Advances in Construction of Road Ways

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In its most general sense, a road is an open, generally public way for the passage of vehicles, people, and animals.

The earliest human road builders predate recorded history by thousands of years. With the advent of modern man, road building - the purposeful construction of general public ways - became a common sign of an advancing civilization.

Covering these roads with a hard smooth surface (pavement) helped make them durable and able to withstand traffic and the environment. Some of the oldest paved roads still in existence were built by the Roman Empire.
By in large, Roman roads (see Figure) were constructed during the Republican times - the oldest road, Via Appia, dates back to 312 B.C.

the Roman road network consisted of over 100,000 km (62,000 miles) of roads.

The superior quality and structure of its pavements have allowed many Roman roads to survive to this day.
ROADS NAMES

The first insight into today's modern pavements can be seen in the pavements of Thomas Telford (born 1757). Telford served his apprenticeship as a building mason (Smiles, 1904) and extended his masonry knowledge to bridge building. During lean times, he carved grave-stones and other ornamental work (about 1780).
... Telford Pavements

2 layers (100 mm & 50 mm) of stones
(60 mm max. size)

40 mm gravel

Broken stones and gravel

Min. crossfall 100 mm on a 10 m road

365 mm

Flat subgrade

Stones 100 mm wide and
175 to 75 mm in depth
Macadam Pavements

The Father of Modern Roads.

The total depth of a typical MacAdam pavement was about 250 mm (10 inches). MacAdam was quoted as saying "no stone larger than will enter a man's mouth should go into a road" (Gillette, 1906). The largest permissible load for this type of design has been estimated to be 158 N/mm (900 lb per in. width).
... Macadam Pavements
ADVANCES IN THE CONSTRUCTION TECHNOLOGY

CONTRACTORS DEVELOPMENT INSTITUTE

1. Pre-fabrication & modular construction
2. Advanced building materials
3. 3D printing & additive manufacturing
4. Autonomous construction
5. Augmented reality & virtualization
6. Big data & predictive analytics
7. Wireless monitoring & connected equipment
8. Cloud & real time collaboration
9. 3D scanning & photogrammetry
10. Building Information Modeling

Source: The Boston Consulting Group, World Economic Forum
The earth is covered in roads...

33,421,323 km (20,767,047.3 miles) of road covers the surface of the earth.

That's enough road to wrap around the equator 833 times – or enough road to get you over halfway to Mars.
Basic Structural Elements
ROAD BASICS

Current road composition and construction

Most roads are made from asphalt concrete, a composite of bitumen and mineral aggregate.

12.5mm surface
19mm intermediate
Base
Aggregate base
The Road of the Future

NEW SURFACE MATERIALS

Currently asphalt-based roads are being replaced by environmentally-friendly, organic resin-based roads such as Eco-Pave.

As well as many road surface manufacturers investigating the possibility of using recycled plastics in road construction.
Product specific...

DYNAMIC PAINT

Usage from 2013

Trialled in: Brabant, Netherlands

Symbols that appear on the road surface, that can indicate whether the temperature is hot enough or cold enough to affect driving conditions.
GLOW IN THE DARK ROAD MARKINGS

Usage from 2013

Trialled in: Brabant, Netherlands

Road markings painted with "glow-in-the-dark" paint so that they can be seen without the need for lights.
Usage specific....

ANTI-ICING ROADS

Usage from 2013

Trialled in: Crandon, Wisconsin, USA

Road surfaces containing naturally reactive de-icer (such as SafeLane) that prevent ice from forming on roads.
Innovative future...

**INTERACTIVE WIND-POWERED LIGHTS**

*Expected: 2018*

*Trialled in: Brabant, Netherlands*

Road lights that only turn on when a car is present and are powered by the wind.
Fuel Free Roads...

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**WIRELESS ELECTRIC VEHICLE CHARGING**

**Expected:** 2018

**Trialled in:** Brabant, Netherlands

Using “inductive power transfer” (the same method by which electric toothbrushes are charged) electric cars can be charged wirelessly as they travel along the road. Removing the need to stop and refuel, ever.
Power generative Roads..

**SOLAR ENERGY ROADS**

*Expected:* In development

*Trialled In:* Sandpoint, Idaho, USA

Cars would drive on specially-toughened and durable solar panels which would help to provide an alternative means of power generation.
Energy Roads....

PIEZOELECTRIC ENERGY ROADS

Expected: 2020
Trialled in: Israel

Piezoelectric crystals can generate energy from the vibrations that vehicles generate as they drive along the road.
INTELLIGENT (NETWORKED) HIGHWAYS

Roadside ‘listening stations’ will link up with GPS receivers in cars to monitor traffic patterns and accidents. Information is then passed back to Sat-Navs in cars to help drivers avoid congested areas and accidents.
Where next

The introduction of these various new and innovative scientific technologies will bring the environmental friendly and driver friendly roads....... 

THANK YOU...

M. RAJ REDDY