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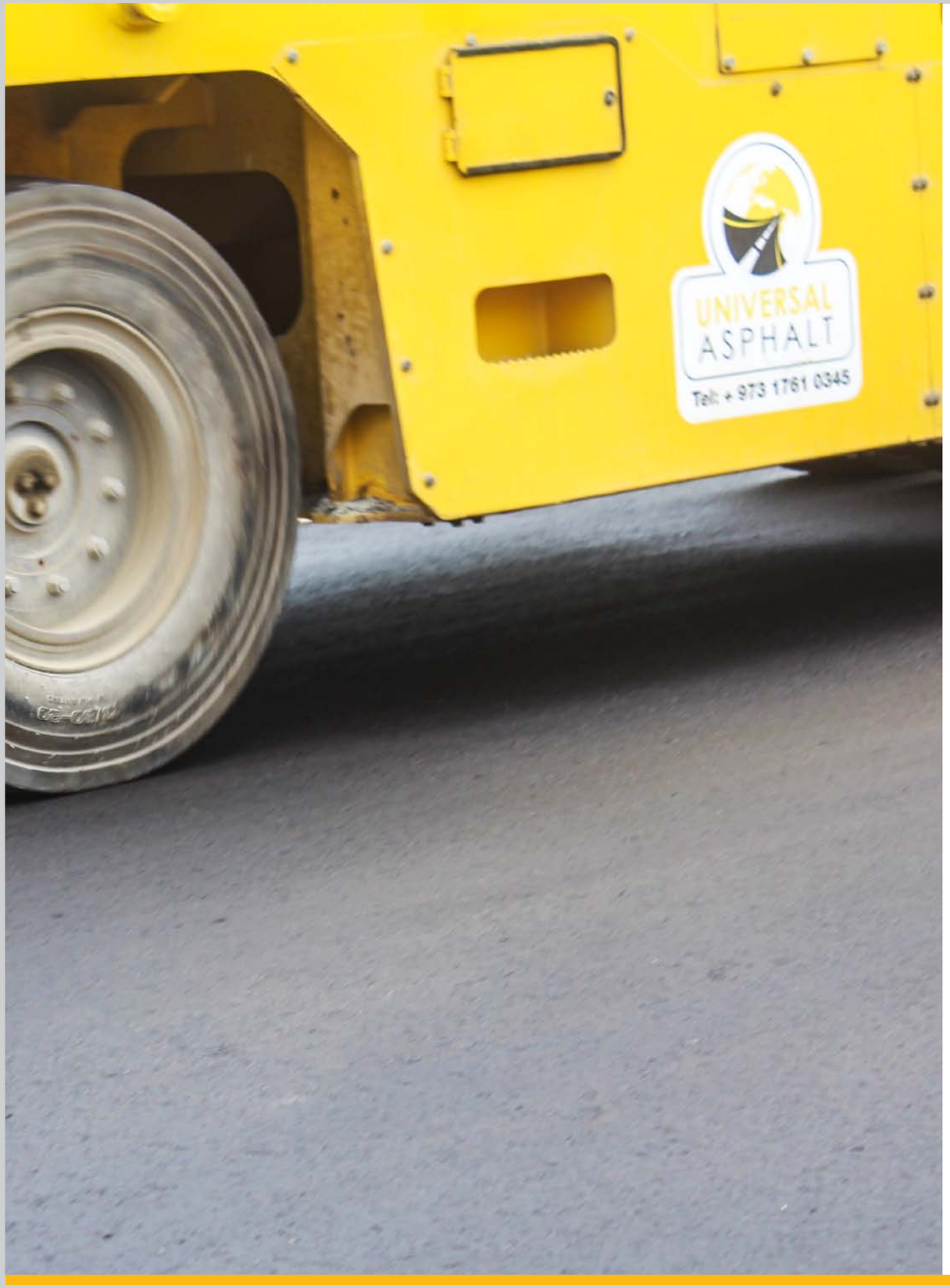
UNIVERSAL ASPHALT

QUALITY ROADS DRIVE
**TO QUALITY LIFE**

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# **ABOUT** COMPANY

- **Universal Asphalt "UA"** is making foot step in the segment of Hot Mix Asphalt, Bitumen Emulsion, and Polymer Modified Bitumen. This is the new wing of the parent company The Sayed Kadhem Al Durazi & Sons. (B.S.C.) © named SKD group is (ISO: 9001-2015; ISO 14001: 2015 and ISO 45001: 2018 certified company.

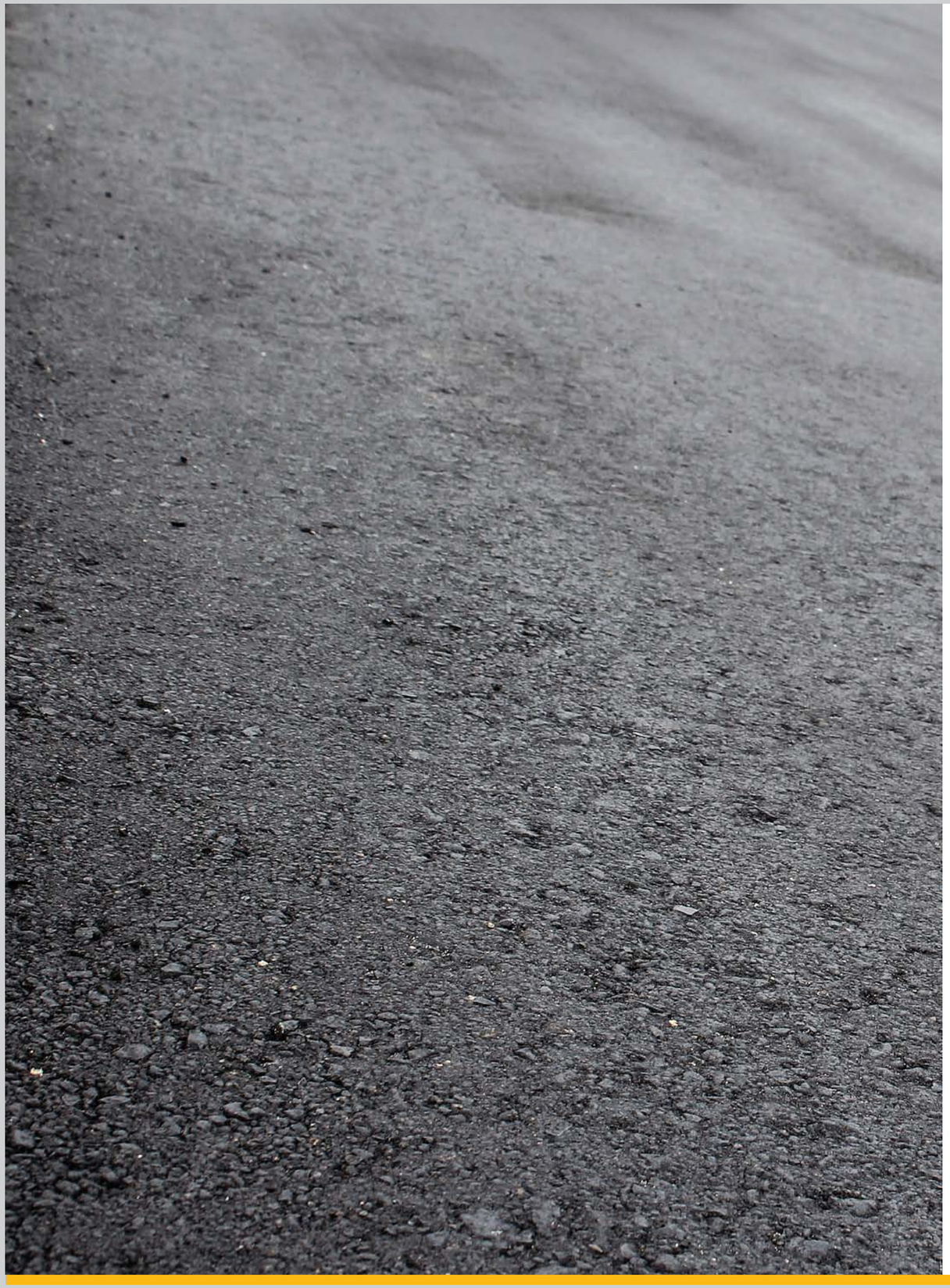
- Our parent company named "The Sayed Kadhem Al Durazi & Sons Co. BSC ©" started its activity as a small "Brick Factory", founded by the current Chairman, Mr. Sayed Kadhem Mohsin Al Durazi. It was in 1963 that he owned two trucks and started the transporting business.

- Our associated and accredited companies are "Al Haidariya Heavy Equipment Hiring", is now biggest fleet of heavy equipment for civil and road construction, Grand Tiger, SK Contracting, SK Electrical, Universal Ready Mix Concrete, Universal Foundations, Universal Block Factory, Single Point Building Material, Single Point Plastic, Single Point Aluminum, SK Commercial.

- UA and its associated fellow companies can deliver Universal Solutions at a Single Point for any kind of Infrastructure and Road Construction Works starting from Earthwork, Road Base Work, Base Course, Wearing Course, Drainage Networks, Safety Fencing, Signage, Road Lighting Works, Kerbs and Paver blocks for footpath and near traffic signal junction as per demand and design of customers.

- UA can deliver complete Road Maintenance Services which covers: solution for rutting, cracking (crack sealing), surface rejuvenating through fog seal, slurry sealing, seal coating, repairing of drive-ways, and parking areas.

- We are AA Class project executor having well trained and experience team.



## VISION:

To become market leader in Hot Mix Asphalt segment in the region.

## MISSION:

**To delight our valued customers by;**

1. Providing superior quality products
2. Providing technical support to customers at site
3. Maintaining unique Quality standard.
   With our responsibilities towards ENVIRONMENT and HEALTH and SAFETY of all concerns.

## OBJECTIVES:

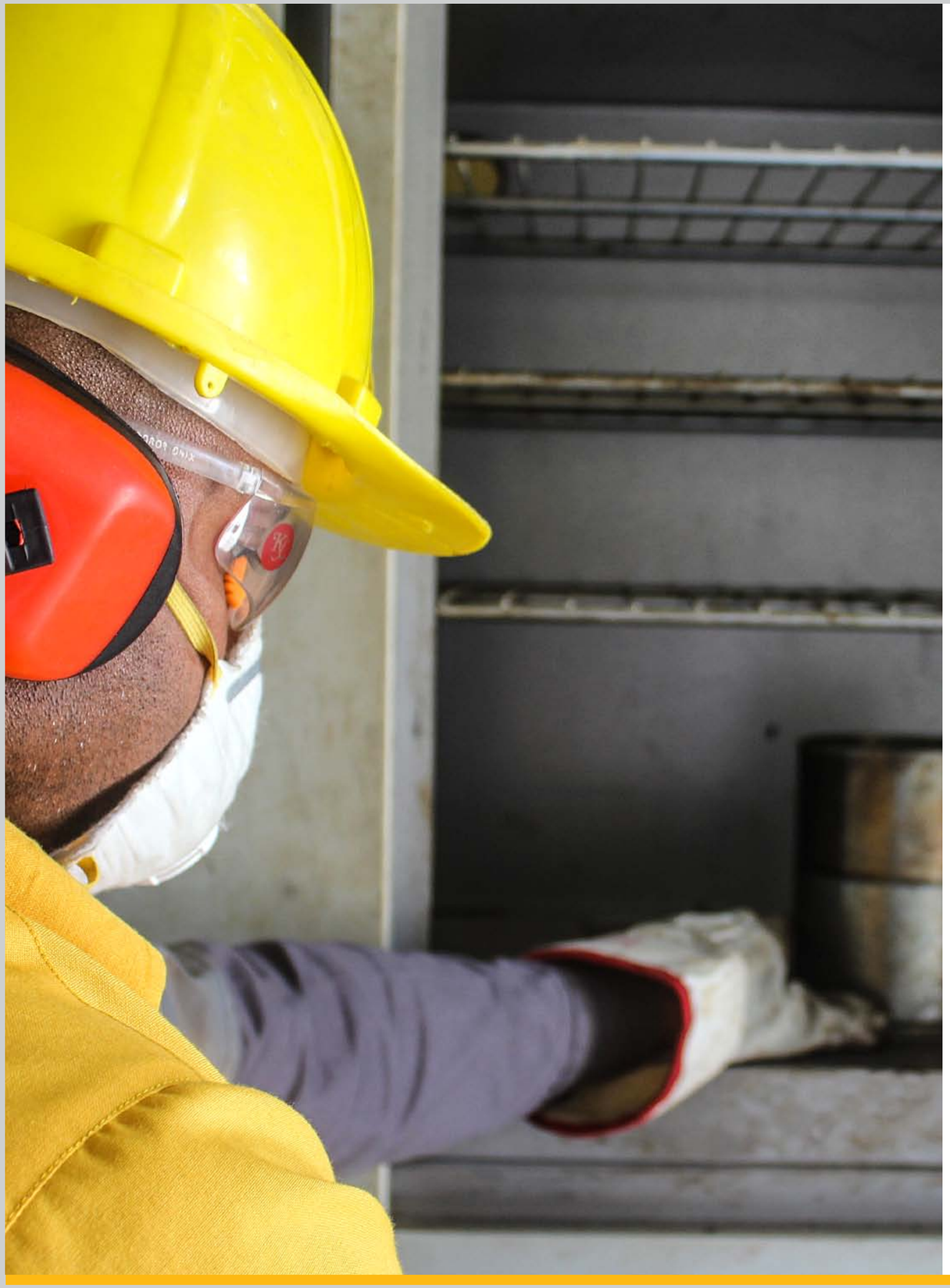
- To provide a range of quality products and services with latest available technologies to meet the customers' requirements and to comply with the relevant National and International standards.

- Asphalt Pavement Recycling with Reclaimed Asphalt Pavement (RAP) Environmental stewardship is designated as a major focus area.

- The Asphalt project aims at developing a cost and precision optimized solution taking the advantage, further more it will result in a better road quality.

- To meet these objectives, we are having dedicated team of engineers, and quality control specialists equipped with advanced machinery and state of art testing facilities to ensure the products' parameters.

- At **Universal Asphalt**, we are fully committed to the standards and act proactively to resolve any quality issues that may arise and work on preventive action system. We are fully dedicated to provide our products and services to customers on a timely basis in accordance with their needs.



## SKAD's Group of Companies

# Integrated Management System (IMS)/QHSE Policy

Universal Asphalt, is in business of manufacturing, sales of Hot Mix Asphalt, Modified Bitumen and Bitumen Emulsion in Bahrain. We at "UA" are deeply committed to retain and maintain our leadership position in quality hot mix asphalt by meeting and exceeding quality, environmental, health and safety needs of all our associated personnel.

Universal Asphalt strive to fulfill its commitment by:

A. QUALITY MANAGEMENT SYSTEM (QMS)

1. Delighting customer by meeting and exceeding their expectations.
2. Meeting national and international standards in terms of quality products.
3. Comply with applicable legal, statutory and other requirements.
4. Strive for continual improvement in its processes through Integrated Management System.

B. OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM (OHSMS)

1. Operate and maintain plant & machinery within designated safety criteria throughout its life.
2. Adopt appropriate control measures to prevent injuries, occupational illness.
3. Implant proactive, safe culture amongst its employees, contract workmen and other related personnel through education and empowerment.

C.ENVIRONMENT MANAGEMENT SYSTEM (EMS)

1. Design and deploy environmentally sound processes for production and product handling at all stages.
2. Conserve key resources like electricity, water, fuels through efficient plant operations.
3. To develop green belt area and to keep continuous watch on all environmental aspects (activities) to minimize possible environmental impacts.

Management at all levels will be responsible and accountable for deployment of this policy.


# 7 FUNDAMENTALS/PILLARS
## FOR STRONG FOUNDATION

**1. QUALITY:**
"A measure of excellence or a state of being free from defects, deficiencies and significant variations."

We believe that Quality is only a single tool through which we can sharpen the diamond of our customer and our own organization too.

**2. INTEGRITY:**
"A concept of consistency of actions, values, methods, measures, principles, expectations, and morals."

Unity, Understanding and proper Communication leads to integrity amongst all the department and resulting in excellent performance.

**3. EXCELLENCE:**
"A talent or quality which is unusually good and so surpasses ordinary standards." Quality, delivery in time and the competitive cost drives towards the road of excellence.

**4. TEAM WORK:**
"Cooperative effort by the members of a group to achieve a common goal."

All in one, and one in all abilities, skills and responsibilities will give single desired output from all department.

**5. COMMITMENT:**
"An agreement to perform a particular activity at a certain time in the future under certain circumstances."

We are committed towards our commitment of Excellence.

**6. SAFE ENVIRONMENT:**
"Sum of all living and non-living things i.e.; flora, fauna, creatures, air, water and soil that surround an organism" Environmental safety is our prime responsibility.

**7. CONTINUOUS IMPROVEMENT:**
"An ongoing effort to improve products, services, or processes."

Strive for continual improvement in processes through Integrated Management System.


## **WE AT UNIVERSAL ASPHALT** are strongly and totally believe that:

1. ‘Quality Roads drives to Quality Life’.
2. Quality and Safety have the uppermost priority.
3. Quality is one of the important Key Performance Indicator.
4. Quality is only a single tool through which we can sharpen the diamond of our customer and our own organization too.
5. We abide and committed to supply quality products and services consistently to fulfil customer requirements.
6. Through Integrated Management System we try to impart continual improvement in Quality which is one of our continuous program.
7. At Universal Asphalt, we are fully committed to the standards and act proactively to resolve any quality issues that may arise and work on preventive action system.
8. To provide a range of quality products and services with latest available technologies to meet the customers’ requirements and to comply with the relevant National and International standards.

# **Quality** Tests

## AGGREGATE EVALUATION

## MOISTURE CONTENT

## HOT AIR OVEN

## RELATIVE DENSITY OF SOIL

## LOS ANGELES ABRASION TEST

## LIQUID LIMIT DEVICE

## MAXIMUM THEORETICAL SPECIFIC GRAVITY

## BULK SPECIFIC GRAVITY OF A COMPACTED ASPHALT

## THE MARSHALL STABILITY AND FLOW TEST

## **PRODUCT** RANGE

- Base Course Asphalt
- Wearing Course Asphalt
- Sub base works
- Pavement works
- Different grades of aggregates (produced in our own Crusher)
- Bitumen Emulsion
- Modified Bitumen

| Product Name | Category | Application | Utilized for |
|---|---|---|---|
| **GB-28** | 28 mm Gabbro Asphalt | Base course | 1. Single and multiple layers for roads<br>2. Heavy traffic areas. |
| **TM-5** | 20 mm Gabbro Asphalt | Wearing course | 1. Airport runways<br>2. Highways |
| **GL-10** | 10 mm Gabbro Asphalt | Wearing course | 1. Car parking<br>2. Tennis Court |
| **Sand Asphalt** | Sand Asphalt | Low stress area | 1. Base work of storage tanks |
| **BRM-14** | 14 mm Wearing course with polymer modified bitumen | Wearing course | 1. Highways<br>2. Airport runways<br>3. Traffic signals<br>4. High stress areas |

## PROJECTS:

| Employer | TITLE |
|---|---|
| **Al Khaldiya** | Construction of 77 Nos. of Town Houses Type 3M at Site 134, Blk 903 & 909 East Riffa |
| **Ministry of Works** | Reconstruction of Sh Isa Bin Salman Highway (Between Bahrain Map Interchange & Sitra Causeway Limits) |
| **Abdulla Hasan Al Durazi** | Infrastructure Works for 156 Houses at Site 145, Block 1048, Dar Kulayb |
| **N S Holding** | Installation of Temporary Roads - Nurana |
| **Amar Holding Co. BSC** | Temporary Road Works For Investment Gateway - (HIDD) |
| **Manara Development** | Road Works For Wahat Al Muharraq At Galali |
| **Al Areen Holding Co BSC** | Infrastructure Works for Al Areen Development |
| **Ministry of Works** | Muharraq Ring Road Phase 1 |
| **Ministry of Works** | Access from King Hamad Highway to Al Hussaya Block 948 |
| **Ministry of Works** | Opening of Roads in Busaiteen Phase 2 Block 226 & 228 |
| **Ministry of Works** | Opening of Roads in Tubli Block 711 Road 1135 & Environs. |
| **ARCH Groups** | Road Works at East Riffa |
| **Ahli United Bank** | Construction of 80 Villas - Hamala |
| **Ministry of Housing** | Infrastructure Works at Al Madina Al Shamaliya |
| **Mohammed Abdul Mohsin Al Kharafi & Sons** | Temporary Causewat at Al Madina Al Shamaliya |
| **Electricity & Water Authority** | Measured Term Contract Works with EWA |
| **Ministry of Works - RPMD** | Asphalt Surfacing & Reinstatement Term Contract |




## **OUR** SERVICES:

1. To provide technical support for road construction at site.
2. One point solution for all means of heavy equipment for road construction.
3. Single source for all kinds of road construction materials.

## GROUP OF COMPANIES

GROUP OF COMPANIES

Grand Tiger
MECHANICAL & INDUSTRIAL

Travel & Tourism
TRUST
الثقة للسفر و السياحة

SinglePoint
ALUMINUM

ALHAIDARIYA
HEAVY EQUIPMENT HIRING

INTELLIGENT E-BUSINESS
SOLUTIONS

UNIVERSAL
MANPOWER

يونيفرسال
universal Foundations

SinglePoint
Building Materials
سنجل بوينت
لمواد البناء
SINGLE POINT

SinglePoint
CARPENTRY

Universal
Block Factory

يونيفرسال
universal REAL ESTATE

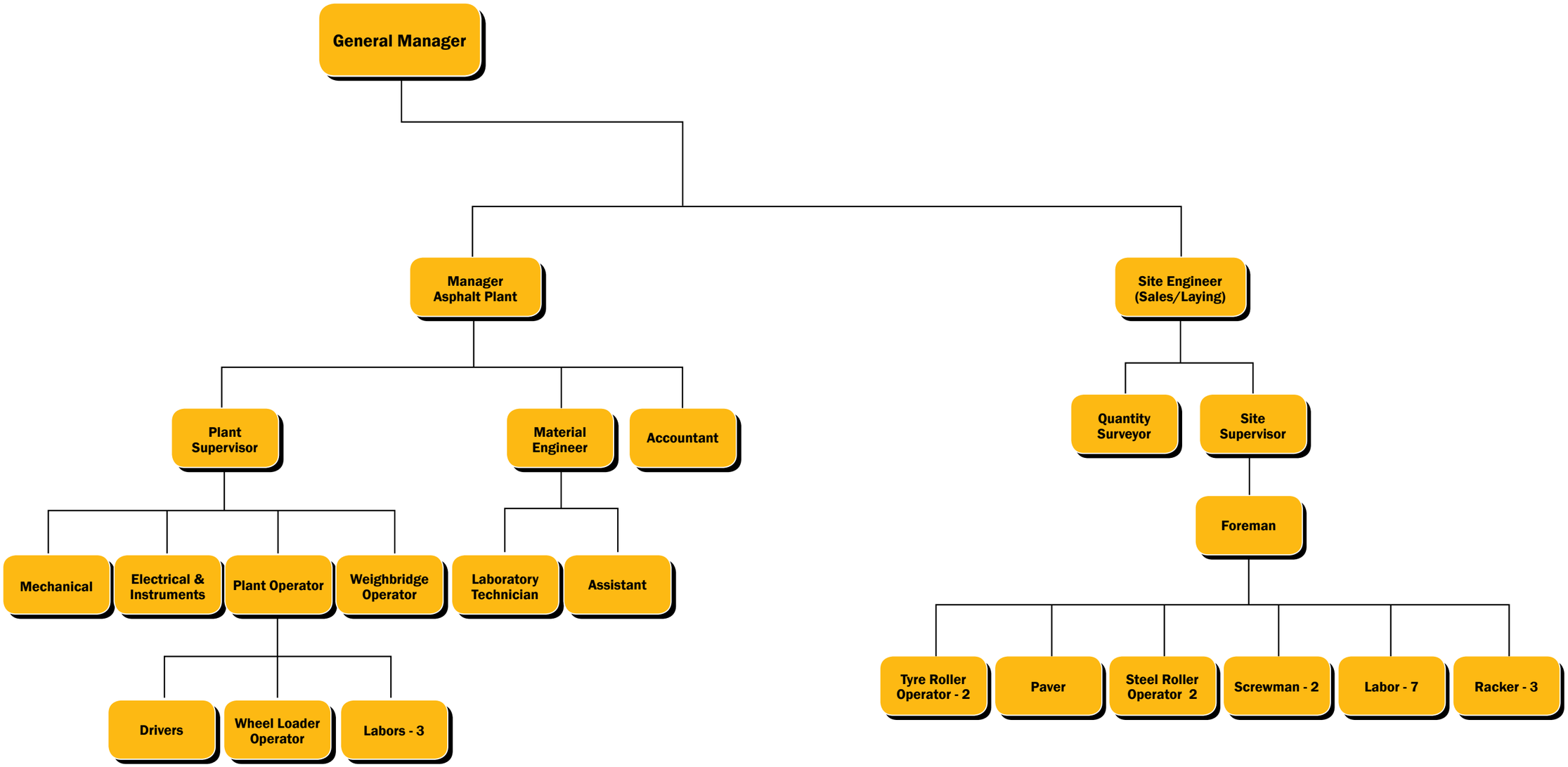
SINGLE POINT
HEAVY LIFTING

SinglePoint
PLASTIC

يونيفرسال للخرسانة الجاهزة
universal READYMIX CONCRETE

UNIVERSAL AGRICULTURE
يونيفرسال للزراعة
Universal Agriculture

# ORGANIZATION CHART



# PLANT AND MACHINERY

## PLANT

Plant delivers cutting-edge technology and includes all the features of current and future plant concepts. This batch mixing plant is optimized to reduce wear and maintenance, and is easily accessible. State - of - the – art electronics, sensors and fully automated control technology guarantee consistent high – quality mixed product.


## PLANT SPECIFICATIONS

We are having state of art and modern Ammann make Just Black Plant having following specifications:

| S. N. | Specification of Plant | Unit | Qty |
|---|---|---|---|
| 1 | Plant Capacity | (ton/hr) | 160 |
| 2 | Number of cold feeders | Nos. | 5 |
| 3 | Content cold feeders | m3 | 10 |
| 4 | Drying drum | Diameter / length | 2.2/ 8 |
| 5 | Drum drive | Kw | 4 × 11 kW |
| 6 | Max. drying capacity at 5 % moisture | (ton/hr) | 161 |
| 7 | Burner power output | MW | 13.9 |
| 8 | Filter capacity | $Nm^3/h$ | 38000 |
| 9 | Filter surface | $m^2$ | 590 |
| 10 | Screening | Fraction | 4 - or 5 |
| 11 | Screen surface | $m^2$ | 27.8 |
| 12 | Number of screen decks | Nos. | 5 |
| 13 | Hot aggregate silo 1-row | Ton | 16 |
| 14 | Aggregate scale | Kg | 2000 |
| 15 | Filler scale | Kg | 250 |
| 16 | Bitumen scale | Kg | 185 |
| 17 | Mixer size | Kg | 2000 |

## PLANT MACHINERIES

**Drying drum and burner**

- The blade of dryer is design with German technology to deliver outstanding efficient drying and heating process with reduced energy consumption.
- The low emissions resulted due to special electronic control of the burner which regulates the mix processing.

**Screen**

- Screens have the largest screening area.
- Advanced charging system with wear-resistant fetures leads to uniform distribution of the particle mix.

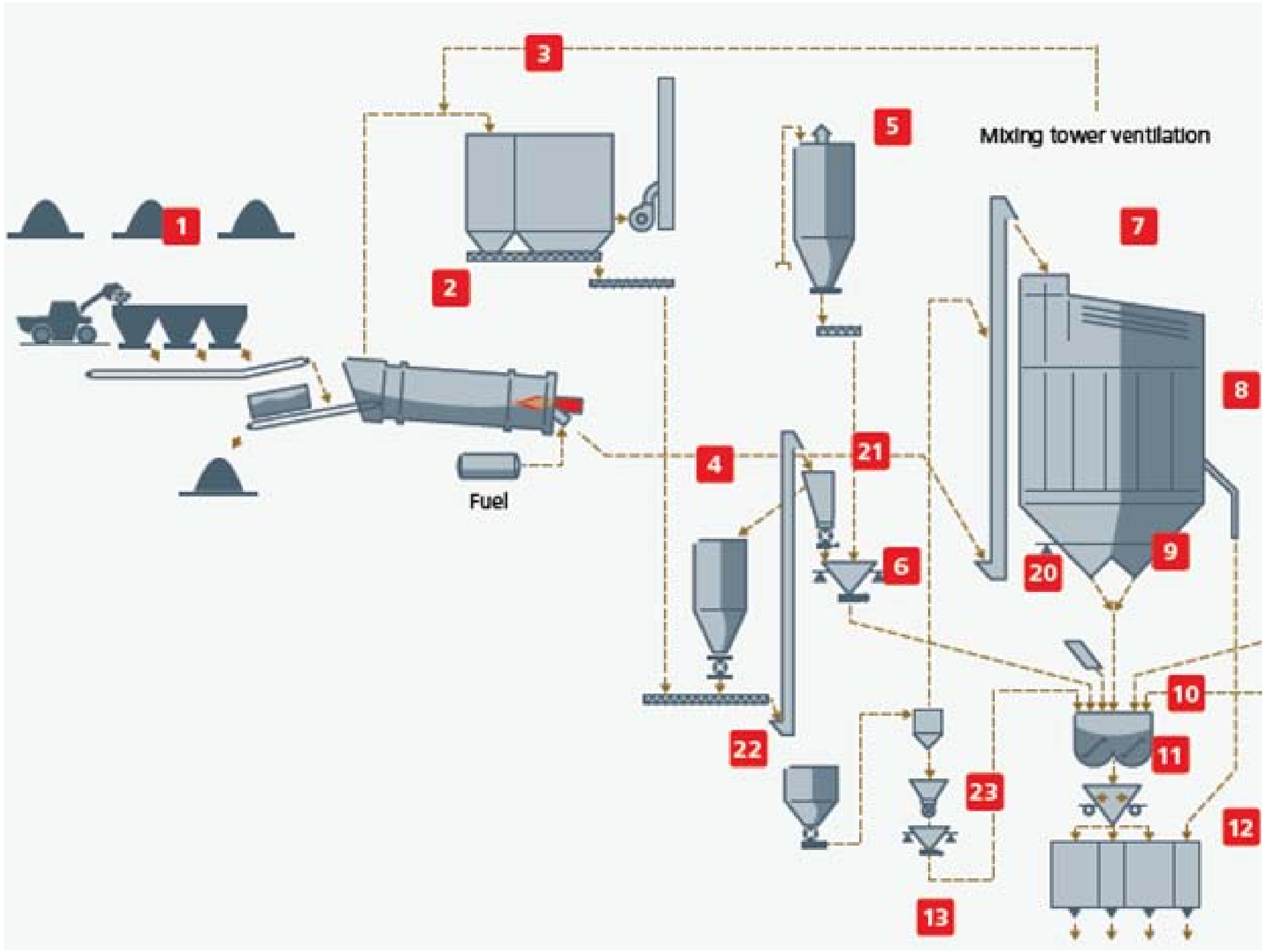
**Filter**

- Capacity utilization is enhanced through uniform distribution of exhaust air in the filter.
- The new design of the filter has drastically reduced the temperature drop
- The highly accurate pre-separator reduces the load on the filter

**Mixer**

- Minimum energy consumption and ultra-fast homogeneous mixing resulted due to top configuration of the mixing.
- Energy efficiency is enhance by reducing net mass of the drive units.

## **PROCESS** FLOWCHART




**In Process Flow Chart:**

1. Cold feeders
2. Drying drum with burner
3. Filter
4. Reclaimed filler silo
5. Imported filler silo
6. Filler scale
7. Screen
8. Hot aggregate silo
9. Aggregate scale
10. Mixer
11. Movable hopper
12. Hot mix storage silo
13. as1 control system
20. Foamed bitumen addition
21. Buffer silo for filler
22. Fibre granulate addition
23. Fibre granulate scale

# ROAD CONSTRUCTION
## EQUIPMENT

Al Haidariya is ultimate source in the Kingdom of Bahrain for heavy machines for all your industrial plant needs; we have the largest selection in quantity and selection for road construction purpose, such as: Wheel Loaders, Skid Steer Loaders, Excavators, Dozers, Rock Breakers, Forklifts, Vibratory Soil, Compactor/Rollers, Telescopic, Telehandler, Dump Trucks, Water Tankers, Cranes, Truck Mounted Cranes, Generators, Port-A-Cabins, Road Sweepers, etc.

Apart from above we are having dedicated and advanced road construction equipment as mentioned below:

| Equipment | Nos. |
|---|---|
| Roller CC3800HF | 4 |
| Roller CC1100 | 4 |
| Pneumatic Tyre Roller CP275 | 4 |
| Tracked Paver SD2500C | 2 |
| Wheeled Paver F1700W | 1 |
| Wirtgen Cold Planer W130 | 1 |
| Wirtgen Cold Planer W200 | 1 |

# LABORATORY INSTRUMENT

We are having State-of-art Quality Control department fully equipped with latest available modern instruments of ELE make. List of instruments are:

| Sr. No. | Description |
|---|---|
| 1 | Buoyancy Balance Electronic - 4.5 KG X 0.01g (Digital) With Frame, Water Tank and wire Baskets |
| 2 | Electronic Balance – 200 g X0.1 mg (Digital) |
| 3 | Semi Automatic Balance – 7 kg X 1/2 g Division with Scoop |
| 4 | Standard Weight – 10 kg,5kg,2kg,1kg,500gm,200gm,100gm |
| 5 | Semi Automatic Balance – 25 kg X 1 g Division with Scoop |
| 6 | Digital Thermometer With Standard Probe |
| 7 | Glass Thermometer (–10–250 deg C) |
| 8 | Drying Oven 225 Litre Cap. 220–240V 50–60Hz. Fan–Circulated. Supplied with 4 Shelves & 1–Year Warranty. |
| 9 | Marshall Test 50 Machine 50kN<br>Capacity. 220□240V 60Hz 1Ph.<br>Breaking Head Stability Mould<br>Flow Meter (Dial Gauge) BS. Supplied Complete with Flow Meter Pedestal. 50 kN Clamped Boss Load Ring Complete with Dial Gauge and Calibration on Certificate. Height 248 mm. |
| 10 | Constant temperature water bath - digital for marshal test |
| 11 | Cone Penetrometer. Complete with Stainless Steel Test Cone. Test Gauge for Checking Condition of Cone Point. Penetration Test Cup. |
| 12 | Electrical Hotplate with Integral<br>Magnet Stirrer 220-240V 1Ph; 50/60Hz<br>Ring and Ball Apparatus. |
| 13 | Binder Recovery Apparatus (Vacuum Pump, Water Bath and Flasks) |
| 14 | Rotatest 3000 220/240V 50/60Hz 1Ph.<br>Supplied with 100 Filter Discs. (Bottle roller with steel bottle) |
| 15 | Laboratory Centrifuge With 8 x 100 ml 8 Place Swing-Out Rotor 8 Buckets and 8 x 100 ml Plastic Tube with Cap |
| 16 | Burette With Stand along with Pipette |
| 17 | Hot Plate Electric |
| 18 | Solvent Evaporator |
| 19 | Compaction Mould BS 598 Incl.<br>Filling/Extraction Collar Mould Body and Baseplate. |
| 20 | Auto compactor 100A. Automatic Marshall Compactor. BS 598-107. for 220-240V; 60Hz 1Ph. |


| Sr. No. | Description |
|---|---|
| 20 | Auto compactor 100A. Automatic Marshall Compactor. BS 598-107. for 220-240V; 60Hz 1Ph. |
| 21 | Proctor/Core Cutter Extruder Frame and Hydraulic Jack. Extrudes100mm/4 Inch Diameter Specimens |
| 22 | Wire basket |
| 23 | Los Angeles Abrasion Machine Meets ASTM and European Standards. 220-240V 60Hz 1Ph. Set of 12 Abrasive Charges (ASTM). |
| 24 | GMM apparatus (Vacuum Pump, Pycnometers & Stand) |
| 25 | Core Drill Unit Petrol Motor. Vertical Drilling Mode Only.<br>100mm Core Barrel Solid Back End Type<br>150mm Core Barrel Solid Back End Type |
| 26 | Sieve Shaker |
| 27 | Riffle Box Sample Splitter Approx – 20 Kg X 3 Box - Asphalt |
| 28 | Riffle Box Sample Splitter Large - X 3 Box - Aggregate |
| 29 | Riffle Box Sample Splitter Medium X 3 Box - Aggregate |
| 30 | Riffle Box Sample Splitter Small X 3 Box - Aggregate |
| 31 | Riffle Box Sample Splitter Mini X 3 Box - Aggregate |
| 32 | Flakiness Gauge |
| 33 | Elongation Gauge |
| 34 | Compaction Hammer (manual) |
| 35 | Metal Measure 0.01M3 - With Tamping Rod |
| 36 | Absorption Cone & Tamping Rod (Cone Replaced With New one ) |
| 37 | Density Bottle 100 ml |
| 38 | Density Bottle 50 ml |
| 39 | 100 mm Sand Pouring Cylinder |
| 40 | 100 mm Calibrating Container (100 mm ID X 150 mm DX200 mm Dia) |
| 41 | Metal Tray, (300 mm Sq. X 40 mm Deep with a 100 mm Dia Hole) |
| 42 | B.S Standard Sieves 300 diameter - 28mm,25mm,20mm,19mm, 14mm,12.5mm,10mm,6.3mm, 5mm,3.35mm,2.36mm,1.18mm,600um,425um,300um,212 um 150um,75um,PAN,LID |
| 43 | B.S Standard Sieves 200 diameter - 28mm,25mm, 20mm,19 mm,14mm,12.5mm,10mm,6.3mm,5mm,3.35mm,2.36mm,1.1 8mm,600um,425um,300um, 212um 150um,75um,PAN,LID |
| 44 | Troxler Portable Basic Model Gyratory Compactor<br>Mfr : Troxler - U.S.A. / E.C. |

# LABORATORY INSTRUMENT

### Dynamic Shear Rheometer (DSR)

The dynamic shear rheometer is used to characterize the viscoelastic behavior of asphalt binders at intermediate temperatures (4C-40□C) and at the highest pavement temperatures (46-82C). It does this by measuring the complex shear modulus (G*) and phase angle (d) of asphalt binders.

### Rolling Thin Film Oven (RTFO)

The RTFO is used because it is repeatable and continually exposes fresh binder to heat and air flow.

Asphalt binders age primarily due to two different mechanisms: loss of light oils present in the asphalt (volatilization) and reaction with oxygen from the environment (oxidation). During manufacturing of asphalt concrete in the hot mixing facility and during lay down and construction, binders age due to both mechanisms because of the high temperature and air flow involved in the process. The rolling thin film oven (RTFO) is used to simulate this form of aging.

### Brookfield Rotational Viscometer (RV)

This apparatus is made up of a Brookfield viscometer and a Thermosel system, The Brookfield viscometer consists of a motor, spindle, control keys and digital readout. The motor powers the spindle with a torsional spring. The spring is wound as the torque increases. Torque in the spring is measured by a rotary transducer.

### NUCLEAR GAUGE

This instruments is used extensively to measure soil density and water content

### Los Angeles Abrasion Test

The Los Angeles (L.A.) abrasion test is a common test method used to indicate aggregate toughness and abrasion characteristics. Aggregate abrasion characteristics are important because the constituent aggregate in HMA must resist crushing, degradation and disintegration in order to produce a high quality HMA.

### Centrifuge Extractor

Centrifuge Extractors are used for quantitative determination of bitumen content in paving mixtures. These units require a relatively short processing time, which includes weighing the asphalt sample, heating the sample slightly until it starts crumbling, cooling the sample, placing it in the centrifuge extractor's rotor bowl and then adding solvent. The extractor's centrifugal action forces liquid through a filter paper ring at bowl's periphery, and the process is repeated until the expelled solvent is a clear color.


### Pavement core drilling machine

This core machine using the purpose of pavement get the thickness of the after paving and find the compaction of pavement.

# LABORATORY INSTRUMENT

## TRAVELLING BEAM DEVICE

The apparatus is used for detecting the road surface irregularity. It can be used either for concrete or asphalt pavements. The apparatus consists essentially of a beam with rigid wheels at the extremities and a wheel at the middle, which can detect any vertical deviation of the surface from a straight-line between the two wheels at the ends of the apparatus. Supplied complete with recording unit to obtain a graph of vertical deviations.

## Manual Marshall Compactor

Manual Marshall Compactor, allows manual compaction of a single 4in Marshall asphalt specimen in a stationary mold. Included is an oak pedestal, hammer support and guide rod, 10lb (4.5kg), 3-7/8in (98mm) diameter flat-face hammer, a MSA-100 4in mold, base and collar assembly, and a mold holder.

## Soil Cone Penetrometer

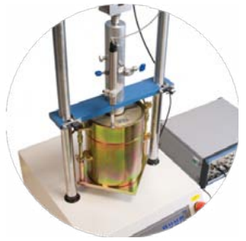
For determining the liquid limit of soil for Soil Testing - . This is specially useful to obtain reliable and accurate results of those soil which have low plasticity index.

## Softening Point-Ring & Ball Apparatus

Used for determination of softening point of bituminous materials

## California bearing ratio (CBR)

The California bearing ratio (CBR) is a penetration test for evaluation of the mechanical strength of road subgrades and base courses. It was developed by the California Department of Transportation before World War II.



The test is performed by measuring the pressure required to penetrate a soil sample with a plunger of standard area. The measured pressure is then divided by the pressure required to achieve an equal penetration on a standard crushed rock material.

## Automatic marshall compactor for moulds

The apparatus automatically compacts the sample and stops after a preset number of blows has been completed.

## Superpave Gyratory Compactor

Superpave stands for Superior Performing Asphalt Pavements. The Superpave system includes a performance-based asphalt binder specification, a mix design analysis system, many new test procedures, and new equipment.

# OPERATION PROCESS

## 1. PURPOSE:

The purpose of this document is to define the production procedure for hot mix asphalt.

## 2. SCOPE:

This document is applicable for production of various grades of hot mix asphalt.

## 3. ABBREVIATION:

SOP – Standard Operating Procedures
WI – Work Instructions

## 4. PROCESS INPUT & OUTPUT:

**4.1 Input**

4.1.1 Raw material – Bitumen
4.1.2 Aggregates of required grades
4.1.3 Fillers
4.1.4 Sand

**4.2 Output**

4.2.1 Hot Mix Asphalt of required grade

## 5. PROCESS DESCRIPTION:

**5.1 Preparation Stage**

5.1.1 The Operation Manager shall take mix design from Technical Manager and shall prepare the production planning according to customer requirement.
5.1.2 The sand shall be tested for moisture content
5.1.3 All grades of aggregates shall be assumed to be in a totally dry state.
5.1.4 Availability, stock and temperature (160$^{o}$C) of bitumen.
5.1.5 Cold bins shall be full of required size of aggregates.
5.1.6 Filler silo shall be full.
5.1.7 Check the automation mode of plant.

**5.1 Preparation Stage**

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5.1.6 Filler silo shall be full.
5.1.7 Check the automation mode of plant.

**5.2 Mixing Stage (Process)**

5.2.1 Aggregates of different sizes taken in to drying drums through their respective belt conveyor.
5.2.2 Temperature of drying drum (160$^{o}$C) is maintain by diesel fired burner.
5.2.3 Aggregates rotate and dries in rotating dryer (drying drum) and then transferred to vibrating screen through hot elevator i.e.; bucket elevator.
5.2.4 Then dried aggregates are separated based on size and stored in to different hot bins.
5.2.5 According to design, aggregates are weighed on scales and then shifted in to mixer. The same is applicable to bitumen and fillers too.
5.2.6 After providing proper and required mixing time, final finished hot mix asphalt can stored in to hot silo or can directly loaded in to the trailer or dump trucks.

**5.3 Testing Stages**

5.3.1 The following tests shall be carried out on the final finished hot mix asphalt.
5.3.1.1 Marshal Stability
5.3.1.2 Loss of stability
5.3.1.3 Bulk specific gravity
5.3.1.4 Maximum specific gravity
5.3.1.5 Asphalt content

## 6. MEASUREMENT AND ANALYSIS:

| S. N. | Data | Source |
|---|---|---|
| 1 | Penetration | Laboratory |
| 2 | Softening Point | Laboratory |
| 3 | Marshal Stability | Laboratory |
| 4 | Loss of stability | Laboratory |
| 5 | Bulk specific gravity | Laboratory |
| 6 | Asphalt content | Laboratory |
| 7 | Maximum specific gravity | Laboratory |

## 7. REFERENCE DOCUMENTS AND RECORDS:

7.1 Work instruction for plant operation
7.2 Standard Operating Procedures
7.3 Production logbooks includes RM and FG
7.4 QC logbook

# LAYING PROCESS @ SITE

## 1. Preparation of Surface for priming

The surface to be primed shall be swept clean from dust by application of power broom and blower. The loose foreign material on the surface shall be removed completely. Large irregularities & potholes shall be repaired before priming. A thin layer of water should be sprayed over the prepared surface. The surface shall allowed to cure for 30 to 60 minutes before the spraying of emulsion. A prime coat of bitumen is applied at 9.0 kg per 10 sq.m are.

## 2. Application of Tack Coat

It is desirable to lay Asphalt Concrete layer over a bituminous base or binder course. A tack coat of bitumen is applied at 5.0 to 7.5 kg per 10 sq.m area, this quantity may be increased to 7.5 to 10 kg for non-bituminous base.

## 3. Preparation and placing of Premix

The premix is prepared in a hot mix plant of a required capacity with the desired quality control. The bitumen may be heated upto 150 – 177 deg C and the aggregate temperature should not differ by over 14 deg C from the binder temperature. The hot mixed material is collected from the mixture by the transporters, carried to the location is spread by a mechanical paver at a temperature of 121 to 163 deg C. the camber and the thickness of the layer are accurately verified. The control of the temperatures during the mixing and the compaction are of great significance in the strength of the resulting pavement structure.

## 4. Rolling

A mix after it is placed on the base course is thoroughly compacted by rolling at a speed not more than 5km per hour.

The initial or break down rolling is done by 8 to 12 tonnes roller and the intermediate rolling is done with a fixed wheel pneumatic roller of 15 to 30 tonnes having a tyre pressure of 7kg per sq.cm. the wheels of the roller are kept damp with water.

The number of passes required depends on the thickness of the layer. In warm weather rolling on the next day, helps to increase the density if the initial rolling was not adequate. The final rolling or finishing is done by 8 to 10 tonne tandem roller.

## 5. Quality control of bituminous concrete construction

The routine checks are carried out at site to ensure the quality of the resulting pavement mixture and the pavement surface.

**Periodical checks are made for**

a) Aggregate grading
b) Grade of bitumen
c) Temperature of aggregate
d) Temperature of paving mix during mixing and compaction.

At least one sample for every 100 tonnes of the mix discharged by the hot mix plant is collected and tested for above requirements. Marshall tests are also conducted. For every 100 $M^2$ of the compacted surface, one test of the field density is conducted to check whether it is at least 95% of the density obtained in the laboratory. The variation in the thickness allowed is 6mm per 4.5m length of construction.

## 6. Final Surface

This shall consist of construction in a single or multiple layers of open graded bituminous concrete without fine aggregates on a previously prepared bituminous bound surface. A single layer shall be 25 mm to 100 mm in thickness.