Lecture 2

Pavement Maintenance Management Systems

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Concept of PMMS

Maintenance -- All actions and measures that are performed to keep a network of pavements at or above a desired level of service

Types of Maintenance

- Routine maintenance
- Corrective maintenance
- Condition Based Preventive Maintenance
- Fixed Period or Time Based Preventive Maintenance

Routine Maintenance

- Regular periodic (e.g. daily or weekly) maintenance activities that are carried out routinely regardless of the condition of pavement.
- Helps to slow down the rate of deterioration of pavement condition

Corrective Maintenance

Maintenance treatment / repair of pavement necessitated by

- Occurrence of failure
- Pavements that have reached terminal serviceability level
- Required corrections of pavements with advanced state of severe distresses

Condition Based Maintenance

- Pavement conditions are continuously assessed
- Maintenance is activated if the measured condition parameter does not satisfy a desired level of service

Fixed Period or Time Based Preventive Maintenance

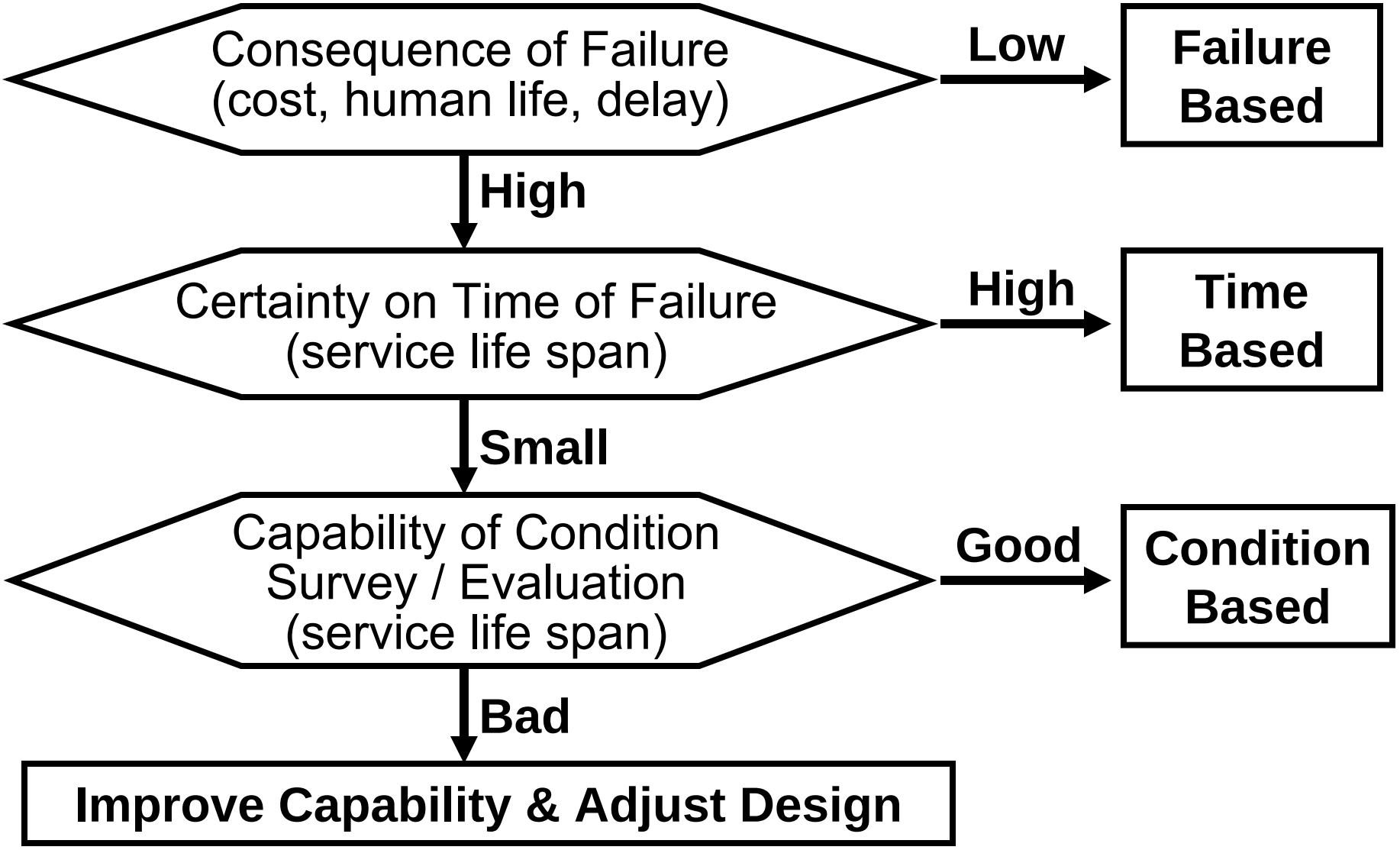
- Periodic (monthly/quarterly/yearly) inspection and maintenance to remove any irregularities and to restore pavement condition to a desired level of service

Factors affecting choice of maintenance type :

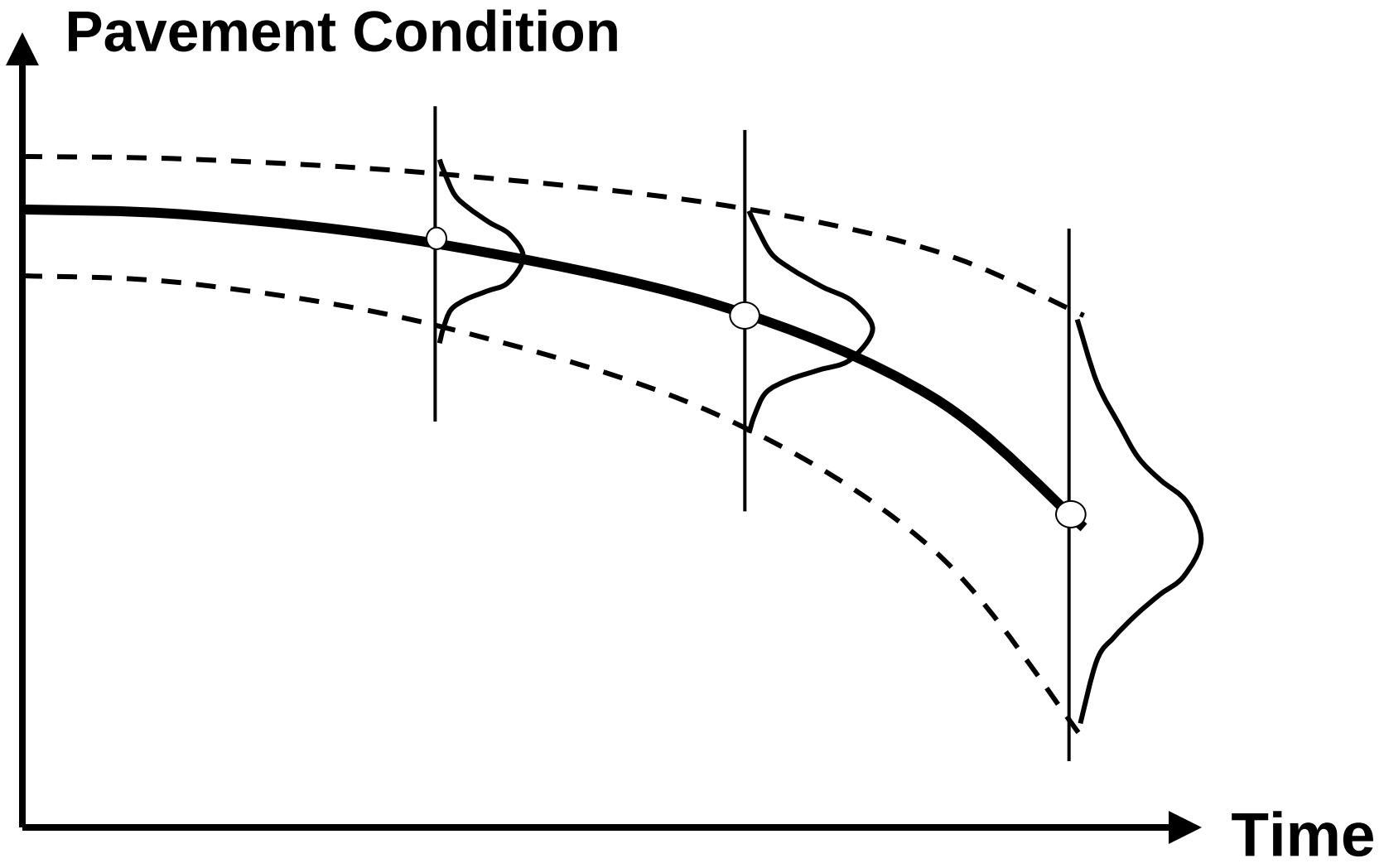
1. Maintenance budget
2. Lack of expertise/technology
3. Lack of data
4. Lack of equipment
5. Lack of Management System
6. Inefficient Management

Concept of PMMS

Factors affecting choice of maintenance strategy



Maintenance Implications of Uncertainty in Predicted Pavement Conditions



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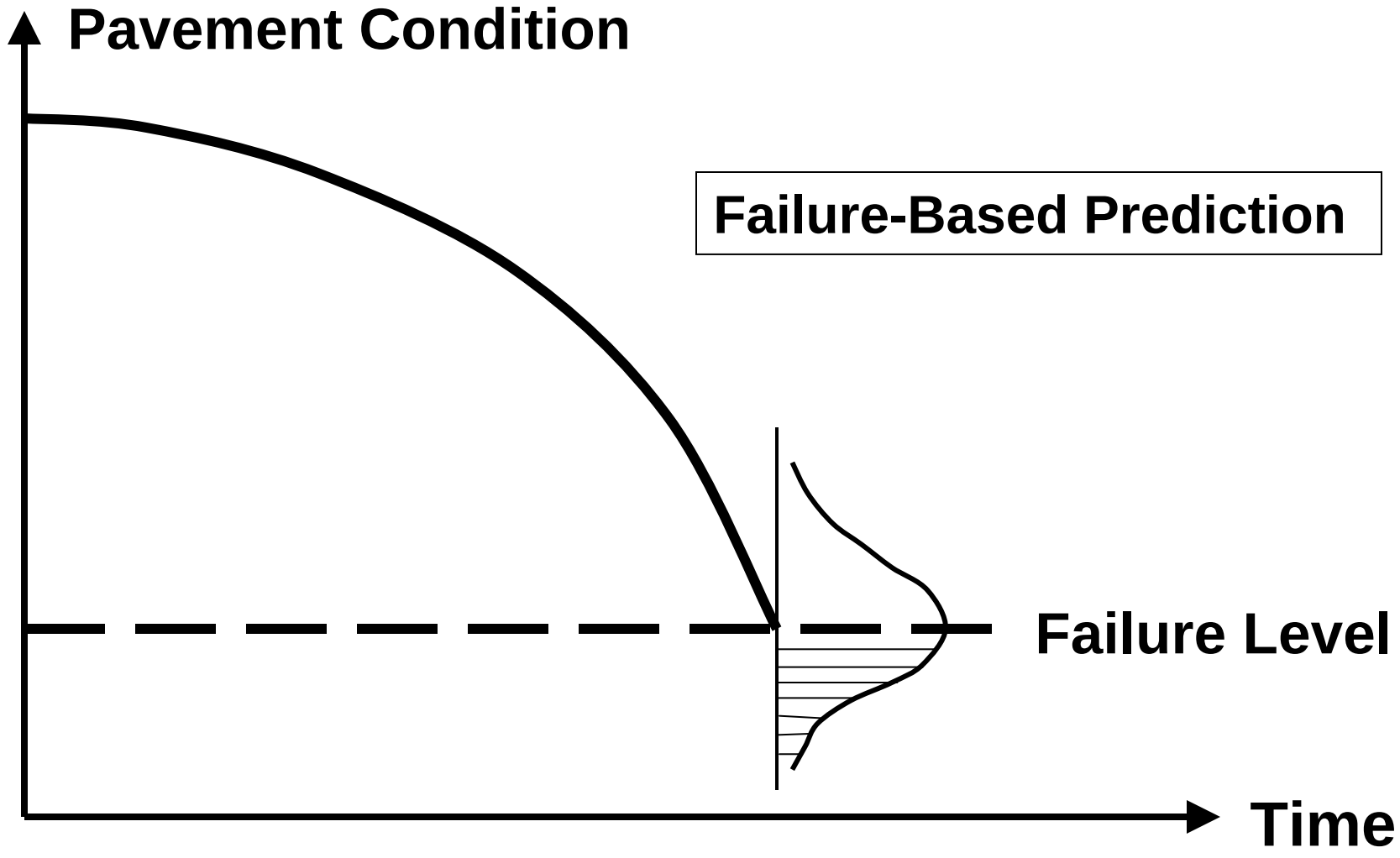

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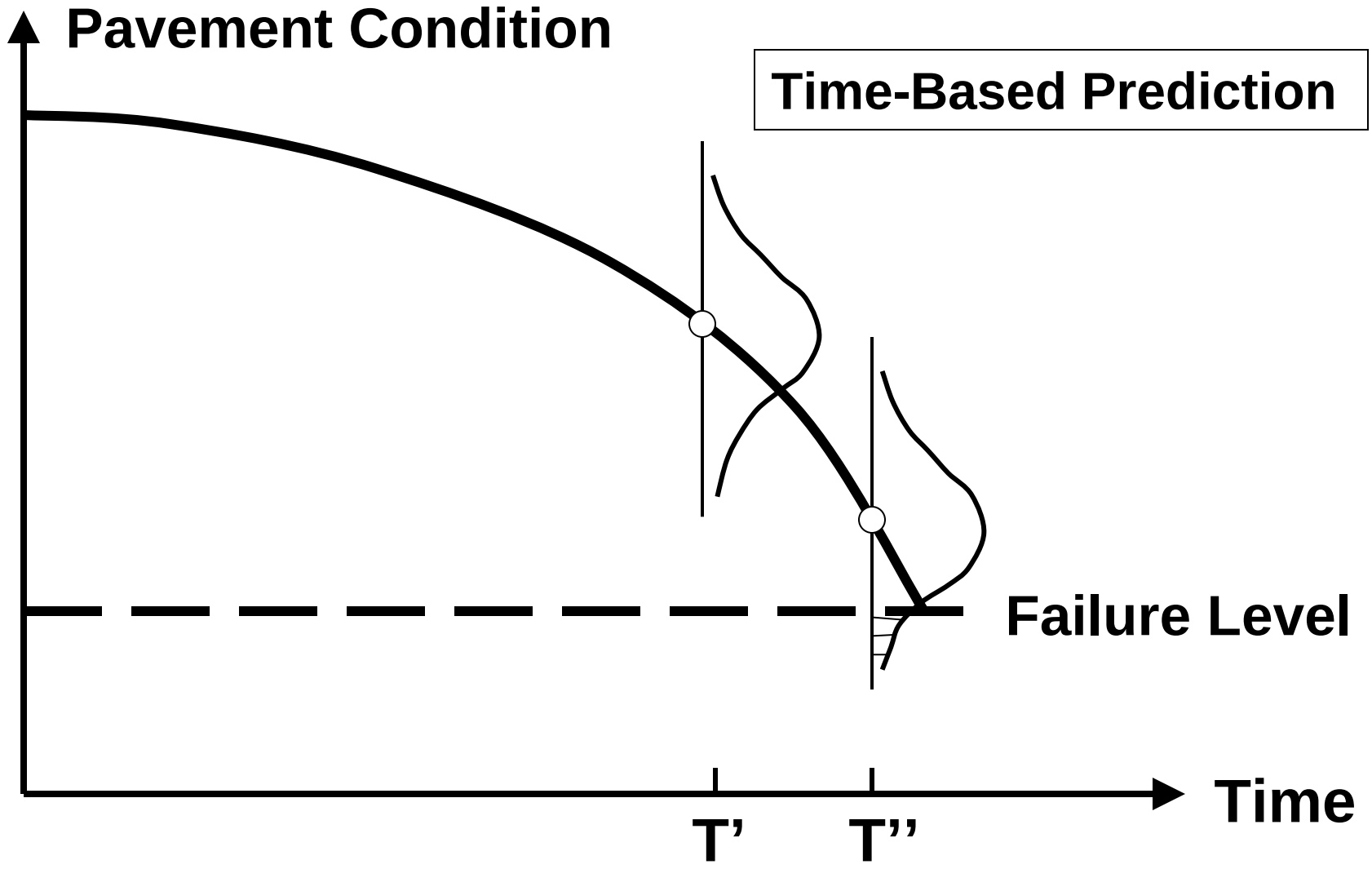

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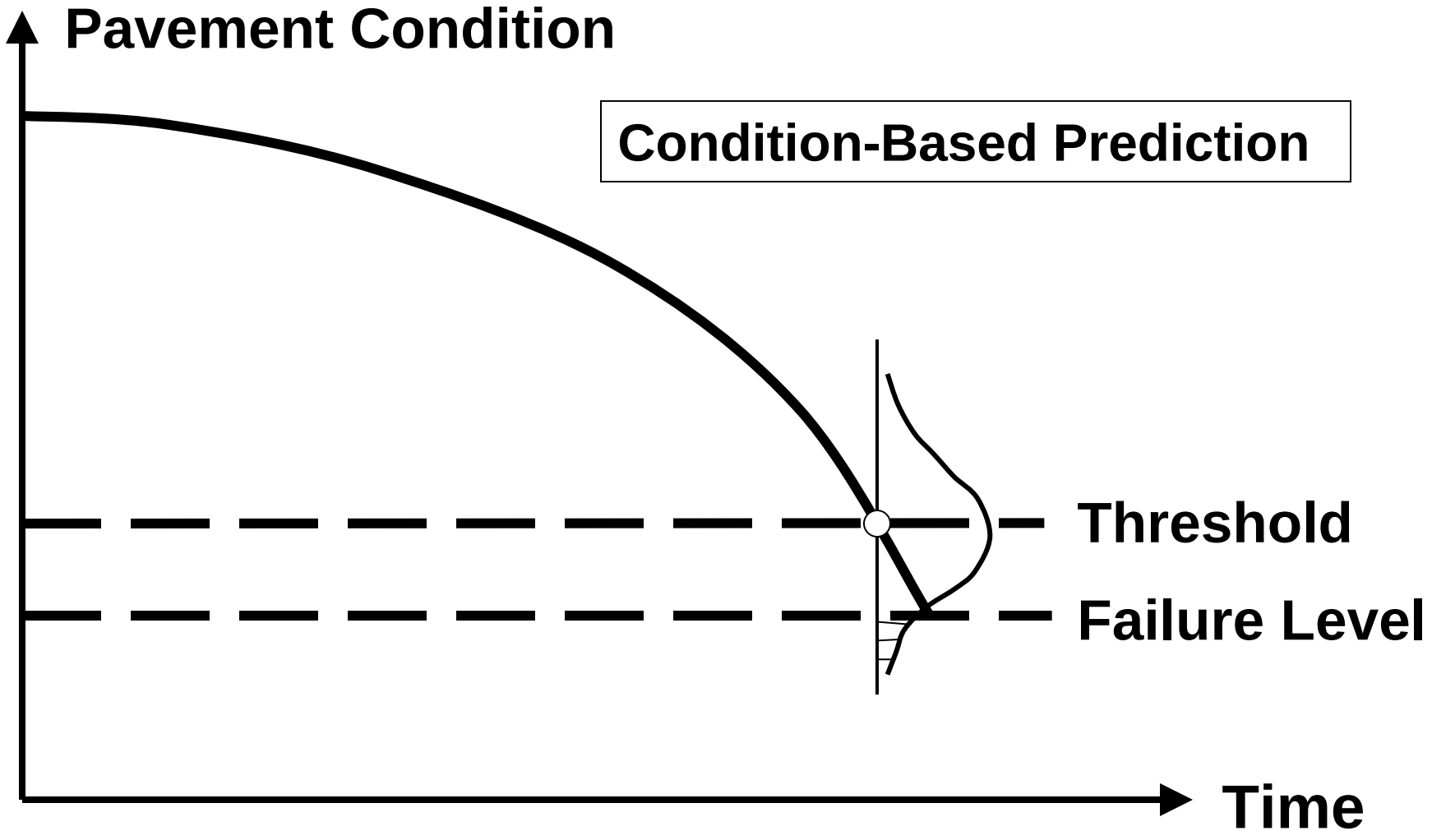

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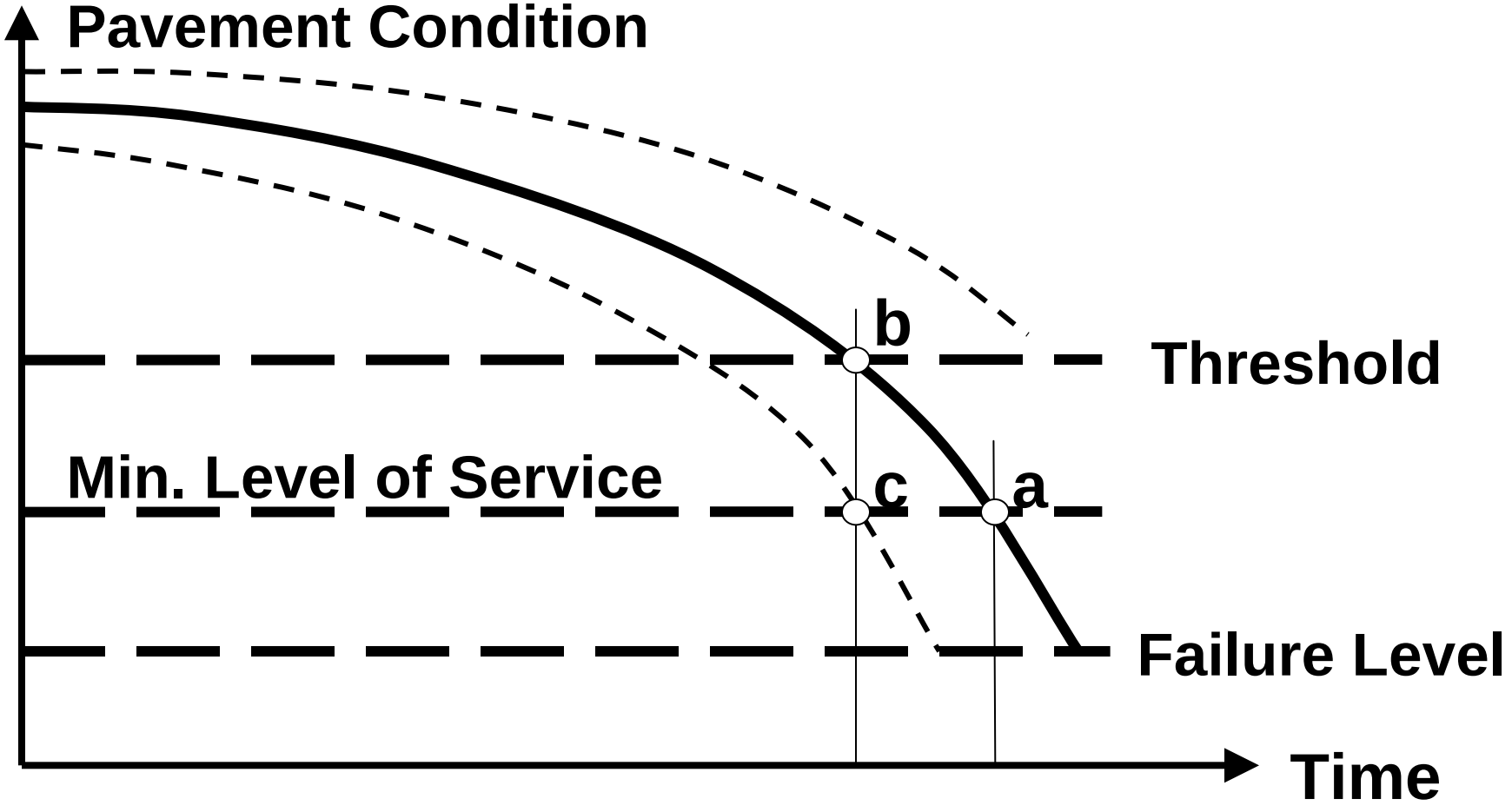


For a given confidence level, the threshold level for maintenance must be set no lower than “b”.

Effect of Raising Threshold Level

(1) Better overall level of service provided

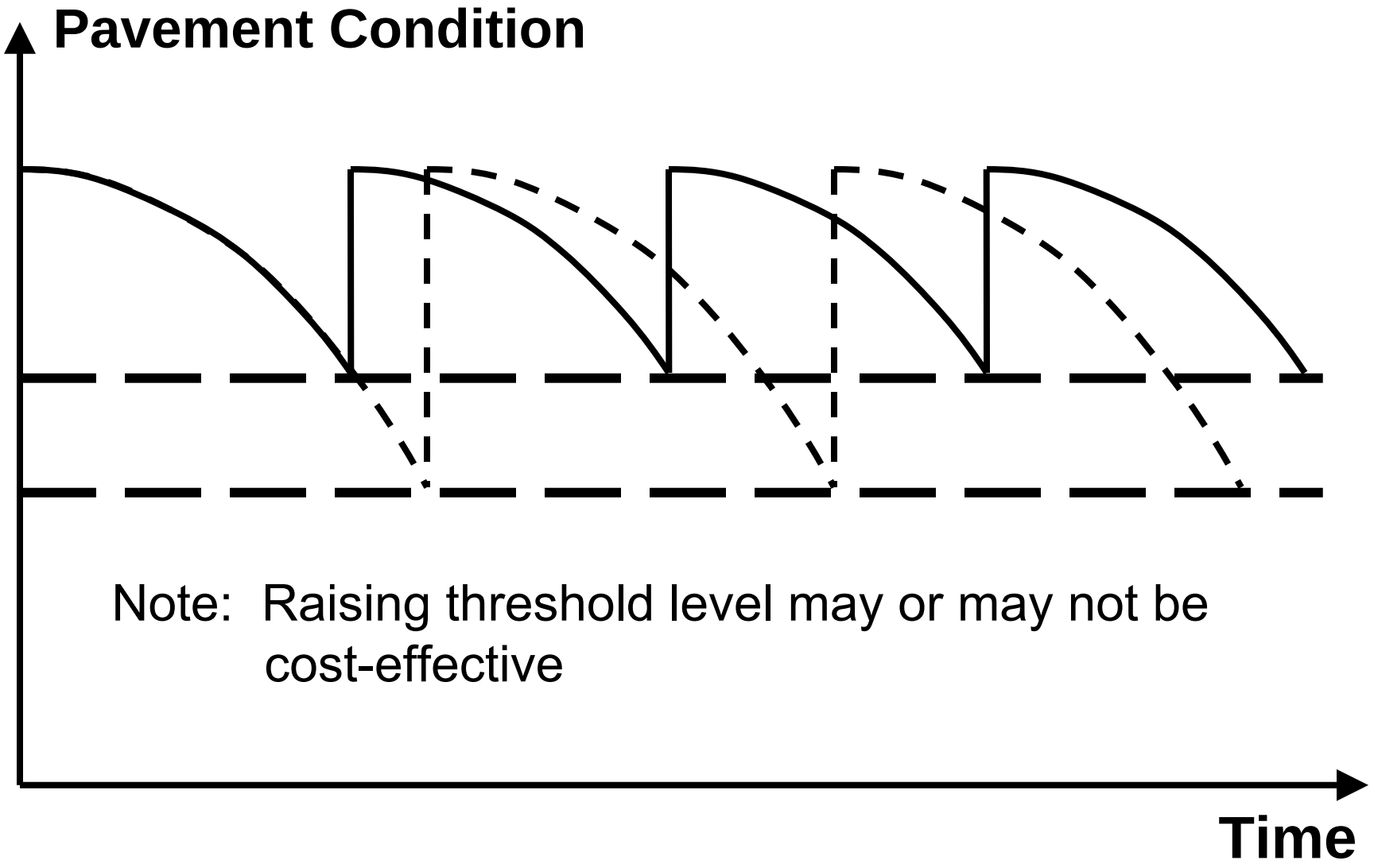
(2) Good quality and frequent condition survey/ inspection needed

(3) More smaller scale maintenance/repair work

(4) Serious defects less likely

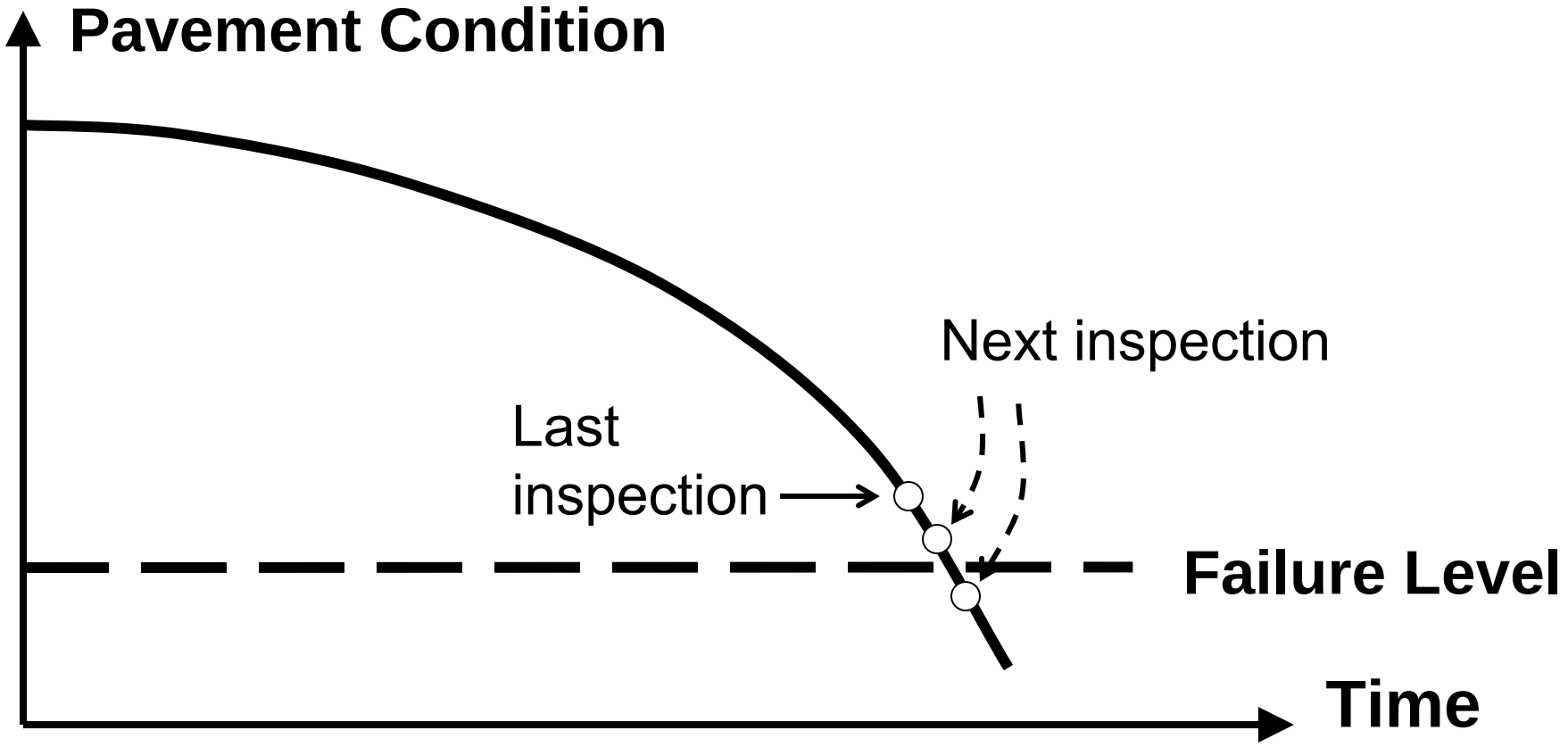
(5) Smaller likelihood of major failure

Effect of Raising Threshold Level



Note: Raising threshold level may or may not be cost-effective

Effect of Interval of Surveys / Inspections



- Shorter intervals, less likelihood of failure occurring, hence better level of service
- May or may not be cost-effective

Maintenance Strategy & 5 Levels of Performance/LOS

Failure level – *level at which pavement can no longer provide service for safe highway operation*

Maintenance level of service – *minimum level that maintenance operations are planned to achieve*

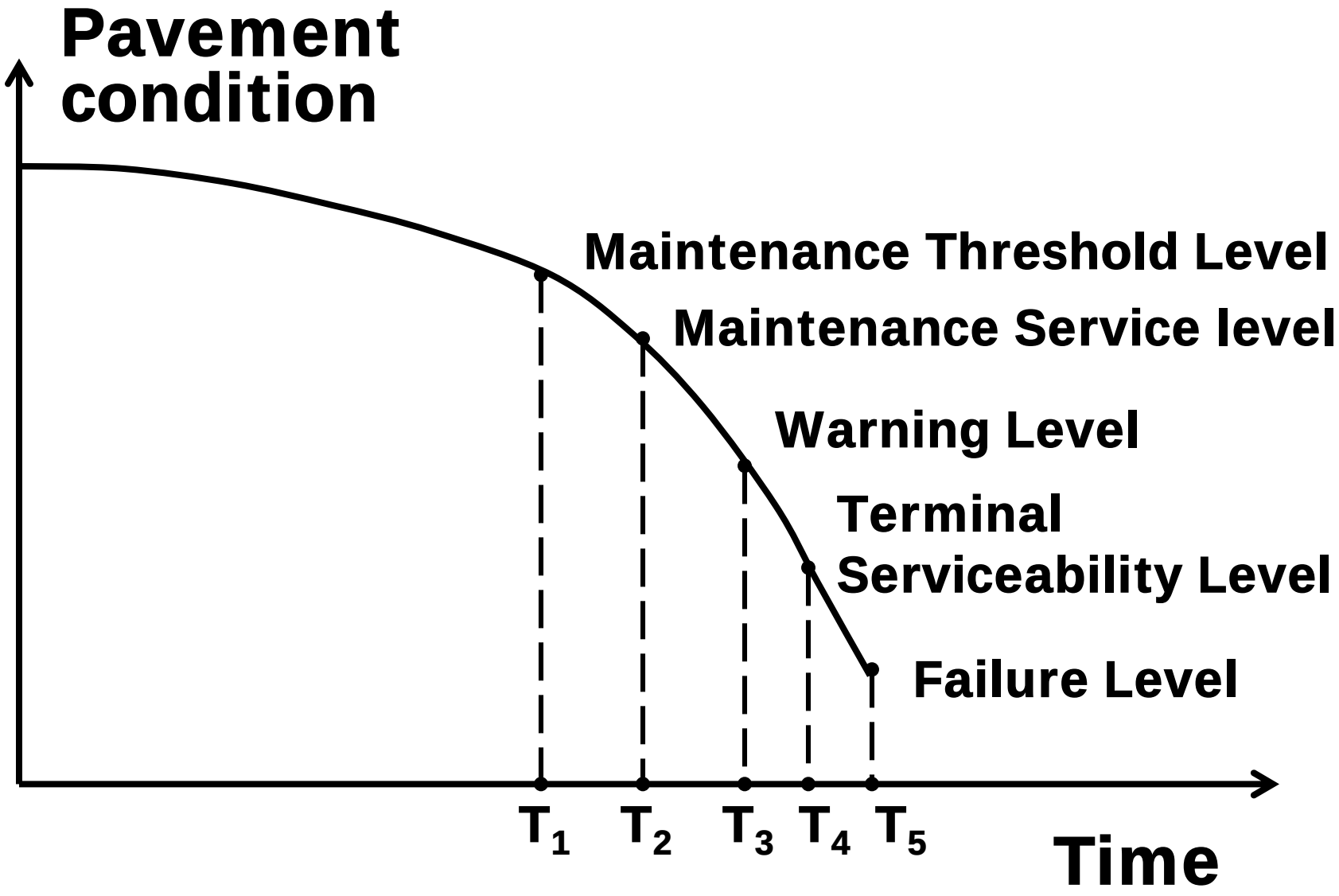
Threshold level for maintenance – *level at which maintenance should be activated to ensure that the maintenance level of service is maintained*

Terminal level of service – *level which is the end of design life, i.e. lowest level accepted for design*

Warning level – *level at which maintenance must be activated to save the pavement from falling below the terminal level of service*

Concept of PMMS

Maintenance Strategy



Main Components/Considerations in PMMS

- *Pavement distress survey and evaluation*
- *Treatment types & maintenance techniques*
- *Effectiveness of pavement maintenance*
- *Priority rating of pavement distresses / maintenance needs*
- *Pavement maintenance planning and scheduling*

References

- Chapter 16 “Highway Maintenance” in The Handbook of Highway Engineering, edited by T. F. Fwa. (2006)
- Chapter 18 “Pavement Management Systems” in The Handbook of Highway Engineering, edited by T. F. Fwa. (2006)
- Chan W. T., Fwa T. F. and Tan C. Y. (1994) Road Maintenance Planning using Genetic Algorithms: Formulation. Journal of Transportation Engineering, ASCE, Vol. 120, No. 5, pp.693-709.
- Fwa T. F., Tan C. Y. and Chan W. T. (1994) Road Maintenance Planning using Genetic Algorithms: Analysis. Journal of Transportation Engineering, ASCE, Vol. 120, No. 5, pp. 710-722.