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The Application of Asphalt Concrete Construction Technology in Bridge Work

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Abstract: It took a foreign bridge construction as the example in this paper, and detailed the asphalt concrete to be applied for bridge construction technology. The asphalt paving works and safety factors are briefly discussed, and the construction organization detail of asphalt concrete was expounded.

Keywords: Bridge; Asphalt Concrete; Construction Technology; Health; Safety

1. Scope

The scope of this paper covers Asphalt Concrete works which includes saw cutting of existing Asphalt edges at the end and scarifying the existing Asphalt to a depth of 50mm construction shall clear the surface of all loose dirt. Supplying and applying liquid asphalt for tack coat conforming to specifications. Construction shall apply a tack coat to all concrete surfaces that will be in contact with the asphalt pavement. The tack coat shall be applied between the existing asphalt base course and the new wearing course, and vertical cut adjacent to the new asphalt. In case of any disturbance to the existing asphalt base course shall compact the existing base course again and conduct inspection. And shall provide Asphalt concrete wearing course from Company approved plant. The wearing course shall be smoothly tied in with the existing binder course pavement. Asphalt concrete wearing course shall be applied partially on either side of the dual carriageway for smooth flow of the traffic at both sides connecting roads, in the end, road marking shall be done.

2. Methodology

The sequence of the Construction Procedure is as follows;

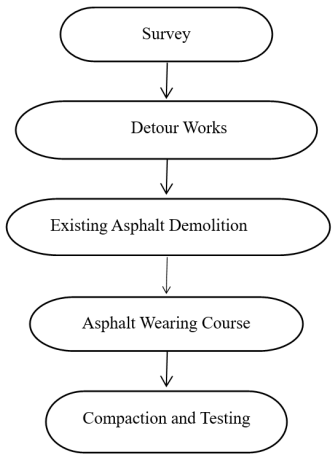

Fig.1 Process flow chart of asphalt concrete construction

2.1 Survey

Before execution, the contractor surveyor shall severely comply with IFC drawings and project requirements to position the central point of the horizontal axis of the area, the surveyor shall set out all the coordinates after verifying the Control Points provided by the company and getting approval from the Company Surveyor. Setting out and Levels shall be checked by the Company Surveyor Before the execution of the work.

2.2 Detour Works

It shall provide temporary barricades on one side of the dual carriageway and do the barricading in the middle of one side of the highway for the smooth flow of traffic on both sides Connecting roads considering the safety and amenity of road users and the public, Site security and site access through signage avoiding delay and inconvenience management Speed limit signage Traffic transfer (switch) arrangements and procedures Maintenance during Construction. Traffic and Safety Management Responsibilities construction staging including detailing the intersection layout and capacities for every construction stage Impact of construction traffic on local roads in particular to Sand track and Emergency and Incident Response Plans.

2.3 Existing Asphalt Demolition

It shall demolish asphalt from connecting roads by the milling machine. The Company representative will verify the Contractor's cross-slope measurements by randomly taking a minimum of ten cross-slope measurements per lane per mile in tangent sections, control points in transition sections, and a minimum of three cross-slope measurements on fully super elevated sections. Construction will measure the cross slope of the milled surface by placing the level at the center location of a lane and perpendicular to the roadway center line. If the average absolute deviation or an individual cross slope deviation falls outside the acceptance tolerance, immediately make a comparison check at the QC test locations to verify the QC measurements in the questionable section. If the comparisons are beyond the acceptable comparison tolerance, stop the milling operation until the problem is resolved to the satisfaction of the Company. Correct any cross slope not meeting the individual deviation acceptance tolerance at no cost to the Company. The Contractor shall check the cross slope of the milled surface at any time by taking cross-slope measurements at any location.

Fig.2 Existing Asphalt Demolition

2.4 Asphalt Wearing Course

The asphalt Wearing course shall be laid in thickness and dimensions provided in the drawings. The execution procedures shall be divided into the following sections, which are:

A) Tack Coat.

B) Binder course.

C) Inspection & Testing.

A) Tack Coat

i) The material (which shall be primarily approved by the Company) shall be applied at the rate of 0.3 to 0.6 lit/sqm at the temperature Between 70 - 90°C above the binder and where there is a joint with the existing asphalt surface.

ii) The surface shall be cured for the period until a tacky surface is visible and acceptable to the Company representative.

B) Wearing Course

i) The hot asphalt mix shall be spread over the cured surface of the tack coat by automatic asphalt paver to the required profile and thickness.

ii) The mix shall be compacted as soon as possible after spreading the material. The tandem roller shall follow the laying operation to carry out breakdown rolling up to a temperature of 110- 120°C.

Self-propelled rollers and Tandem rollers shall follow the breakdown rolling and sufficient passes shall be made to achieve the required compaction.

Rolling shall start from the sides and proceed toward the center. Each trip of the roller shall overlap the previous trip by at least 30 cm.

Roller wheels shall be kept moistened. The roller shall be able to reverse without backlash and shall be free from worn parts. Heavy tandem roller shall be used to complete all rolling including the elimination of waves caused by the lighter rollers Full compaction shall be obtained before the asphalt temperature reaches 100°C. Compaction shall follow the specification of relevant standards.

iii) Traffic shall not be allowed on this layer until it is properly cooled, a minimum period of 12 hours shall be considered after the completion of the rolling.

iv) Test holes shall be made good with hot asphalt mix and compacted using Marshal Hammer.`

C) Compaction and Testing

Compaction and Testing shall be conducted by the Company's approved third party and laboratory. Contractor QA/QC shall reach the Asphalt plant prior to any Asphalt loading check the temperature and quality and then allow the Trailers to leave for the site. No Asphalt laying shall start without the presence of a company representative, third-party technician, and contractor QA/QC. Third-party shall take samples and take Company representative approval for temperature and quality and then Asphalt laying shall start after approval from the Company representative, also tests shall be carried out as per the approved Field Quality Control Plan of Asphalt Work. After the wearing course. Third-party shall take coring samples from the asphalt together with the Company representative and Contractor QA/QC, also tests shall be carried out as per the approved ITP of Asphalt Work.

3. Equipment and Resources

The contractor shall provide all types, sizes, and numbers of equipment that are necessary for the Asphalt Concrete Pavement including but not limited to Asphalt Paver, Pneumatic Roller, Dump Truck, Loader, Water Tank Truck, Bobcat, Asphalt Compaction Roller, Survey Instruments (GPS), Plate Compactor.

4. Quality Assurance and Quality Control

The Contractor shall sample and test all types of materials covered by the specifications as necessary to confirm the quality of materials entering the work. The Contractor shall furnish the test results to the Company within twenty-four (24) hours after completion of the test. On completion of the work, the QA/QC Inspector shall inspect the work and verify the elevation. The inspector shall raise the RFI to Saudi Aramco before 24 hours. The contractor QA/QC Inspector shall raise RFI Conduct Inspections for the area and take Company approval for Levelling and compaction 24 hours prior to the Asphalt laying. Testing shall be conducted by the Company's approved third-party site laboratory. Relevant QC records shall be kept by the Contractor's QC Inspector. Contractor Plant QA/QC shall reach the Asphalt plant prior to any Asphalt loading shall check the temperature and quality and then allow the Trailers to leave for the site. Asphalt laying shall not start without the presence of the company representative, third-party technician, and contractor QA/QC. Third-party shall take samples and take Company representative approval for temperature and quality and then Asphalt laying shall start after approval from the Company representative, also tests shall be carried out as per the approved Field Quality Control Plan of Asphalt Work. The contractor QA/QC supervisor shall closely monitor and ensure all activities are carried out as per construction specification requirements and shall conduct frequent inspections and maintain all records as required by the project QA/QC program.

5. Health, Safety and Risk Assessment

The health and safety shall severely monitor all construction activities to ensure that all the work is being carried out safely and creating a healthy environment at the site. All works performed by individuals shall comply with the health and safety standards.

5.1 Hazardous Materials

i) When hazardous materials are known or suspected (e.g. sludge, asbestos, etc.), work shall not be started until authorized safety personnel is contacted and has evaluated the potential hazard(s) and specified the precautions to be taken.

ii) If materials suspected of being hazardous are unearthed during Asphalt activities, all work shall stop until the material is identified by SA EPD, appropriate removal and disposal procedures are established, and work practices are modified as needed.

5.2 Protective & Safety Equipment

Personal Protective Equipment's mandatory at the site all the time.

5.3 Information to Personnel

i) The supervisor shall conduct a prestart meeting before the commencement of any job and he must deliver enough knowledge to the worker about the task.

ii) Working area permit and permission shall be prepared as per drawing and closely supervised.

iii) All work permit and permission shall be obtained as per drawing and closely supervised.

iv) During any lifting, the working area shall be barricaded with a sign board.

v) All equipment shall be parked away from the edge of the Road.

vi) Safety officer and supervisor both shall closely monitor the work.

vii) All equipment shall be equipped with a backup alarm, a fire extinguisher, and a seatbelt.

viii) The Operator shall have a license and shall be third-party certified.

ix) A skilled flag shall be responsible for controlling the movement of all heavy equipment.

x) Sufficient drinking water will be available for the workforce at all times.

xi) Heat stress shelter and beach umbrella shall be provided on-site for the worker.

6. Conclusion

Asphalt concrete construction is an important part of the bridge pavement project. It is very important to do a good job of asphalt concrete pavement construction operations. As a construction unit, it should be familiar with the main points of the construction technology of asphalt concrete pavement, prepare before construction, formulate reasonable and scientific construction technical measures, do a good job of HSSE management, and provide certain references for subsequent construction.

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