الحلول النموذجية لاسئلة مادة المواصفات والصيانة

Q1)A-the tolerances for the JMF according to the specification

Sieve No.	3/4in.	1/2in.	3/8in.	No. 4	No. 8	No.50	No.200	Asphalt content%
%passing	100	95	82	58	39	16	7	5
tolerances	100-94	100-90	76-88	52-64	35-43	12-20	5-9	4.7-5.3

B-The following classification of highway maintenance activities:

· Preventive maintenance refers to actions associated with restoring the condition of the highway, reducing the rate of deterioration and increasing the life of the pavement. The restoration of the condition of the pavement is primarily related to the functional, i.e., skid resistance and riding quality, properties of the pavement. These activities are normally planned based on an assessment and processing of information in a pavement or bridge management system. All maintenance should include attention to drainage as water is the single most important factor affecting pavement performance.

・ Remedial maintenance refers to actions associated with the rectification of defects on the carriageway or the road reserve.

・ Emergency maintenances refer to activities associated with the urgent repair of defects caused by natural disasters or accidents.

Q2) A–Excavation for culverts, pipelines and drains shall be carried out in trenches and be straight and true to the lines and levels shown on the Drawings. All trenches shall be excavated to such width as will give adequate room in the trench for the proper support of the pipe, and shall be excavated to a sufficient depth and width to enable the pipe and any specified or agreed joint, bedding, haunching and surround to be accommodated. Trenches shall be of width not exceeding the outside diameter of the pipe plus 30cm up to a level 30cm above the top of the pipe barrel, but the width of trenches for lines of flexible pipes shall not be less than the outside diameter of the pipe plus 30cm.

The sides of the trenches shall at all times be adequately supported by means of waling, struts and runners or sheet piling of sufficient number and dimension to prevent the falling in, movement or slipping of the ground, injury to workmen and damage to the Works or adjacent property.

Before any pipes are laid, or concrete bed placed in the trench, the base of the excavation shall be trimmed true in cross-section and gradient and hand-rammed solid. Any part of the formation which is disturbed or damaged shall be excavated to such additional depth as may be required by the Engineer'sbRepresentative and be made up to the proper level with normal Class E Concrete at the Contractor's expense.

Where solid rock is encountered, it shall be removed below grade and the trench backfilled with

compacted sand, gravel or bedding material as specified under Bedding to provide a compacted soil cushion with a thickness under the pipe of not less than 3cm per metre of height of fill over the top of the pipe, with a minimum allowable thickness of 20cm. Where a firm foundation is not encountered, due to soft, spongy or other unsuitable material, all of such unsuitable material under the pipe and for a width of not less than one diameter on each side of the pipe shall be removed and the space backfilled with gravel or bedding material properly compacted to provide adequate support for the pipe.
Unless otherwise specified in the Special Specification of Particular Application, where pipes are installed in new embankments, the embankment shall be constructed to a minimum height equal to theoutside diameter of the pipe plus 60cm and to a width of not less thanfive times the diameter of the pipe. The trench shall then be excavated with vertical sides as specified above for normal pipe trenches.

B-

1. General: In general bar lists and bending schedules with diagrams will be included in the Contract Documents, but the Contractor shall be responsible for satisfying himself of the correctness of all detail inaccordance with the Drawings and the quantities, before placing orders.
2. Protection of Materials: Steel reinforcement shall be protected at all times from damage and whenplaced in the structure shall be free from dirt, loose mill scale and rust scale, paint, oil or other foreignsubstance.
3. Bending: Reinforcement shall be bent to the dimensions given in the Bar Schedules which shall comply with BS.All reinforcement shall be bent at temperatures in the range of 5°C to 100°C.Cold worked bars and hot rolled high yield bars shall not be straightened or bent again once havingbeen bent. Where it is necessary to bend mild steel reinforcement projecting from the concrete, theinternal radius of bend shall be not less than twice the diameter of the bar.

4. **Placing:** Reinforcement shall be placed and firmly maintained in the position shown on the Drawings. Unless otherwise permitted by the Engineer's Representative, all bar intersections shall be tied together and the ends of the tying wire shall be turned into the main body of the concrete. 1·2mm diameter stainless steel wire shall be used for in-situ members having exposed soffits. 1·6mm diameter soft annealed iron wire shall be used elsewhere.

No splices shall be made in the reinforcement except where described in the Contract or where approved by the Engineer's Representative.

5. **Cover Blocks:** Precast concrete cover blocks required for ensuring that the reinforcement is correctly positioned shall be as small as possible consistent with their purpose of a shape acceptable to the Engineer's Representative and designed so that they will not overturn when the concrete is placed.

The blocks, which may be reinforced, shall be short enough to permit their ends to be covered with concrete. The use of pebbles, pieces of broken stone or brick, metal pipe and wooden blocks will not be permitted. Reinforcement in any member shall be placed, inspected and approved before any concrete is placed. Concrete placed in violation of this provision will be subject to removal.

They shall be made of concrete with 10mm maximum aggregate size and the mix proportions shall comply with Table B8/6 of Clause B8 07 to produce the same strength as the adjacent concrete. Tying wire complying with the requirements of Clause B7 04-4 shall be cast in the block for the purpose of tying it to the reinforcement.

The use of purpose made asbestos-cement spacer blocks will be permitted subject to the approval of the Engineer's Representative and that they are of adequate contact area to ensure that they do not punch into the formwork. The use of plastic spacer blocks will not be permitted.

6. **Welding:** Reinforcement in stuctures shall not be welded except where permitted in the Contract. All welding procedures shall be subject to the prior approval of the Engineer's Representative in writing and shall comply with any appropriate sections of Clause B1004-7.

C−The surface of the base course will be inspected and tested for finish Immediately before applying the prime coat, all loose material, dirt, or other objectionable material shall be removed from the surface to be primed by power brooms and/or blowers, supplemented by hand brooms as directed by the Engineer's Representative. Prior to application of the prime coat an inspection of the prepared surface will be made by the Engineer's Representative to determine its fitness to receive the bituminous binder, and no primary coat shall be applied until the surface has been approved. If the surface is excessively dry and/or dusty so that the bituminous surface ravels, it shall be lightly and uniformly sprinkled with water immediately in advance of priming, but bituminous binder shall not be applied until all free surface water has disappeared.Following the application of prime material, the surface shall be allowed to cure for a period of at least 24 hours without being disturbed or for such additional period of time as may be necessary to attain penetration into the base course and aeration of the volatiles from the prime material. The Contractor shall furnish and spread sufficient approved sand on all areas which show an excess of bituminous material to effectively blot up the excess as directed by the Engineer's Representative.

Q3) A−Pavements fail prematurely because of many factors. When boiled down to the basics, there are four primary reasons pavements fail prematurely:

1. Failure in design
2. Failure in construction
3. Failure in materials
4. Failure in maintenance

Choose to explain any one from the following:

1. ***Design***

There are still many failures due to design

A. Under-designed

A road that cannot handle the loads is under-designed. This could be due to a failure to account for conditions such as an increase in truck traffic.

B. Failure to account for conditions

Even if the road is built to a quality standard, there may be premature failure if any conditions remain unaccounted for in the design. The condition assessment problem that leads to the most premature failures is a lack of good drainage.

C. Changes after construction

If you build it, they will come. As soon as you build a smooth section of pavement, vehicles that had detoured in the past may suddenly decide to use the new roadway. If you failed to anticipate this increased traffic, your road may fail too soon.

Examples of failure in design

- Overlay too thin for traffic load (Too thick is also not desirable. It wastes money.)
- Failure to account for a spring in the middle of the roadway.

2. ***Construction***

Just as design can lead to premature failure, poor quality construction can cause a roadway to fail early. Many construction failures do not appear as defects for several years, so it can be difficult to determine the reason for the failure. Whether the work is done in-house or by contract, it is important to get the job done right.

a) Poor workmanship

A very common problem in culvert installation is the failure to compact the backfill inthin even lifts. It may be faster to put in thick lifts, but coming back to fix the problemafter settlement occurs is not a good alternative.

b) Using incorrect equipment

Using the wrong tool in pavement maintenance can lead to prematurefailure. A rubber-tired roller should be used on a chip seal. A steel drum roller can crushand break the aggregate.

c) Using equipment improperly

Even if you have the right piece of equipment, it is important to use it correctly. Know what a piece of equipment is for and how touse it properly.

d) Failure to follow plans

Engineering drawings are not required for pavement maintenance,but writing down the steps and having a plan is a valuable tool.

Examples of failure in construction

• Failure to compact cold patch with the truck tire

• Failure to place the aggregate in a chip seal before the asphalt emulsion breaks

• Using an air compressor without an oil/water separator to clean cracks (can introducewater and cause a loss of bond)

• Paving over a base that is not properly prepared.

e) Materials

Using the wrong material in the right place or the right material in the wrong place can lead topremature failure.

f) Material does not meet specifications

Once you select the material, make sure it meets specifications. One recommendation is to always sample the materials on site. It is not always possible to go back and get a sample after the construction is complete.

Examples of failures in materials

- Using an asphalt emulsion to *seal* cracks
- Using a cheaper cold patch that may last only a few hours
- Using a dusty or wet aggregate in surface treatment operations

B-1. The shuttering shall be cleaned out prior to concreting and the bottom thoroughly freed from sawdust, shavings, rust, dirt, mud or other debris, and special removable sections of shuttering shall be provided to facilitate this, all to the Engineer's Representative's approval.
2. To prevent concrete adhering to the shuttering, a thin coat of a chemical release agent approved by the Engineer's Representative shall be applied to the inner surface of the shutters before concrete is placed. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not come into contact with the reinforcement of prestressing tendons and anchorages. Different release agents shall not be used in formwork to concrete which will be visible in the finished Works.
3. When absorbent timber forms are used in high temperatures they shall be thoroughly wetted on both sides in advance of placing the concrete.
4. Forms for concrete can also be oiled with form oil acceptable to the Engineer's Representative. The oil shall be applied several days before the concrete is placed and shall be in such quantity that it will be fully absorbed by the wood and will not discolor the surface of the concrete.
5. Metal forms which do not present a smooth surface or line up properly, shall not be used.

Special care shall be exercised to keep metal forms free from rust, grease or other foreign matter such as will tend to discolor the concrete.
6. No concrete shall be placed until the formwork or shuttering has been inspected and approved by the Engineer's Representative. After concreting, the exposed surfaces of the shuttering shall be cleaned of all adhering concrete before depositing fresh concrete.

Q4)A-

The various types of base courses covered by this Section of the Specification are as follows:—

1. Crushed-Limestone Base Course.
2. Crushed-Gravel Base Course.
3. Vibratory-Compacted Macadam Stone Base Course.

The material requirements for various types of base courses shall be as follows:—

1. Crushed-Limestone and Crushed-Gravel Base Course: The material for the crushed limestone or crushed-gravel base course shall be composed of hard sound, durable crushed limestone, particles free from thin elongated, soft and disintegrated material or other objectionable matter. The crushed limestone or gravel shall be produced from the sources shown on the Drawings or from sources selected by the Contractor and approved by the Engineer's Representative. Preliminary approval of sources shall not mean that all material in such sources is acceptable. When the grading and fracture requirements cannot be produced by utilising all of the pit-run material, portions of the raw material, as may be required, shall be removed by mechanical screening prior to the crushing operations.Boulders encountered in the pit, up to 25cm in the largest dimension,

shall be processed by mechanical crushing. The crushed limestone or gravel as finally processed shall comply with the following requirements:

(a) Grading according to the specification.

The fraction of the material passing the 0-075mm (No. 200) sieve shall not be more than 60% of the fraction passing the 0-425mm (No. 40) sieve. When using crushed gravel the percentage passing the 0-075 (No. 200) sieve shall be 5-12%.

(b) Fracture: The fraction of the aggregate retained on the sieve shall contain at least 75% by weight of crushed particles having more than one fractured face.

(c) Abrasion Loss: The abrasion loss of the crushed limestone as determined by AASHTO Standard Method T96-74 shall not exceed 45%.

(d) Fines: Thefraction of the aggregate passing the 2mm (No. 10) sieve shall consistof limestone or gravel screenings and shall be free of loam, organic or other foreign matter. The material passing the 0-425mm (No. 40) sieve, when prepared in accordance with AASHTO Standard Method Tl 46-49 and tested by the appropriate methods, shall conform with the following requirements:

AASHTO Standard Method Maximum

Liquid Limit T89-68 25%

Plasticity Index T90-70 • 4%

(e) Gypsum content. The gypsum content of crushed gravel in terms of So_3 shall notbe more than 5% by weigh.

(f) The California bearing ratio of the base course when tested in accordance with ASTM D 1883 at 95% modified compaction shall not be less than 80 % .

(g) The soundness test according to AASHTO T 104 shall, have a weighted loss of not more than 12% when subjected to 5 cycles of the test with sodium sulphate

solution , and not more than 18% when subjected to 5 cycles with magnesium sulphate solution.

B-Longitudinal cracks are long cracks that run parallel to the center line of the roadway. These maybe caused by frost heaving or joint failures or they may be load induced. Understanding thecause is critical to selecting the proper repair.

Multiple parallel cracks may eventually form from the initial crack. This phenomenon, known asdeterioration, is usually a sign that crack repairs are not the proper solution.

Filling or sealing longitudinal cracks can work if the cracks are narrow and not deteriorated toomuch. Figure 5 shows sealed longitudinal cracks. Multiple cracks may require patching or area repairs to fix the problem

Q5)A-

I-a II-b III-b IV-a V-c

B-Backfill material shall be approved by the Engineer's Representative and shall be free from stones or lumps exceeding 8cm in largest dimension, vegetable matter and other unsatisfactory material.If the Contractor allows material which, on excavation, is suitable for re-use to become unsuitable and it is in this Condition when required for backfilling, he shall make good by running it to spoil and replacing with other suitable material, or when directed by the Engineer's Representative, the moisture content of the backfilling material shall be adjusted, before

depositing in the trench, to facilitate so that after compaction its dry density is not less than that of the soil in the trench sides. Backfilling shall wherever practicable be undertaken immediately the specified operations preceding it
have been completed, and the works have been inspected and approved by the Engineer's Representative so as to reduce the lengths of trenches open at any one time.
When concrete haunches or surround have been placed, compaction by mechanical means shall not be commenced until at least four days have elapsed from the placing of the concrete.
The material shall be deposited in layers each not exceeding 15cm thickness and each compacted , unless other compacting equipment is required or agreed, power rammers or vibrating plate compactors. Where bedding material is specified just above the top of the pipes, then un powered hand tools shall be used.Regardless of the method of compaction, no traffic or heavy loads shall be allowed over the backfilled surfaces until the four days for the setting of concrete have elapsed. Movement of construction equipment over a culvert or pipe shall be at the Contractor's risk. Any pipe injured thereby shall be repaired or replaced at the opinion of the Engineer's Representative and at the contractor's own expense.

Q6)A-

I-True II-False...(1%) III-True IV-True IV-True

B-**1. Removal of Unsuitable Material:** In the event of unsuitable material as decided by the Engineer's Representative and defined in Clause R5 02-4 being found on the site of any embankment, cutting, bridge or drainage structure and borrow areas, the Contractor shall remove such material to the depth indicated on the Drawings or as directed by the Engineer's Representative in writing. No payment will be made for quantities of unsuitable material exceeding those stated in the Bill of Quantities unless the approval in writing of the Engineer's Representative is obtained prior to carrying out the work. Materials so removed shall be disposed of outside the Right of Way.

2. Diversions or Reshaping of Watercourses: Where directed by the Engineer's Representative streams or watercourses crossing or adjacent to the Works shall be diverted, enlarged or straightened.

Where in diversions or reshaping of streams or watercourses the original channels lie within the earthworks, such channels shall be cleaned of all vegetable growth and soft deposits and filled with approved material compacted in accordance with the Clause R5 11-4 hereof.

3. Intercepting Ditches to Protect Cuttings and Embankment: Open ditches to protect cuttings and embankments shall be constructed in accordance with the Drawings or as directed by the Engineer. Where possible intercepting ditches shall be constructed in advance of general earthworks in cuttings and embankments. Unless otherwise directed they shall be 30cm wide at the invert (bottom), of an average depth of 50cm and with the sides trimmed back to a slope of 1½ to 1.

4. Under draining of Embankments: