

BITUMINOUS SURFACING - PRINCIPLES & PRACTICE



ASSIGNMENT

ADVANCED COURSE FOR ENGINEERS AND SUPERVISORS

Please note that there are 7 Questions to this assignment.

Advice to candidates

1. **Late submissions** will be returned without an assessment unless an extension of the submission time has been approved by the AAPA Training and Advisory Centre.
2. This **assignment should be completed on separate paper** — the questions cannot be answered in sufficient detail on the assignment sheet itself.
3. **Typed submissions** are preferred but neat handwriting is acceptable.
4. **Read each question carefully.**
5. **Answer all questions** and begin each question on a new page.
6. **The assignment must be your own work.** Copying of material from another candidate's submission or from any other source (but see note 7) will result in your submission being returned without an assessment.
7. Answers should be in your own words but use quotes from books or manuals etc where appropriate. **Always record the source of information you use.**
8. Show all calculations and clearly state all assumptions required to answer the question. Providing an answer alone is not sufficient. You must be able to demonstrate an understanding of the principles behind your decisions and computations
9. It is estimated it will require between **6-8 hours** to satisfactorily complete the assignment.

Certificate of Successful Completion of Written Assignment

All candidates submitting an assignment will be advised of the result in writing.

- Unsatisfactory – where the assessor considers the delegate's responses to be insufficient (including a lack of explanations or failure to clearly state assumptions) and show substantial gaps in technical knowledge and understanding of the critical technical principles. No Statement awarded
- Retry – where the assessor considers there to be some gaps in certain knowledge areas, but that, in general, they have a good knowledge of the technical principles, delegates will be allowed one retry, and will be advised to resubmit part or all of the assignment.

Retries are subject to a new due date; an extension of time will not be allowed for retries. No Statement will be awarded where the delegate fails to submit retry questions by the due date

- Satisfactory- delegate's responses have provided sufficient evidence that they have gained knowledge of the critical aspects of the topic - Statement awarded (subject to some specific requirements)

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QUESTION 1

- a)
 - (i) What grades of bitumen are specified in AS2008 and
 - (ii) Which of these grades would be most appropriate to use in the manufacture of asphalt for the following road classifications:
 - i. Light trafficked residential street
 - ii. Collector road
 - iii. Arterial type road
 - iv. Freeway/motorway/heavy duty pavement
- b) Describe
 - (i) the components of a bitumen emulsion
 - (ii) the manufacture of a bitumen emulsion.
 - (iii) the types of emulsion
- c) Name two polymer groups typically used in binders and give an example of a polymer type for each group.

QUESTION 2

- a) What are the two principal reasons for controlling temperature during asphalt manufacture?
- b) What are the main characteristics (performance requirements) for asphalt mixes used in:
 - i. wearing courses on lightly trafficked pavements?
 - ii. wearing courses on heavily trafficked pavements?
 - iii. thick structural layers in modified full-depth asphalt pavements?

QUESTION 3

- a) Describe the two primary sources of pavement failure which are considered in the design of a flexible pavements i.e. causes not “symptoms” or “evidence” of failure.
- b) Nominate the most commonly used pavement in your area and explain why it is used.
- c) What other type of pavement might be suitable? Give reasons.

QUESTION 4

An asphalt overlay is being supplied for placing at a major intersection on a Sunday. Because of the importance of the job, surveillance of the plant was requested by the client's supervising engineer.

The Surveillance Officer found that due to a shortage of staff at the plant, it was not intended to conduct any testing. The officer was then asked by the Contractor's staff to do quick extractions.

- a) What action should the Surveillance Officer take to protect himself/herself and the client?
- b) What could be the consequences of the Surveillance Officer's action if the laid asphalt subsequently failed?
- c) If the asphalt failed where would the responsibility lie?

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QUESTION 5

You have been asked to arrange resealing of a rural main road linking two regional centres. The existing pavement is in good condition and has been recently patched. Explain the factors you would take into account to determine the following:

- (a) The type of seal treatment
- (b) The type of binder and size of aggregate(s) in the treatment
- (c) The design of rates of application of binder and aggregate

QUESTION 6

An asphalt surfaced (asphalt thickness 100mm) granular pavement located on a heavily trafficked road near an intersection is visually distressed. The distress includes:

- rutting to a depth of approximately 20mm over a length of 80m in both wheelpaths of the slow lane
- less significant rutting in the fast lane.

There is no evidence of cracking.

5 years ago the asphalt surfacing was removed to a depth of 40mm and replaced in an attempt to treat rutting which was evident at that time.

The area is flat, and level control will allow the placement of an overlay up to a maximum thickness of 40mm. Kerb and channel is comprised of bluestone pitchers.

- a) Prepare a list of the likely causes of rutting.
- b) What testing could be undertaken to assist in determining the causes of pavement distress?
- c) Describe two possible treatments and explain
 - i) which you prefer
 - ii) why this treatment is more suitable

QUESTION 7

- (a) What are the main points to consider in minimising potential hazards in handling hot bitumen
- (b) Explain the importance of achieving the specified level of compaction of a dense graded asphalt mix and possible affect on the asphalt performance if compaction is not achieved
- (c) What are the main advantages of Warm Mix asphalt over conventional hot mix
- (d) On a new construction job, when would you use a primerseal in preference to a prime and seal treatment and briefly explain the advantages/disadvantages of your choice

**Please return your completed assignment to AAPA within 4 weeks.
Refer to cover page for address details.**