightings (eg. MS 825 part 1:2007).	CKE	1	1
TOTAL MR		**NEW ROAD**		**10**
		UPGRADING ROAD		**11**

CODE	CRITERIA	RESPONSIBILITY	ALLOCATION POINTS (AP)	MAXIMUM POINTS (MP)
IN	**INNOVATION**			
	Any Innovation	ALL		5

	< Innovation 1 >		1	
	< Innovation 1 >		1	
	< Innovation 1 >		1	
	< Innovation 1 >		1	
	< Innovation 1 >		1	
TOTAL IN		**NEW ROAD**		**5**
		UPGRADING ROAD		**5**

EC	ELECTIVE CRITERIA			
EC-SM 5	**SERVICES FOR DISABLED USERS**			
	Crossing for disabled users with noise making devices installed	CJ	1	3
	Walkway access for disabled users by providing sidewalks sloped for easy access	CJ	1	
	Tac tile on the pedestrian pathway and access for disabled users.	CJ	1	
EC-SM 6	**NOISE CONTROL**			
	The pavement mix design by using quiet pavement	CJ	2	2
	Noise barrier shall be provided in sensitive areas such as housing situated beside busy roads or highways, schools and hospitals.	CJ	2	
	Buffer Zone	CJ	2	
EC-EW 3	**ECOLOGICAL CONNECTIVITY**			
	Provide dedicated wildlife crossing structures and protective fencing as determined by Environmental Impact Assessment (EIA) report	CJ	1	2
	Provide sound barrier at sensitive area		1	

	for wildlife			
EC-AE 3	**PEDESTRIAN ACCESS**			
	Zebra Crossing, Signalised Pedestrian Crossing and Refuge Island	CJ	1	4
	Overhead Pedestrian Bridge		2	
	Sidewalk / Walkway and Raised Crosswalk		1	
EC-AE 4	**MOTORCYCLE LANE**			
	Paved shoulder, non-exclusive motorcycle lane and end treatment at junction	CJ	1	5
	Exclusive motorcycle lane		2	
	Overhead motorcycle bridge		1	
	Motorcycle shelter		1	
EC-AE 5	**REST AREA**			
	Provide or maintain existing rest area along the project location.	CJ	2	2
TOTAL ELECTIVE POINTS				**18**

13.4 REGISTRATION

Registration can be made by submitting an application form JKR / JKR pH / BRG01 (see **Appendix A**) to the *Pasukan Pelaksana* pH JKR. Applicants are requested relevant documents (projects brief, site inventory, etc.) to assist in determining the suitability of the project. This form can be downloaded via the official JKR website www.jkr.gov.my.

13.5 SCORECARD pH JKR ROAD SECTOR

pH JKR Scorecard allows the project team to identify the compliance of a credit. Scorecard is also used to facilitate the project team to check the sufficiency of points for the implementation of the following: -

1. Pre-Evaluation Stage (target)
2. Evaluation Design Stage
3. Verify Scoring Stage.

pH JKR Scorecard can be found in the **Appendix B** of this manual

13.6 SUBMITTAL

1. Submittals shall be submitted to *Pasukan Pelaksana* pH JKR as per work flow .
2. Required documentation shall be submitted in softcopy (PDF format) and hardcopy (not exceeding A3 size).

REQUIREMENTS FOR ROAD WORKS DESIGN

SM 1

NEW ROAD

5 POINTS

UPGRADING ROAD

8 POINTS

OBJECTIVE

To study and review requirements for upgrading an existing road or construction of new roads. The outcomes will be used to determine the viability of the project.

CREDIT REQUIREMENT

1 Point : Traffic study
1 Point : Axle Load Study
1 Point : Flood records
1 Point : Response to public complaints and requests
1 Point : Cost Benefit Analysis (CBA)

UPGRADING ROAD
1 Point : As built drawings
1 Point : Accident reports
1 Point : Structures replacement

DOCUMENTATION

A. Design Evaluation Stage

i. A copy of reports/ records/ data that support the requirement of road works design.
ii. Traffic Impact Assessment Report (TIA)
iii. A copy of flood records from JPS
iv. A copy of response / complaints /requests
v. Bridge assessment report/ Inventory card
vi. CBA calculations/ VE report
vii. As built drawings
viii. POL 27 for accident reports

B. Verification Scoring Stage

Nil

APPROACHES & STRATEGIES

A proper study needs to be conducted towards causes which lead to the construction of the road that may comprise any of below:

i. Traffic study report which consists of traffic volume, existing level of service (LOS) and growth rate.
ii. Flood records which shows highest flood level, magnitude, frequency and recurrence of event from relevant authorities or carry out own study.
iii. Public response through any medium (e.g: newspaper, emails, etc).

BENEFITS

- Improve accountability
- Improve public delivery governance

iv. Structure replacement due to life span of the structure in accordance to bridge assessment or damages.
v. Cost benefits analysis to determine values of the particular upgrading works.
vi. As built drawings are essential for reference. (FOR UPGRADING WORKS ONLY)
vii. Accident reports which refer to black spot records. (FOR UPGRADING WORKS ONLY)

POTENTIAL ISSUES

Unavailability of the reports / records will affect the effectiveness of upgrading work (cost, time and quality)

REFERENCES

i. Road Traffic Volume of Malaysia (Latest edition), Highway Planning Unit
ii. Malaysian Highway Capacity Manual – HPU, Highway Planning Unit
iii. Flood Record, Drainage & Irrigation Department (JPS)

ROAD ALIGNMENT

SM 2

6 POINTS

BENEFITS

- Improve the quality and comforts of travelling.
- Improve local economies.

OBJECTIVE

To follow closely the contours to minimize high cutting and embankment. To avoid construction of road in sensitive areas such as swampy areas, forest reserved and catchment areas.

CREDIT REQUIREMENT

1 Point : Not more than 6 berms
1 Point : Cut slope not steeper than 1:1.5 or Rock slope not steeper than 4:1
1 Point : Fill slope not steeper than 1:2
1 Point : Maximum grade less than 7%
1 Point : No reclamation involved
1 Point : Provide added uphill lane (climbing lane) where the length of critical grade exceeds 5%

AND

1 Point : Not in Sensitive Area

OR

1 Point: Sensitive area with mitigation plan

DOCUMENTATION

A. **<u>Design Evaluation Stage</u>**
Drawings
Penilaian Awal Tapak (PAT) report
Mitigation Plan report

B. **<u>Verification Scoring Stage</u>**
As-built drawings

APPROACHES & STRATEGIES

To design according to:

1. Refer JKR guidelines and specifications
    i. ATJ 8/86 Pindaan 2015 A Guide on Geometric Design
    ii. Garis Panduan Rekabentuk Cerun.

EXAMPLE :

Standard Typical Cross-Section, Plan & Longitudinal Profile

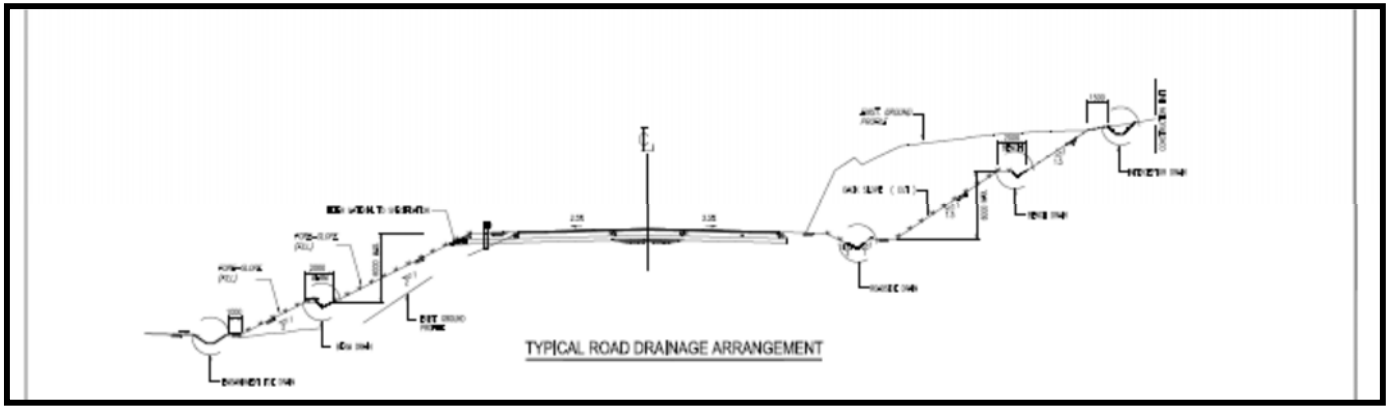


Figure 1: Typical cross-section

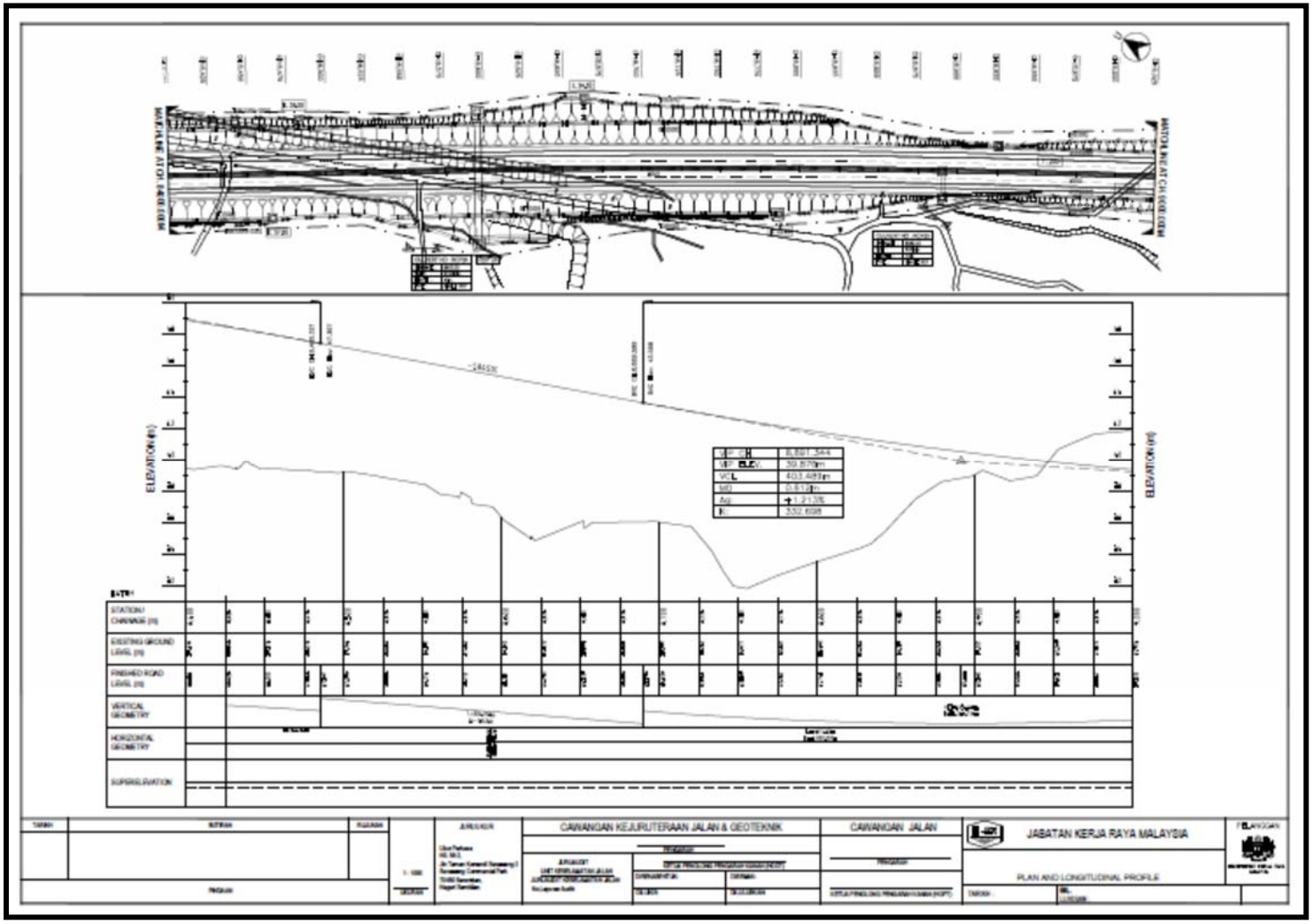


Figure 2: Plan & Longitudinal Profile

POTENTIAL ISSUES

i. Combination of geometric design element of roads cannot be fulfilled (depends on site condition).
ii. Different design software used produce different results. For purposes of this credit, any software can be used as long as the inputs and results are justifiable, reasonable and validated by the professional working on the project.

REFERENCES

i. Arahan Teknik (Jalan) 8/86 Pindaan 2015
ii. Rancangan Fizikal Negara (RFN)
iii. Garis Panduan Rekabentuk Cerun

SITE VEGETATION

SM 3

3 POINTS

BENEFITS

- Reduces greenhouse gases.
- Increase aesthetics.
- Reduce soil erosion.

OBJECTIVE

To ensure slope or earth surface covered by vegetation with less maintenance type.

Promote sustainable site vegetation on slope/unpaved shoulder that does not require irrigation.

CREDIT REQUIREMENT

1 Point : Use non-invasive plant species (example: grass/creeper)
1 Point : Use native plant species
1 Point : Use of grass/creeper for slope protection/unpaved shoulder.
1 Point : Hydroseeding with recycled local fibro material (example: paddy straw, coconut husk, rice husk etc.)
1 Point : Preservation of existing vegetation
1 Point : Use bio-engineering techniques (example: vetiver grass, creeper and regeneration of natural plant species and material)

DOCUMENTATION

A. <u>Design Evaluation Stage</u>

i. Design Drawing showing the location of all plants to be planted
ii. Bill of Quantities (related items only)
iii. A copy of Environmental Impact Assessment (EIA) report if required and Environmental Management Plan (EMP).
iv. A copy of specification sections relating to site vegetation including planting bed requirements. These are typically found in the Arahan Teknik Jalan 16/03 Pindaan 2015.

B. <u>Verification Scoring Stage</u>

As-built drawing

APPROACHES & STRATEGIES

i. Use JKR guidelines and specification.
Arahan Teknik Jalan 16/03 Pindaan 2015.
ii. In the absence of existing guidance, it may be necessary to have an expert develop an entirely new site-specific vegetation plan.
iii. Long term maintenance plan and goals must be established for the plant community.

EXAMPLE :

Figure 3 : Close turfing on earth surface

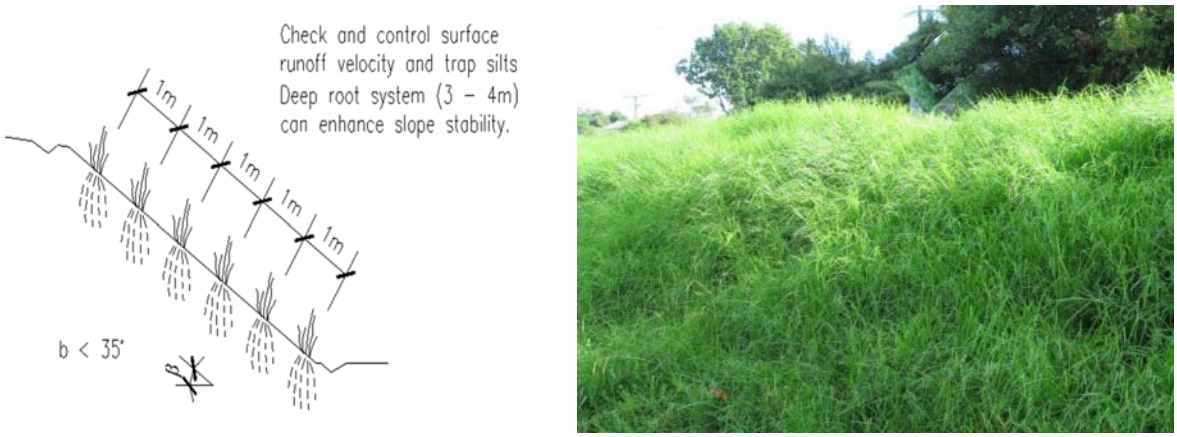


Figure 4: Vetiver grass system

Figure 5: Hydro-seeding

POTENTIAL ISSUES

i. Site planting without proper integration with other road activities (eg. maintenance, roadside safety)

ii. Not considering the suitability of a plant species specific for site condition salt tolerance and soil pH, pest susceptibility and maintenance requirement. The roadway environment might be significantly different from surrounding area, and may not necessarily support its indigenous plant species.

iii. Site vegetation must be considered in the context of soils, compaction, slopes and hydrology in order to be successful on road projects.

iv. Disturbed soil condition must be modified to create condition that will sustain native plant growth. Planting beds should be prepared based on disturbed condition and specified in project documents.

v. There are few current studies on the vegetation of less maintenance that designer shall refer before choosing the appropriate vegetation.

vi. Hydroseeding with recycled fibro material is relatively costly in comparable of hydroseeding alone.

REFERENCES

Arahan Teknik Jalan 16/03 Pindaan-2015

NOISE MITIGATION PLAN

SM 4

2 POINTS

OBJECTIVE

Reduce or eliminate annoyance or disturbance to surrounding neighborhoods and environments from road construction noise during construction.

CREDIT REQUIREMENT

2 Points : Supply and install noise barrier including maintenance during the construction and defects liability period.

OR

2 Points: to ensure that all equipment and machinery are in proper working condition so as to minimise the amount of noise generated.

Limiting Sound Level (Leq) From Road Traffic (For Proposed New Roads And/ Or Redevelopment of Existing Roads)

Receiving Land Use Category	Day Time 7am – 10 pm	Night time 10pm-7am
Noise sensitive Areas Low Density Residential Areas	55 dBA	50 dBA
Suburban Residential (Medium Density)	60 dBA	55 dBA
Urban Residential (High Density)	65 dBA	60 dBA
Commercial, Business	70 dBA	60 dBA
Industrial	75 dBA	65 dBA

Source: Schedule from the planning guidelines for environmental noise limits and control (Jabatan Alam Sekitar, NRE)

DOCUMENTATION

A. <u>Design Evaluation Stage</u>

i. Drawing showing the location of the proposed quiet pavement.
ii. Quiet pavement design mix.

B. <u>Verification Scoring Stage</u>

i. A list of pavement sections built and their associated surface material type and surface areas.
ii. Drawing and photo showing the location of quiet pavement.
iii. Quietness test result.

BENEFITS

- Improve Human Health & Safety

APPROACHES & STRATEGIES

Establish, implement, and maintain a formal Noise Mitigation Plan (NMP) during construction for the prime contractor. The NMP must address, at minimum, the following elements:

1. Responsible party for noise mitigation activities, contact information, their responsibilities and their qualifications. Include information for NMP preparer, if applicable or completed by an outside party.
2. Project location and distance to closest receptor of noise. Include a description of the surrounding zoning and parcel information (i.e., commercial, residential, hospitals, schools, parks, sensitive habitat).
3. A list of proposed construction activities (e.g. demolition, excavation, paving, bridge foundations, finishing).
4. Dates and working hours of proposed construction activities.
5. A list of noise generating devices used during each construction activity.
6. A list of noise mitigating devices used during each construction activity, including personal safety equipment requirements for all site employees.
7. Noise permit numbers, agency or local authority policies associated with construction work, as applicable.
8. Description of noise monitoring standards, methods, and acceptable levels.
9. Description of correction procedures for non-compliant noise levels.
10. Signature of responsible party.

POTENTIAL ISSUES

i. Without adequate prior testing on the surface course mix design, there is some risk that the constructed surface course will not meet the required limit noise level.
ii. Life-cycle costing of the road surface using quiet pavement should be considered.
iii. Method to measure sound level during construction.

REFERENCES

i. Standard Specification For Road Works Section 4 : Flexible Pavement JKR/SPJ/2008-S4
ii. ATJ 5/85 (Pindaan 2013) Manual For the Structural Design of Flexible Pavement
iii. US department of Transportation (FHWA) Federal Highway Administration
iv. The planning guidelines for environmental noise limits and control, Jabatan Alam Sekitar
v. Greenroads us_v1 manual
vi. ATJ 16/03 Pindaan 2015 : Guide For Environmental Protection & Enhancement Works

SERVICES FOR DISABLED USERS (ELECTIVE CRITERIA)

EC-SM5

3 POINTS

OBJECTIVE

Providing dedicated facilities for disabled users.

CREDIT REQUIREMENT

1 Point : Crossing for disabled users with noise making devices installed.
1 Point : Walkway access for disabled users by providing sidewalks sloped for easy access.
1 Point : Tac tile on the pedestrian pathway and access for disabled users.

DOCUMENTATION

A. Design Evaluation Stage

i. A copy of approved Development Order (DO) by the local authority.
ii. Detail drawings

B. Verification Scoring Stage

Photo evidence showing type and location of disabled services provided
As-built drawings

APPROACHES & STRATEGIES

To design disabled facilities according to:

1. Uniform Building by Law(UBBL)
2. MS 1331 Code of Practice for Access of Disabled Person Outside Buildings
3. Disabled Person Act 685

EXAMPLE :

i. Ramp for disabled users at zebra crossing
ii. Tac tile in pedestrian walk

BENEFITS

- Improve access.
- Improve mobility.
- Improve awareness.

Figure 6: Ramp for disabled users at zebra crossing

Figure 7: Tac tile in pedestrian walk

POTENTIAL ISSUES

Many project locations do not have disabled user infrastructure or master plans to support the needs of disabled user facilities. Short term and long term goals, objectives and general disabled user strategies should be considered when accommodating disabled users within the areas.

REFERENCES

i. Uniform Building by Law (UBBL)
ii. MS 1331 Code of Practice for Access of Disabled Person Outside Buildings
iii. Local authority's policy

NOISE CONTROL
(ELECTIVE CRITERIA)

EC-SM6

2 POINTS

BENEFITS

- Improve Human Health & Safety

OBJECTIVE

Improve healthy environment by reducing traffic noise pollution during operation.

CREDIT REQUIREMENT

AFTER CONSTRUCTION

2 Points : The pavement mix design by using quiet pavement.

OR

2 Points : Noise barrier shall be provided in sensitive areas such as housing situated beside busy roads or highways, schools and hospitals.

The type of noise barrier used shall be either absorptive, reflective, dispersive or mixed depending upon the noise level survey con-ducted and recommendations made by noise barrier experts.

OR

2 Point : Buffer Zone

Limiting Sound Level (Leq) From Road Traffic (For Proposed New Roads And/ Or Redevelopment of Existing Roads)

Receiving Land Use Category	Day Time 7am – 10 pm	Night time 10pm-7am
Noise sensitive Areas Low Density Residential Areas	55 dBA	50 dBA
Suburban Residential (Medium Density)	60 dBA	55 dBA
Urban Residential (High Density)	65 dBA	60 dBA
Commercial, Business	70 dBA	60 dBA
Industrial	75 dBA	65 dBA

Source: Schedule from the planning guidelines for environmental noise limits and control (Jabatan Alam Sekitar)

DOCUMENTATION

A. <u>Design Evaluation Stage</u>

i. Related drawing

B. <u>Verification Scoring Stage</u>

i. As build drawing

ii. Sound Testing report

APPROACHES & STRATEGIES

Levels of traffic noise typically range from 70 to 80 dBA at a distance of 15 meters from the roads. These levels affect majority of people, interrupting concentration, increasing heart rates, or limiting the ability to carry on a conversation. Most people prefer the noise levels in their homes/ small office to be in the 40-45 dBA range.

Overview of quiet pavement options, fundamentals and research, including pavement design guidelines for reducing tire-pavement noise.

<u>EXAMPLE :</u>

i. Porous Asphalt
ii. Concrete Pavement
iii. Open-Graded Friction Course

Noise barrier is an exterior structure designed to protect sensitive land area from noise pollution. Noise barrier shall be provided in sensitive areas such as housing situated beside busy roads or highways, schools and hospitals.

The type of noise barrier used shall be either absorptive, reflective, dispersive or mixed depending upon the noise level survey conducted and recommendations made by noise barrier experts.

<u>POTENTIAL ISSUES</u>

i. Without adequate prior testing on the surface course mix design, there is some risk that the constructed surface course will not meet the required limit noise level.
ii. Life-cycle costing of the road surface using quiet pavement should be considered.
iii. Site constraint.
iv. Cost effectiveness.

REFERENCES

i. Standard Specification For Road Works Section 4: Flexible Pavement JKR/SPJ/2008-S4
ii. ATJ 5/85 (Pindaan 2013) Manual For the Structural Design of Flexible Pavement
iii. US department of Transportation (FHWA) Federal Highway Administration
iv. The planning guidelines for environmental noise limits and control, Jabatan Alam Sekitar
v. Greenroads us_v1 manual
vi. ATJ 16/03 Pindaan 2015: Guide For Environmental Protection & Enhancement Works

EXISTING PAVEMENT EVALUATION

PT 1

3POINTS

BENEFITS

- Reduce material wastage
- Reduce Carbon Footprint
- Improve pavement quality
- Increase life span

OBJECTIVE

To determine the strength and residual life of the existing pavement structure as a basis for rehabilitation design.

CREDIT REQUIREMENT

Carry out the following test and intergrated data analysis to identify the current functional and structural existing road condition.

1 Point: Surface Condition Survey
1 Point: Coring & Dynamic Cone Penetrometer test
1 Point: Deflection test
1 Point: Trial pit & Laboratory test
1 Point: Surface Regularity Test

DOCUMENTATION

A. Design Evaluation Stage

i. Submit a copy of the Pavement Evaluation reports with the intergrated analysed data.
ii. Recommended pavement rehabiliation method.
iii. Construction Drawing

B. Verification Scoring Stage

NIL

APPROACHES & STRATEGIES

i. Pavement evaluation shall only be conducted on road that the existing pavement structure will be reused as part of the new pavement.

ii. Pavement evaluation are conducted to determine functional and structural condition of road section either for purpose of routine monitoring or planned corrective action. Functional condition is primarily concerned with the ride quality or surface texture of a highway section Structural condition is concerned with the structural capacity of the pavement as measured by deflection, layer thickness, and material properties.

iii. At the network level, routine evaluations can be used to develop performance models and prioritize maintenance or rehabilitation efforts and funding. At the project level, evaluations are more focused on establishing the root causes of existing distress in order to determine the best rehabilitation strategies.

Details

Pavement evaluation report should include the following test categories or other relevant evaluations:

i. Surface condition survey
ii. Non-destructive testing
    a) Deflection test
    b) Surface Regularity Test

Figure 8: Deflection test

iii. Destructive Testing
    a) Dynamic Cone Penetrometer (DCP)
    b) Trial Pit & Laboratory Test

Figure 9: Dynamic Cone Penetrometer (DCP)

Figure 10: Trial Pit & Laboratory Test

Visual Condition Survey

Visual condition surveys cover aspects of both functional and structural pavement condition, but generally serve as a qualitative indicator of overall condition. Specialized equipment is used to quantify both functional and structural properties of the pavement structure.

Ideally, for any given section of roads, two or more evaluators would arrive at the same assessment of the section's current condition. However, there are still many aspects of pavement evaluation that are highly subjective. For example, in visual condition surveys, the percent of surface area affected by alligator cracking is highly dependent upon the visual acuity of the evaluator.

Non – Destructive Testing

Non-destructive testing is the collective term for evaluations conducted on an existing pavement structure that do not require subsequent maintenance work to return the pavement to its pre-testing state. This is generally desirable to minimize disruption to traffic, and is essential as a screening tool to determine locations where selective material sampling should be conducted to evaluate other material properties in the laboratory. Non-destructive test may include deflection test, Determination of pavement density, determination of surface roughness or other relevant testing.

Destructive Testing

Destructive testing provides more detailed data about the pavement not possible to obtain through non-destructive testing. Such detailed data include:

- Laboratory mechanical, physical, and chemical properties and visual inspection of pavement layers through that obtained through coring or trial pit.

Design Elements

The selection of pavement rehabilitation method should refer to the Pavement Evaluation report. The rehabilitation method should be determined using an established pavement rehabilitation system or it can be designed manually.

EXAMPLE :

i. Elmod
ii. Rubicon
iii. Circly

POTENTIAL ISSUES

Insufficient fund to carry out the pavement evaluation.

REFERENCES

i. ATJ 5/85 (Rev 2013) : Manual for the Structural Design of Flexible Pavement
ii. Arahan Teknik Jalan 5/85 : Manual on Pavement Design
iii. A Guide to the Visual Assessment of Flexible Surface Conditions JKR 20709-2060-92
iv. Interim Guide to Evaluation and Rehabilitation of Flexible Road Pavement JKR 20709-0315-94

PERMEABLE PAVEMENT

PT 2

3 POINTS

BENEFITS

- Reduce Water Pollution
- Reduces Manmade Footprint

OBJECTIVE

Improve flow control and quality of stormwater runoff through use of permeable pavement.

CREDIT REQUIREMENT

1 Point : Use of permeable (porous) pavement mix design with higher range of air void (18 -25%)

1 Point : Drainability shall be sufficient to allow satisfactory drainage of drain water during heavy rainfall

1 Point : Drainability shall not be less than 10 litre/minute for 54cm^2 area, 50mm thickness.

DOCUMENTATION

A. Design Evaluation Stage

Copy of the permeable pavement mix design. The mix design should have the following items highlighted:

I. Copy of the permeable pavement mix design record
II. Bill of quantities

B. Verification Scoring Stage

i. Permeable pavement installed (processes) on the project (Photos/Progress report)
ii. Delivery Order Record
iii. Test results

APPROACHES & STRATEGIES

Following some of the key design and maintenance elements will promote maximum performance of permeable pavements:

i. Design Elements
ii. Maintenance Repairs

Design Elements

i. Use mix design for the pavement with significant permeability 10 liter/minute for 54cm^{2}area, 50mm thickness.
ii. Use open graded wearing course with range of air void (18 -25%)
iii. Permeable should be laid on impermeable and relatively even bituminous surface with adequate cross fall (minimum 2.5%)
iv. Existing cracks and depression shall be sealed and patched prior to application of porous asphalt.
v. Only used static steel wheel tandem roller to compact porous asphalt pavement layer.

vi. Attempt to make periodic maintenance easy for owners in the design process. Pavement areas should be accessible and slope gradually to accommodate standard maintenance vehicles.

EXAMPLE :

i. Porous Asphalt
ii. Open graded aggregate
iii. Stone mastic asphalt

Figure 11: Porous Asphalt

Figure 12: Porous Asphalt

POTENTIAL ISSUES

i. Clogging of voids in the pavement. Routine maintenance is required to prevent clogging and optimize infiltration rates.
ii. Quality control and familiarity varies.
iii. Permeable pavement may not be suitable for high volume traffic loads or arterials. However, shoulder areas may be appropriate applications to consider.
iv. Difficult to apply due to budget constraint.

REFERENCES

i. Specification For Road Works Section 4 : Flexible Pavement JKR/SPJ/2008-S4
ii. ATJ 5/85 (Pindaan 2013) Manual For the Structural Design of Flexible Pavement

PAVEMENT PERFORMANCE TRACKING

PT 3

2 POINTS

OBJECTIVE

Allow for more thorough performance tracking by integrating construction quality and pavement performance data.

CREDIT REQUIREMENT

2 Points : Use a process that allows construction quality measurements and long-term pavement performance measurements to be spatially located and correlated to one another. This implies four requirements: CSFJ

i. Construction quality measurements must be spatially located such that the location of the quality measurement is known
ii. Pavement condition measurements must be taken at least every 3 years and must be spatially located to a specific portion of roadway or location within roadway
iii. An operational system, computer based or otherwise that is capable of storing construction quality measurements, pavement condition measurement and their spatial locations.
iv. The designated system must be demonstrated in operation, be capable of updates and have written plans for its maintenance in perpetuity.

BENEFITS

- Increases Service Life
- Reduce Lifecycle Cost
- Improves Accountability

Details

This generally means spatially location construction quality measurement in a permanent location system and maintaining those records indefinitely. Examples of construction quality records include but not limited to:

i. Density test
ii. Water content test
iii. Bitumen content test
iv. Gradation test
v. Slump test
vi. Air content test
vii. Compressive Strength test
viii. Thickness test

Examples of pavement condition measurement include, but not limited to the extent and severity of:

i. Cracking
ii. Permanent deformation (rutting)
iii. Bleeding
iv. Faulting
v. Joint Spalling
vi. Pavement strength

DOCUMENTATION

A. Design Evaluation Stage

i. Pavement structure design
ii. Pavement Testing reports

B. Verification Scoring Stage

Pavement performance tracking system that is operational and has been populated with the required data.

APPROACHES & STRATEGIES

Develop and implement a pavement tracking system.

EXAMPLE :

i. Pavement Interactive (PI) Maps
ii. Highway Development and Management (HDM-4)

POTENTIAL ISSUES

i. The general trend in road construction is to dispose of construction records after a prescribed amount of time set by legal obligations.
ii. It is difficult to define the concepts of performance and quality in simple terms.
iii. It is difficult to trace pavement performance issues back to construction quality due to lack of integration between construction quality control data with long-term pavement performance data.

REFERENCES

i. Standard Specification For Road Works Section 4: Flexible Pavement JKR/SPJ/2008-S4
ii. ATJ 5/85 (Pindaan 2013) Manual For the Structural Design of Flexible Pavement

LONG-LIFE PAVEMENT

PT 4

4 POINTS

BENEFITS

- Reduce Raw Material
- Reduce Lifecycle Cost
- Reduced Fossil Fuel Use
- Increase Service Life
- Improves Accountability

OBJECTIVE

Minimize life cycle costs by promoting design of long-lasting pavement structures.

CREDIT REQUIREMENT

1 Point : Meet the requirements of Arahan Teknik Jalan 5/85 (Pindaan 2013), for the structural design of flexible pavement.

1 Point : Pavement design is in accordance with a design procedure that is formally recognized, adopted and documented by the agency.

2 Points: Rigid Pavement > 40 years design life

or

2 Points: Flexible Pavement > 20 Years design life

DOCUMENTATION

A. <u>Design Evaluation Stage</u>

i. A list of pavement sections to be built or reconstruction and their associated pavement material type, surface areas, ESALs, design thickness and subgrade CBR.
ii. A calculation to indicate the total percentage of trafficked lane pavement areas that are designed for long-life.
iii. Design calculation
iv. Drawing showing locations of pavement sections designed for long-life.

B. <u>Verification Scoring Stage</u>

As-built drawings

Generally, not all pavement section on a project will be designed as long-lasting section. This credit is not applicable to roads that are not surfaced with asphaltic or Portland cement concrete such as gravel road or road seal with bituminous surface treatment.

APPROACHES & STRATEGIES

1. Consider designing long-lasting pavement that meets the requirement of this credit. Any number of pavement design methods can produce pavement sections that meets the requirement of this credit.
2. Have a rehabilitation / preservation program that strives to keep existing pavements in satisfactory condition such that they may remain in place for overlays or diamond grinds. This allows simple rehabilitations such as diamond grinds and overlays to quality for this credit. Ultimately, this gives credit for a road being durable enough such that it does not need to be entirely replaced.

EXAMPLE :

i. Hot Mix Asphalt (HMA Pavements)
ii. Rigid Pavements

Figure 13: (HMA Pavement)

POTENTIAL ISSUES

Some of pavement design methods may produce pavement thicknesses that require higher construction cost.

REFERENCES

i. Standard Specification For Road Works Section 4: Flexible Pavement JKR/SPJ/2008-S4.
ii. Standard Specification For Road Works: JKR/SPJ/1998 Section 5.
iii. ATJ 5/85 (Pindaan 2013) Manual For the Structural Design of Flexible Pavement.

ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

EW 1

3 POINTS

BENEFITS

- Reduces water use.
- Reduces air emission
- Reduces water pollution.
- Improves human health and safety.
- Increases awareness.
- Increases competitiveness

OBJECTIVE

Improve environmental stewardship by using a contractor that has the formal environmental management process.

CREDIT REQUIREMENT

3 Points : MS ISO 14001: 2004 certification for the main contractor CAKT

DOCUMENTATION

A. Design Evaluation Stage

Nil

B. Verification Scoring Stage

Submit copy of the MS ISO 14001:2004 certification for the main contractor.

APPROACHES & STRATEGIES

i. Have a main contractor with MS ISO 14001:2004.
ii. Have a main contractor with a documented EMS that meets the requirements of MS ISO 14001:2004.

EXAMPLE :

i. While it is not possible to present an entire EMS, there is an example of key EMS documents available on http://www.jkr.gov.my/cast.

POTENTIAL ISSUES

i. Smaller firms may not be able to afford the ISO certification process.
ii. Documentations of an EMS are not the same as having an effective EMS, however collection of documentations is an efficient way of gathering evidence of an effective EMS.

REFERENCES

i. JKR MS MS ISO 14001:2004

STORMWATER MANAGEMENT

EW 2

2 POINTS

BENEFITS

- Reduces water pollution.
- Avoid flooding / ponding
- Reduces water use.
- Improves human health and safety.

OBJECTIVE

To have best management practices for stormwater during construction of road project

CREDIT REQUIREMENT

1 Point : Develop a stormwater management plan for the site using stormwater Best Management Practices (BMP) for flow control in conformance to the Stormwater Management Manual for Malaysia (MSMA) and MS ISO 14001:2004. Demonstrate that the planned BMPs to conform to all applicable 5% above minimum flow control standards set by MSMA and MS ISO 14001: 2004.

1 Point : Develop a stormwater management plan for the site using stormwater Best Management Practices (BMP) for water quality control in conformance to the Stormwater Management Manual for Malaysia (MSMA) and MS ISO 14001:2004. Demonstrate that the planned BMPs to conform to all applicable 5% above minimum water quality standards set by MSMA and MS ISO 14001: 2004.

DOCUMENTATION

A. <u>Design Evaluation Stage</u>

i. Documentation of the Stormwater Management Plan.
ii. Executive summary of the project drainage design report.
iii. Calculation for runoff areas and runoff volume (output from any rainfall modelling software used is adequate).

B. <u>Verification Scoring Stage</u>

i. Copy of monthly water quality monitoring report. (Based on requirement).

APPROACHES & STRATEGIES

i. Refer Stormwater Management Manual for Malaysia (MSMA)
ii. Preserve native vegetation.
iii. Protect soil with good infiltration capacity.

iv. Assess the feasibility of infiltration and evapotranspiration to reduce the needs for retention pond outside the right of way.

v. Convey stormwater in swales to promote infiltration.

vi. Consider geometric design for erosion control and flow moderation.

EXAMPLE :

Figure 14: Silt Curtain

Figure 15: Silt Curtain

Figure 16: Check dam

Figure 17: Check dam

Figure 18: Silt fence

Figure 19 : Silt fence

Figure 20: Wash trough

Figure 21: Wash trough

POTENTIAL ISSUES

i. There are numerous methods to calculate runoff volume. Many are applicable to rainfall of large magnitude and under estimate the runoff generated by various rainfall intensity.
ii. Any models that are used inherently have some limitations and assumptions. Some are better than other depending on project location.
iii. Long-term performance data for many low-impact development methods used for quality control are not available for road project.

REFERENCES

i. Stormwater Management Manual for Malaysia (MSMA) 2nd Edition.
ii. Arahan Teknik (J) 16/03 Pindaan 2015 : Guide For Environmental Protection & Enhancement Works
iii. MS ISO 14001 : 2004

ECOLOGICAL CONNECTIVITY

(ELECTIVE CRITERIA)

EC-EW3

2 POINTS

OBJECTIVE

Provide and improve wildlife access and mobility across roadways

CREDIT REQUIREMENT

1 Point : Provide dedicated eco-friendly wildlife crossing structures and protective fencing as determined by EIA report and to comply with the Department of Wildlife and National Park (PERHILITAN) requirement.

1 Point : Provide sound barrier at sensitive area for wildlife

DOCUMENTATION

A. Design Evaluation Stage

i. Submit a copy of approved EIA report.

ii. Related design reports / presentations showing type and location of wildlife access provided

B. Verification Scoring Stage

i. As-built drawings

ii. Photo evidence

APPROACHES & STRATEGIES

i. Study the animal population in the area, migration pattern, types of animals and habitual behavior.

ii. Protective fencing

BENEFITS

- Restores habitat.
- Improves access.
- Improves mobility
- Improves human health and safety

EXAMPLE :

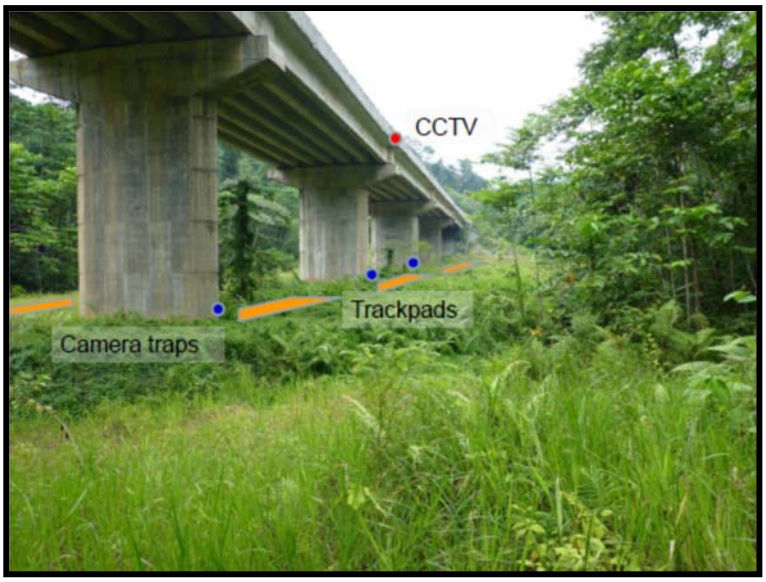


Figure 22: Animal Viaduct

Figure 23: Animal Viaduct

POTENTIAL ISSUES

i. Lack of ecological or species data.
ii. Prior migration pattern and other animal and aquatic organism behaviors may be altered by the presence of the road.
iii. Identifying ecological connectivity requirements needs well-designed long-term studies.

REFERENCES

i. Department of Wildlife and National Park.
ii. Department of Forestry
iii. Laporan Akhir *Central Forest Spine* Pelan Induk Rangkaian Ekologi : - Bab 4.0 Garis Panduan Umum untuk Rangkaian Ekologi.

SAFETY AUDIT

AE 1

4 POINTS

BENEFITS

- Improves Road Users Safety

OBJECTIVE

Improve road safety through review by an accredited Road Safety Auditor registered with JKR.

CREDIT REQUIREMENT

1 Point : Road Safety Audit Stage 1-3 (Design Stage)

1 Point : Road Safety Audit Stage 4 Part I-III (Construction Stage)

1 Point : Road Safety Audit Stage 5 (Operational Stage)

1 Point : Additional Audit For Traffic Management During Construction

DOCUMENTATION

A. Design Evaluation Stage

i. Submit a copy of the Road Safety Audit (RSA) Report, Designer's Response report and decision of meeting for Stage 1 to Stage 3.

ii. Show any exemption of any stages of audit (to be issued only by the authorized party).

B. Verification Scoring Stage

i. Submit a copy of the Road Safety Audit (RSA) Report and Contractor's Response report for Stage 4 to Stage 5

ii. Submit additional Audit Report for Traffic Management during construction

APPROACHES & STRATEGIES

i. Follow decision agreed upon RSA Meeting and incorporate in the design.

EXAMPLE :

KERAJAAN MALAYSIA

JABATAN KERJA RAYA MALAYSIA

Menaiktaraf Jalan Dari Terowong
(Selepas Tol Seremban) Ke Bandar Seri Sendayan, Laluan
195, Jalan Pelupusan Sisa Toksik Seremban, Negeri Sembilan

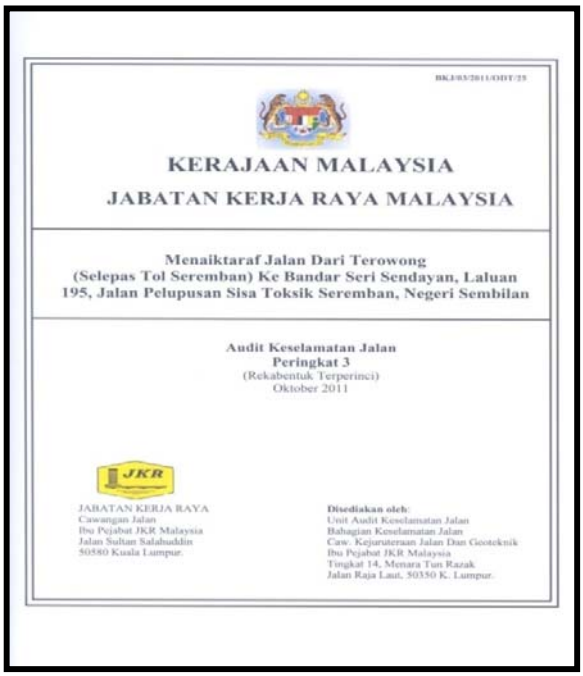
Audit Keselamatan Jalan
Peringkat 2
(Rekabentuk Awalan)
Ogos 2011

JKR

JABATAN KERJA RAYA
Cawangan Jalan
Ibu Pejabat JKR Malaysia
Jalan Sultan Salahuddin
50580 Kuala Lumpur.

Disediakan oleh:
Unit Audit Keselamatan Jalan
Bahagian Keselamatan Jalan
Caw. Kejuruteraan Jalan Dan Geoteknik
Ibu Pejabat JKR Malaysia
Tingkat 14, Menara Tun Razak
Jalan Raja Laut, 50350 K. Lumpur.

Figure 24: Road Safety Audit Report Stage 2



KERAJAAN MALAYSIA

JABATAN KERJA RAYA MALAYSIA

Menaiktaraf Jalan Dari Terowong
(Selepas Tol Seremban) Ke Bandar Seri Sendayan, Laluan
195, Jalan Pelupusan Sisa Toksik Seremban, Negeri Sembilan

Audit Keselamatan Jalan
Peringkat 3
(Rekabentuk Terperinci)
Oktober 2011

JKR

JABATAN KERJA RAYA
Cawangan Jalan
Ibu Pejabat JKR Malaysia
Jalan Sultan Salahuddin
50580 Kuala Lumpur.

Disediakan oleh:
Unit Audit Keselamatan Jalan
Bahagian Keselamatan Jalan
Caw. Kejuruteraan Jalan Dan Geoteknik
Ibu Pejabat JKR Malaysia
Tingkat 14, Menara Tun Razak
Jalan Raja Laut, 50350 K. Lumpur.

Figure 25: Road Safety Audit Report Stage 3

POTENTIAL ISSUES

i. The RSA process allows a design team to respond to Auditor's comments on the safety issue concerned. However, safety issues identified by RSA may not be addressed fully.
ii. RSA is implemented but no corrective action done.
iii. RSA not done at the right time thus producing lock-in situation and benefits of RSA is not fully achieved.

REFERENCES

i. Road Safety Audit : Guidelines For The Safety Audit of Roads And Road Project In Malaysia
ii. Nota Teknik (Jalan) 25/07 : Guidelines On The Contents Of A Road Safety Audit Report
iii. Interim Guide on Identifying, Prioritising and Treating Hazardous Locations On Roads In Malaysia
iv. Arahan Teknik (J) 8/86 (Pindaan 2015) : A Guide On Geometric Design Of Roads

SCENIC VIEWS

AE 2

2 POINTS

OBJECTIVE

Feature scenic, natural and recreational qualities into roadways.

CREDIT REQUIREMENT

1 Point : Provide at least one access from the project to a designated area for vehicles to exit the traffic stream.

1 Point : Provide park area for road user to stop and experience the scenic views at strategic location.

DOCUMENTATION

A. <u>Design Evaluation Stage</u>

i. Indicate in the submitted plans where the lookout point or overlook is drawn and specified.

B. <u>Verification Scoring Stage</u>

i. Provide a photo of the access point and a picture of the related attraction.

APPROACHES & STRATEGIES

i. Provide locations, such as lookout point or pullouts, where road user can stop to enjoy a scenic, historic, cultural, natural, recreational or archaeological feature of the roadway area.

RELATED CREDITS

- SM 1 – Road Alignment

BENEFITS

- Increase awareness
- Increase Human Safety & Health

POTENTIAL ISSUES

i. Provision of access and parking area to the lookout point often not taken into consideration due to area and budgetary constraint.

REFERENCES

i. Local Authority's Policy

PEDESTRIAN ACCESS (ELECTIVE POINTS)

EC-AE

4 POINTS

BENEFITS

- Reduces carbon emissions
- Improves access
- Improves mobility
- Improves Health & Safety

OBJECTIVE

Promote walkable communities by providing pedestrian safe and friendly roads

CREDIT REQUIREMENT

1 Point :Zebra Crossing, Signalized Pedestrian Crossing and Refuge Island CJ

2 Points :Overhead Pedestrian Bridge

1 Point :Sidewalk / Walkway and Raised Crosswalk

DOCUMENTATION

A. Design Evaluation Stage

i. Copy of Road Safety Audit report that focuses on pedestrian facilities and related drawings.

B. Verification Scoring Stage

i. As-built drawings

APPROACHES & STRATEGIES

i. Consider how a new road will impact the existing or planned pedestrian networks and integrate design elements with other facilities to mitigate overall impacts. This may mean providing connection or adaptability for future pathway, sidewalks and crossing within pedestrian networks.

ii. Design the road to accommodate existing new and planned pedestrian facilities.

EXAMPLE :

Figure 26: Pedestrian Bridge

POTENTIAL ISSUES

i. Many rural areas do not have surrounding pedestrian infrastructure or master plan to support the addition of new pedestrian facilities. Short term and long term goals, objectives and general pedestrian strategies should be considered when accommodating pedestrian within the areas.

REFERENCES

i. Nota Teknik Jalan 18/97: Basic Guidelines On Pedestrian Facilities

MOTORCYLE LANE (ELECTIVE CRITERIA)

EC-AE 3

5 POINTS

BENEFITS

- Improves access
- Improves mobility
- Improves Health & Safety

OBJECTIVE

Provide safe motorcycle lane within the project right of way.

CREDIT REQUIREMENT

1 Point : Paved shoulder, non-exclusive motorcycle lane and end treatment at junction

2 Points : Exclusive motorcycle lane

1 Point : Overhead Motorcycle Bridge

1 Point : Motorcycle shelter

DOCUMENTATION

A. <u>Design Evaluation Stage</u>

i. Submit a copy of Road Safety Audit report that focuses on motorcycle lane facilities.

ii. Design drawings

B. <u>Verification Scoring Stage</u>

i. As-built drawings

APPROACHES & STRATEGIES

i. Consider how a new road projects will impact the existing or planned motorcycle lane networks and integrate design elements with others facilities to mitigate overall impacts. This may mean providing connection or adaptability for future motorcycle lane, crossing or other facilities within motorcycle lane network.

ii. Design the road to accommodate existing new and planned motorcycle lane facilities.

EXAMPLE :

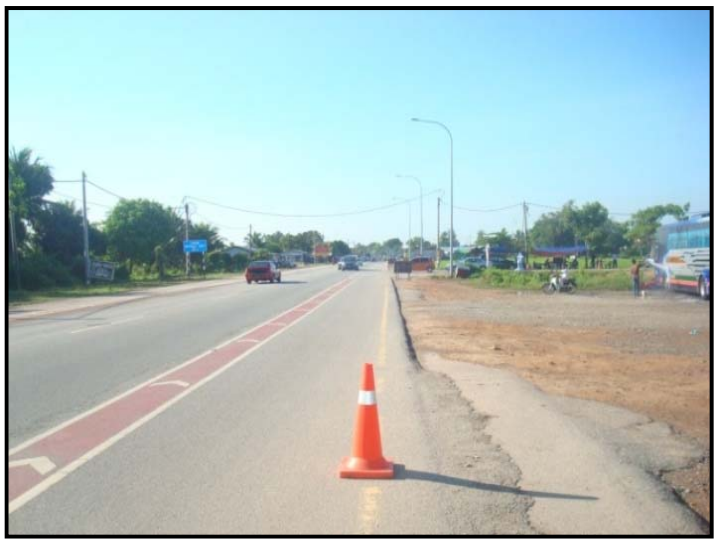


Figure 27: Non Exclusive Motorcycle Lane

POTENTIAL ISSUES

i. Many rural areas do not have surrounding motorcycle lane infrastructure or master plan to support the addition of new motorcycle facilities. Short term and long term goals, objectives and general motorcycle lane strategies should be considered when accommodating motorcycling within the areas.

REFERENCES

i. Nota Teknik (J) 33/2015: Guidelines for Motorcycle Facilities
ii. STD DRW/S9 (Pindaan 2014) Standard Drawing For Road Works Section 9: Motorcycle Lane
iii. REAM – GL 11/2011: Guidelines for Motorcycle Facilities

REST AREA (ELECTIVE CRITERIA)

EC-AE 4

2 POINTS

BENEFITS

- Reduces air emissions
- Improves access
- Improves mobility
- Reduces Fossil Fuel Use

OBJECTIVE

Provide access to public rest area facilities

CREDIT REQUIREMENT

2 Points : Provide or maintain existing rest area along the project location.

DOCUMENTATION

A. Design Evaluation Stage

i. Submit a copy of rest area layout plan including detailed drawing.

B. Verification Scoring Stage

i. Related As-built drawings

APPROACHES & STRATEGIES

i. Survey existing routes and ask stakeholders for suggestions on how to improve access to existing transit facilities during the public involvement process.
ii. Consider how a new roadway will impact the existing or planned pedestrian network and integrate design elements with other facilities to mitigate overall impacts.
iii. Locate enhancements to transit station/stop amenities at more than 20% of the station/stops along 200m ROW.
iv. Provide extra ROW width to accommodate transit shelters.

EXAMPLE :

Figure 28: KAWASAN REHAT GUA MUSANG

POTENTIAL ISSUES

i. Provision of transit shelters and stop amenities often not taken into consideration due to area and budgetary constraint.

REFERENCES

i. Local authority's policy

REQUIREMENT FOR ROAD WORK DESIGN

CA 1

3 POINTS

BENEFITS

- Improve Accountability
- Increase Awareness
- Improves Human Health & Safety

OBJECTIVE

Improve construction quality by using a contractor that has a formal project quality management system.

CREDIT REQUIREMENT

3 Points : MS ISO 9001 (latest version) certification for main contractor.

DOCUMENTATION

A. Design Evaluation Stage
NIL

B. Verification Scoring Stage
Valid MS ISO 9001 certificate

APPROACHES & STRATEGIES

i. Have a main contractor with MS ISO 9001 certification.
ii. Have a main contractor with a documented QMS that meets the requirements of MS ISO 9001

EXAMPLE :

While it is not possible to present an entire QMS, there is an example of key QMS documents available on http://www.jkr.gov.my/

POTENTIAL ISSUES

i. Small companies may not be able to afford the ISO certification process.
ii. Documentations of QMS may not the same as having an effective QMS, however collection of documentations is an efficient way of gathering evidences of an effective QMS.

REFERENCES

MS ISO 9001 (Latest version)

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM

CA 2

3 POINTS

BENEFITS

- Improve Accountability
- Increase Awareness
- Improves Human Health & Safety

OBJECTIVE

Improve occupational health and safety management system by using a contractor that has a formal project OHSAS management system.

CREDIT REQUIREMENT

3 Points : OHSAS 18001: (latest version) certification for main contractor

DOCUMENTATION

A. Design Evaluation Stage
NIL

B. Verification Scoring Stage
Valid OHSAS 18001 certificate

APPROACHES & STRATEGIES

i. Have a main contractor with a documented OHSMS that meets the requirements of OHSAS 18001 certification.

EXAMPLE :

While it is not possible to present an entire OHSMS, there is an example of key OHSMS documents available on http://www.jkr.gov.my/

POTENTIAL ISSUES

i. Small companies may not be able to afford the OHSAS certification process.
ii. Documentations of OHSMS may not the same as having an effective OHSMS, however collection of documentations is an efficient way of gathering evidences of an effective OHSMS.

REFERENCES

OHSAS 18001 (Latest version)

CONSTRUCTION WASTE MANAGEMENT PLAN

CA 3

4 POINTS

BENEFITS

- Reduce Solid Waste
- Reduce Manmade Footprint
- Reduce Lifecycle Cost
- Improves Accountability

OBJECTIVE

Create an accounting and management plan for road construction waste materials.

CREDIT REQUIREMENT

2 Points : Create, establish, implement and maintain a formal construction waste management plan during road construction.

1 Point : Provide a designated location to segregate construction waste on-site.

1 Point : Appoint the licensed contractor(s) to collect the construction waste from the site to approved locations for disposal.

DOCUMENTATION

A. <u>Design Evaluation Stage</u>

Nil

B. <u>Verification Scoring Stage</u>

Copy of the project construction waste management plan (CWMP). The plan should identify these items:

i. Type of construction waste
ii. Expected tonnage
iii. Related cost of disposal of such waste
iv. Management strategy for waste generated from site including household and domestic waste

APPROACHES & STRATEGIES

The project team shall ensure all waste generated on site shall be managed in accordance with the Solid Waste And Public Cleansing Management Act 2007 and Environmental Quality Act 1974 as follow:-

i. The contractor shall submit in the approved format the Construction Waste Management Plan (CWMP) to the S.O. for approval within fourteen (14) days from the date of site possession.
ii. The contractor shall provide Roll-On Roll Off (RORO) for construction waste and Mobile Garbage Bin (MGB) for domestic waste.
iii. The contractor shall provide a minimum of one (1) location on site for segregation and collection of construction and domestic waste.
iv. The contractor shall appoint the licensed contractor(s) to collect the construction waste, schedule waste and domestic waste from the site to approved locations for disposal or recycle waste.

EXAMPLE :

i. Projek Kompleks KKR, AZRB (sample of waste management plan)
ii. http://www.claycorp.com/sustainable/documents/Clayco_Construction_Waste_Management_Plan.pdf
iii. http://www.epa.gov/rtp/campus/environmental/017419.pdf

Figure 29: General Trash

Figure 30: Recycled Material (Reinforcement Steel)

Figure 31: Recycled Material (Wood)

Figure 32: Segregation containers for recycled materials

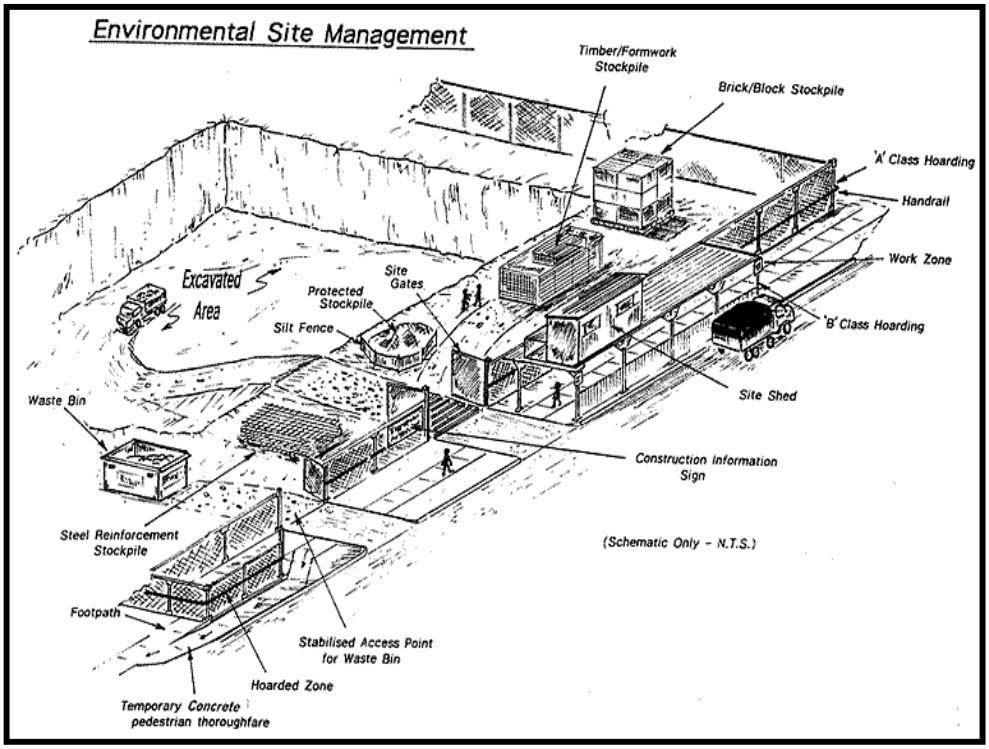


Figure 33: Layout plan for environmental site management

POTENTIAL ISSUES

i. Specifying and creating documents for waste management practices may be unfamiliar to designers and decision-makers.
ii. Careless behavior or lack of stewardship may be an issue that can result in recyclables being disposed, or vice versa.
iii. Safety and security considerations should be taken into account relative to storage on-site of recoverable materials of high value.
iv. Weather, performance, location and availability issues may limit the amount of recycled content that can feasibly be included in project materials.
v. Transport of waste to the disposal/recycle location is sometimes costly, depending on availability and distance of transport. Occasionally this cost exceeds the total benefit of using the recycled material.

REFERENCES

i. Environmental Quality Act (EQA), 1974
ii. Solid Waste And Public Cleansing Management Act,2007
iii. Standard Specification For Building Works 2014
iv. Arahan Teknik Jalan 16/03 Pindaan 2015

TRAFFIC MANAGEMENT PLAN

CA 4

2 POINTS

BENEFITS

- Improves Accountability
- Improves Human Health & Safety

OBJECTIVE

Develop traffic management plan for use during construction.

CREDIT REQUIREMENT

2 Points : Create, establish and implement a formal traffic management plan during road construction.

DOCUMENTATION

A. Design Evaluation Stage

Copy of the project Traffic Management Plan (TMP). The plan should identify these items,Eg;

i. all sequence of construction stage with appropriate traffic control devices
ii. Smooth flow of existing traffic connected to project
iii. Adequate signages and barriers
iv. Temporary road diversion where necessary
v. Adequate flagman and blinkers

B. Verification Scoring Stage

Audit report (part of Road Safety Audit report stage 4) – to be submitted during construction stage.

APPROACHES & STRATEGIES

i. Follow the traffic management plan strictly
ii. Include the traffic management plan in agency contract documents, specifications and construction drawing.
iii. Keep records of all complaint and incident related to traffic management.
iv. Revise and review traffic management plan to suit project site condition
v. Develop and deliver training to workers to educate them on traffic management efforts being implemented onsite.
vi. Include itemized quantities in tender documents.

EXAMPLE :

All JKR's road projects (standard template)

POTENTIAL ISSUES

i. Not following the traffic management plan as required.
ii. Lack of awareness over traffic management practices during construction.
iii. Not following the procedure in reviewing traffic management plan.
iv. Difficulty in design TMP because lack of experience among designers.
v. Traffic management implementation is not workable and suitable for construction.
vi. Inadequate provision of traffic control devices.

REFERENCES

Arahan Teknik (Jalan) 6/85 : Guidelines for Presentation of Engineering Drawings

SITE ROUTINE MAINTENANCE PLAN

CA 5

2 POINTS

BENEFITS

- Improves Accountability
- Improves Human Health & Safety

OBJECTIVE

To implement a proper site routine maintenance during construction

CREDIT REQUIREMENT

2 Points : Create, establish, implement and maintain a formal construction waste management plan during road construction.

DOCUMENTATION

A. Design Evaluation Stage

Contractual Requirements for the implementation of Site Routine Maintenance Plan (Eg:- Bill of Quantity/ Need Statement)

B. Verification Scoring Stage

Records showing the periodic maintenance works being carried out by the contractor.

APPROACHES & STRATEGIES

i. Prepare site routine maintenance program which consists of regular maintenance works to keep site in order and safe throughout the construction phase.
ii. Ensure the provision of maintenance works in the contract.
iii. Keep records as evidence of works being carried out properly.

POTENTIAL ISSUES

i. Not following the site routine maintenance programs as required
ii. Lack of awareness over site routine maintenance practices during construction.
iii. Inadequate provision of routine maintenance.

REFERENCES

Specification of Road Works Section 1: General

HOUSEKEEPING

CA 6

2 POINTS

BENEFITS

- Improves Accountability
- Improves Human Health & Safety

OBJECTIVE

To ensure the site is neat,tidy and accessible during construction.

CREDIT REQUIREMENT

2 Points : Establish and implement housekeeping during construction

DOCUMENTATION

A. Design Evaluation Stage
Contractual Requirements for the implementation of Housekeeping plan (Preliminary item)

B. Verification Scoring Stage
Progress report (with photo)

APPROACHES & STRATEGIES

I. Include Housekeeping requirement in the Bill of Quantities (Preliminary item).
II. Periodic inspection by Superintending Officer (S.O).
III. Keep record of site photo and to be included in the progress report.

POTENTIAL ISSUES

i. Site and time constrain
ii. Weather
iii. Item not quoted in the BQ by contractor.

REFERENCES

Method of Measurement

SUSTAINABLE CONSTRUCTION MACHINERIES

CA 7

4 POINTS

BENEFITS

- Reduces Fossil Fuel Use
- Reduces Air Emissions
- Reduce Greenhouse Gases

OBJECTIVE

To ensure construction machineries are regularly maintained for optimal operation that contribute to reduced emission to the environment (eg air emission, land, water).

CREDIT REQUIREMENT

2 Points : Perform scheduled maintenance of construction machineries.

2 Points : Use high performance machineries with low fuel consumption and low air emission.

DOCUMENTATION

A. Design Evaluation Stage

Nil

B. Verification Scoring Stage

i. Documents and record showing the maintenance schedule and maintenance works done.

ii. Any documented evidence showing the procurement and usage of high performance machineries.

APPROACHES & STRATEGIES

i. For foundation system, method of pile installation that can be opted are:
   a) Use jack in pile which use hydraulic hammer

EXAMPLE :

i. Palm oil bio-diesel (Methyl ester + diesel + crude palm oil + oleinpalm oil)

ii. MembinaBangunanPejabatLembagaPelabuhan Johor Di Atas Lot 69989 Dan Lot 69990, MukimPlentong, Daerah Johor Bahru, Johor

iii. CadanganPembinaanPejabat Dan SetorPencegahanKastam Di Ayer Keroh, Melaka Tengah, Melaka

POTENTIAL ISSUES

i. There may be a cost premium per liter for biodiesel over that of conventional diesel fuel.
ii. Biodiesel is currently not produced in sufficient quantities to meet widespread demand.
iii. Lack of research over the renewable energy sources.
iv. Installation of pile using jack in and hydraulic hammer is relatively costly in comparable of driving method.

REFERENCES

i. Ministry of Natural Resources & Environment
ii. Palm Oil Research Institute of Malaysia (PORIM)

MATERIAL REUSE

MR 1

5 POINTS

BENEFITS

- Reduce consumption of raw material
- Reduce Carbon Footprint
- Reduce Solid Waste

OBJECTIVE

Optimize construction material and reduce carbon footprint.

CREDIT REQUIREMENT

3 Points : Reuse at a minimum 30% of existing pavement materials by estimated volume.

1 Point : Reuse of existing material other than pavement materials (eg: road furniture)

1 point : Earthwork balance

DOCUMENTATION

A. Design Evaluation Stage

i. A calculation that shows the computed percentage of material reused including the following items at minimum:
   a) Total volume of existing pavement material.
   b) Total volume of reused pavement material.
   c) The computed percentage of the total reused volume.

ii. Inventory of existing road furniture

iii. Earthwork calculation

B. Verification Scoring Stage

Total volume of reused pavement material via progress payment or delivery order

APPROACHES & STRATEGIES

i. Use in place recycling technique such as hot in-place recycling, cold in-place recycling and full depth reclamation. These methods qualify as reuse because the material has not crossed project boundaries.

ii. Evaluate the structural condition of existing elements such as bridges and retaining walls. This typically determined by a structural engineer. Do not reuse elements that have been damaged by corrosion or natural hazards without review by a structural engineer.

iii. any elements are determined to be inadequate for reuse, consider salvaging them or deconstructing them for use on another project or purpose (road furniture).

iv. Reuse of excavated rock materials on site for the road construction (eg: Crushed Rock for rock base)

v. Reuse cut material for filling work (eg:suitable materials).

EXAMPLE CALCULATION:

Calculation of existing pavement reused percentage for widening an existing roadway.

Description:

5 km of an existing two-lane road with 7 m wide lanes and no shoulder is to be widened to include a 3 m wide two-way left turn lane and 2.5 m shoulders. The existing pavement structure consists of 12 cm of HMA over 20 cm of crushed aggregate. The existing pavement is kept in place except that the top 4 cm of HMA is removed by a milling machine. New pavement of the same structure is built on either side of the existing pavement structure to accommodate the wider final alignment.

Calculation logic:

All 20 cm of the base material and 9 cm of the HMA are reused. The 4 cm removed by the milling machine is not considered "reused". If it is recycled then it may qualify for consideration under MR-5 Recycled Materials.

Calculation:

$$(Lane\ width\ (m))x\ (HMA\ (cm) + Crushed\ agg.\ (cm))\ x\ \left(\frac{1\ m}{100\ cm}\right)\ x\ (Road\ length\ (km))\ x\ \left(\frac{1000\ m}{1\ km}\right)$$

Total volume of existing pavement;

$$\boldsymbol{(7\ m)x\ (12\ cm + 20\ cm)x\ \left(\frac{1\ m}{100\ cm}\right)\ x\ (5\ km)x\ \left(\frac{1000\ m}{1\ km}\right) = \ 11200.0\ m^3}$$

Reused volume of existing pavement;

$$\boldsymbol{(7\ m)x\ (9\ cm + 20\ cm)x\ \left(\frac{1\ m}{100\ cm}\right)\ x\ (5\ km)x\ \left(\frac{1000\ m}{1\ km}\right) = \ 10150.0\ m^3}$$

Percentage of existing pavement reused;

$$\boldsymbol{\frac{10150}{11200}x\ 100\% = \ 91\ \%}$$

EXAMPLE :

Figure 34: Reclamation of existing pavement for reuse

Figure 35: Re-usage of existing signboard

Figure 36: Relocation of existing guardrail

POTENTIAL ISSUES

i. A project may misclassify a material as “recycled” instead of “reused”
ii. Pavement thickness in existing road sections may vary, therefore estimating existing volume can be difficult.

REFERENCES

Greenroads Manual V1.5

GREEN PRODUCT

MR 2

3 POINTS

BENEFITS

- Improves Accountability
- Improves Human Health & Safety

OBJECTIVE

To encourage the usage of green products in the construction industry.

CREDIT REQUIREMENT

3 Points : Target Green Products Scoring System (GPSS) of 70% - 100%
2 Points : Target Green Products Scoring System (GPSS) of 50% - 69%
1 Point : Target Green Products Scoring System (GPSS) of 40% - 49%

DOCUMENTATION

A. <u>Design Evaluation Stage</u>
Product Certification and brochure
Specification of the products use

B. <u>Verification Scoring Stage</u>
Copy of product certification.

APPROACHES & STRATEGIES

The application of the Green Product Scoring System (GPSS) is to encourage a project team to specify the green products to be used in their projects. It is also to educate and create awareness among the stakeholders in the environmentally friendly products and services and to encourage manufacturers to apply for green certification for their products.

Identify the green products available in the market by considering the major product components listed in the Green Product Scoring System Manual (GPSS). The product shall have any of the following criteria:
1. Durable product
2. Environmental protection
3. Renewable Energy
4. Recycled content
5. Local product
6. Recyclable materials
7. Improved water quality/efficiency
8. Energy efficiency
9. Improved indoor air quality (IAQ)

The GPSS calculation for building considers only the superstructure elements and M&E systems. Substructure components for the building and all temporary works shall be removed from the GPSS calculation. The GPSS calculation for road excludes electrical works, mechanical works and road furniture.

POTENTIAL ISSUES

i. Higher initial cost.
ii. A tradeoff exists between cost and service life of eco-label product.

REFERENCES

I. Green Product Scoring System Manual
II. CIDB Malaysia, Manual for IBS Content Scoring System (IBS Score), IBS Publication series No.17
III. Green Product Scoring System Manual.
IV. Green Pages Malaysia
V. SIRIM, Eco-label Criteria Documents
VI. Green Purchasing Network Malaysia
VII. MyHijau Directory – http://www.greendirectory.my
VIII. JMAL – Green Product Directory

ROAD INVENTORIES

MR 3

NEW ROAD

1 POINTS

UPGRADING ROAD

2 POINTS

OBJECTIVE

Proper documentation and records of road assets for future references.

CREDIT REQUIREMENT

1 Point : Provide updated master inventory of material/product after completion of road works.

1 Point : Provide established master inventory of material/product of existing road (upgrading road project)

DOCUMENTATION

A. Design Evaluation Stage

A copy of established master inventory of material/product of existing road.

B. Verification Scoring Stage

i. A copy of updated master inventory of material/product after completion of road works.

ii. As built drawing

APPROACHES & STRATEGIES

i. Check on the availability of existing master inventory to be used during design stage

ii. Establish or update the master inventory based on the road works done.

POTENTIAL ISSUES

Unavailable or incomplete existing master inventory.

REFERENCES

Prosedur Pendaftaran Aset JKR.PK(O)06D

BENEFITS

- Reduce carbon footprint
- Increases Awareness
- Retrievable data

EFFICIENT ROAD LIGHTINGS

MR 4

1 POINTS

BENEFITS

- Reduce Fossil Fuel Usage
- Reduce Carbon Emission

OBJECTIVE

To promote optimal usage of energy through installation of energy efficient and energy saving devices for road lightings.

CREDIT REQUIREMENT

1 Point:All systems should be designed to use energy efficient road lightings, while complying to standard and specification for road lightings (eg. MS 825 part 1:2007).

DOCUMENTATION

A. Design Evaluation Stage

Submit a copy of the following documents:

1. specifications
2. drawings
3. catalogue

B. Verification Scoring Stage

As-built drawings

APPROACHES & STRATEGIES

i. Design road lightings that comply to JKR specifications, MS 825 Part 1: 2007 or latest edition, and other relevant standards.
ii. Incorporate latest energy efficient road lighting (LED, induction, ceramic metal halide, plasma, etc.) and energy saving device technologies.

EXAMPLE :

i. Federal Highway
ii. Lingkaran Pulau Indah

POTENTIAL ISSUES

i. Higher initial cost.
ii. New technology for road lighting (energy efficient) may not be technically equivalent to current conventional road lighting technology (HPSV) in terms of lighting performance, robustness and maintainability.
iii.

REFERENCES

i. JKR L-S 20: Specification for Road Lighting
ii. JKR Provision of Road Lighting
iii. Section 8 Arahan Teknik Jalan JKR
iv. MS IEC 60364 Wiring Regulation
v. MS 825 Part 1: 2007

INNOVATION

IN

5 POINTS

BENEFITS

- Increase Alternative

OBJECTIVE

Recognize innovation sustainable road design and construction practices.

CREDIT REQUIREMENT

5 Points: Come up with an idea for a design or construction best practice for road that is not currently included in Manual pH JKR and is more sustainable than standard or conventional practices. The innovations that can be applied for road project is:-

i. Ultra High Performance Concrete
ii. Usage of Industrial by-product (exp: fibromat, steel slag)
iii. Sub-grade improvement/ soil stabilization
iv. Warm mix asphalt (if achieve the requirement as hot mix)
v. Specialty mix
vi. Research and development (exp: Foam Concrete)
vii. Renewable Energy
viii. Project monitoring

DOCUMENTATION

A. Design Evaluation Stage
Contractual requirement for Innovation plan

B. Verification Scoring Stage
1. A copy the specification an innovative idea and photos
2. A copy of innovation report.

APPROACHES & STRATEGIES

i. Explain approaches and strategies in achieving the said innovation (e.g. processes, system, material and plan).
ii. Conduct comprehensive research if required.

EXAMPLE :
Case study or calculation.

POTENTIAL ISSUES
Cost constrain
Subject to approval by top management

REFERENCES

List of references use

APPENDIX -A

RELATED FORM

APPLICATION & REGISTRATION FORM

PROJECT INFORMATION

Project: ……..

……..

Type of Development:

CODE	CATEGORIES	PLEASE CHECK APPROPRIATE (X)
KB 1	Bangunan Baharu Bukan Kediaman	
Kb1a	Penarafan Semula Bangunan Baharu Bukan Kediaman	
KB 2	Bangunan Sediada Bukan Kediaman	
KJ	New & Upgrading of Roads-KJ	

Client /Agency Name:: ……

PROJECT MANAGEMENT TEAM INFORMATION

Project Team Leader: ……..

Branch / State: ……..

No.Telephone:……No.Fax :…… E-mail : ……..

	NAME	POSITION	BRANCH/STATE	CONTACT NO.	E-MAIL
HODT	1.				
	2.				
	3.				
	4.				
	5.				
	6.				
	7.				
	8.				
	9.				

PEMUDAHCARA **pH JKR INFORMATION** (Determined by the *Pasukan Pelaksana* pH JKR)

Pemudahcara pH JKR Name : ……

Branch / State: ……

No.Telephone:……No.Fax :…… E-mail : ……..

SUPPORTING DOCUMENT

Please provide a copy of the document - the following documents:

NO	DOCUMENT NAME	INCLUDED (PLEASE TICK)
	[BORANG JKR.PK(O).01-1] ~ Brief Checklist	
	[BORANG JKR.PK(O).01-2] ~ Customer Verification Form	
	[BORANG JKR.PK(O).01-3] ~ Site Visit Checklist	
	Other supporting documents (if any). Name: …… ……..	

SUBMISSION OF APPLICATIONS

Each application must be accompanied by information and supporting documents.

I agree that all information given above is true:

……
(Signature of Project Team Leader)
Name :

Position :

Date :

Official Stamp

PLEASE SUBMIT FORM AND SUPPORTING DOCUMENTS TO:

***PASUKAN PERLAKSANA* pH JKR**
CAWANGAN ALAM SEKITAR & TENAGA
IBU PEJABAT JKR MALAYSIA
TING 23, MENARA PJD
50, JALAN TUN RAZAK
50400 KUALA LUMPUR

FOR OFFICE USE

pH JKR Registration No.:..... Receipt Of Application Date : .....

DESIGN EVALUATION (P2) / VERIFICATION (P3)

pH JKR GREEN RATINGS

CHECKLIST OF DOCUMENTS:

BIL.	PERKARA	SEMAKAN
1.	Document Submission Form	
2.	Submission of documents. All plans / documents attached to A4 / A3 in PDF format	
3.	Submission of documents must have a front page stating the following: ASSESSMENT OF APPLICATIONS FOR PROJECT DESIGN**.....**	
4.	Each criterion should be separated using flypage. Each flypage should be labeled on the right side and front page.	
5.	Plans / documents should refer to the applied. These criteria can be marked / etched in the plans / documents. Plan may be submitted in any relevant scale in size A4 / A3.	
6.	Applicants must have a copy of the compact disc (CD) and should be submitted together - together. Drawings submitted in hardcopy form should be included in softcopy (AutoCAD drawing)	

*refer pH JKR Manual for a detailed description of each submission

DESIGN EVALUATION (P2)/ VERIFICATION SCORING (P3)

pH JKR GREEN RATINGS

FORM OF DOCUMENTS

Production Stage: Design Evaluation (P2) / Verification Scoring(P3)*

PROJECT TITLE :					**DATE OF RECEIVING:** **DATE & PH JKR REGISTRATION NO.:**
	NAME	**POSITION**	**CONTACT NO.**	**BARNCH/STATE**	**SIGNATURE**
HOPT					
HODT	1.				
	2.				
	3.				
	4.				
	5.				
	6.				
	7.				
	8.				
	9.				

* Delete whichever is inapplicable

CERTIFICATION OF ASSESSMENT

TEAM LEADER :……..

ASSESSMENT DATE :……

PROJECT :……

	ASSESSMENT TEAM (BRANCH)	*PEMUDAHCARA*	CONTACT NO.	ASESSMENT DATE	SIGNATURE	REMARKS/COMMENTS
1						
2						
3						
4						
5						
6						

CERTIFICATION OF CHIEF EXECUTIVE TEAM

…… **……**

(Date) **(Stamp & Signature)**

APPENDIX -B

SCORECARD
pH JKR ROAD SECTOR