



DESIGNING OF GO-KARTING TRACK USING PAVER BLOCKS

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Abstract:

A race track is a facility built for racing of vehicles, athletes, animals. Race track also may feature grandstands or concourses, a race track is a permanent facility or a building, circuit is common alternate term for the race tracks, given the circuit configurations of most of the race tracks, allowing races to occur over several laps. Some tracks may also be known as speedways or race ways. Many sports usually held on race tracks also can occur on temporary tracks, such as the Monaco Grand Prix in Formula One^[1]. Outdoor tracks can offer low-speed karts strictly for amusement (dedicated chassis equipped with low powered four-stroke engines or electric motors), or faster, more powerful karts, similar to a racing kart, powered by four-stroke engines up to 15 hp (11 kW) and, more rarely, by 2-stroke engines, but designed to be more robust for rental use. Typically, outdoor tracks are also used for traditional kart races^[3]. One such innovative way of constructing the racing circuit is, by developing the racing track by using paver blocks which is itself is produced by unique technology used in construction, also reducing the cost of the track to 1/3 of conventional track making more feasible for entertainment parks to implement.



Figure 1: Go kart racing

Auto racing is a motorsport involving the racing of automobiles for competition. Races of various sports are organized with first recorded as early as 1867. Kart racing or karting is a variant of motor sport road racing with open wheel, four wheeled vehicles known as go karts or shifter karts they are usually raced on scaled down circuit, although some professional kart races are also held on full size motorsports circuits.

Racetracks are used for:

Animal Sports:

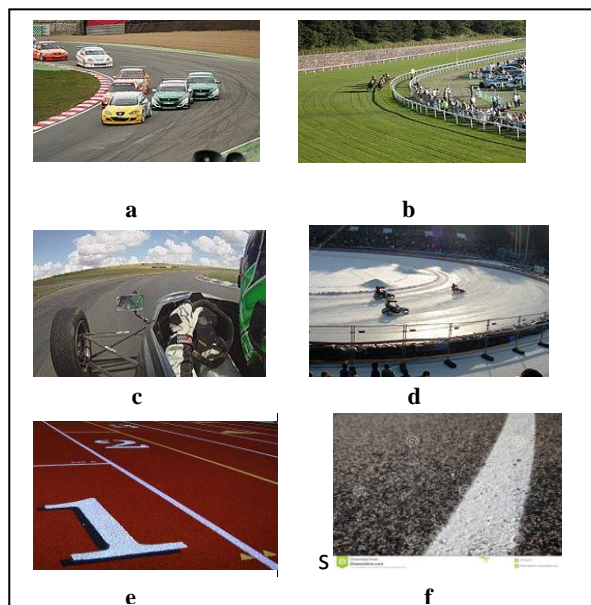
- Camel racing
- Greyhound racing
- Harness racing
- Horse racing

Human Sports:

- Bobsleigh
- Cycle sport
- Skeleton (sport)
- Track and field

Motor Sports:

- Auto racing
- Drag racing
- Kart racing
- Motorcycle racing
- Stock car racing
- Track racing (motorcycles)
- Truck racing



An interlocking concrete paver is a type of paver. This special type of paver, also known as a segmental paver, has emerged over the last couple of decades as a very popular alternative to brick, clay or concrete [8]. An interlocker is a concrete block paver which is designed in such a way that it locks in with the next paver. The locking effect allows for a stronger connection between pavers and with this interlocking effect the paving itself is resistant to movement under traffic.



Figure 2: Interlocking pavers

In addition to being economical, interlocking concrete pavers are also widely available in water-permeable designs, which have added ecological benefits. By allowing water to drain through the pavers in a way that mimics natural absorption, builders and landscapers are able to limit surface runoff and prevent soil erosion or buildup of standing water in the surrounding land area. Some permeable paver installations are designed to harvest rainwater, which can then be repurposed for uses such as irrigation or washing a car.

Comparison of Roads Made of Paver Blocks, R.C.C. & Asphalt:

Concrete road paving is quickly reaching higher popularity than Asphalt and R.C.C, and the reasons are so many. Read on to discover how Paver blocks roads are more popular than the other two. Today, we are going to compare Paver, RCC, and Asphalt, Road, let's see which one is stronger, durable, and environmentally friendly?

Features of Paver Blocks, R.C.C. & Asphalt [1]:

S.No	Characteristics	Paver Blocks	R.C.C Roads	Asphalt Roads
1	Life Expectancy	18-20years	15-18 years	10-14 years
2	Initial Cost	Medium	Very High	Medium
3	Construction Time	Less	High	Less
4	Rainwater Drainage	Best	No good	No good
5	Safety	Very good	Good	Good
6	Surface Cracks	No	Cracks	Potholes
7	Repairs	Easy	Tough	Tough
8	Reuse	Possible	Not possible	Not possible
9	Quality	Good	Best	Good
10	Environmental Issues	No harm	No harm	Harmful
11	Colour and Shapes	Possible	Not possible	Not possible

The main objective of the project is utilizing the knowledge of construction technology and designing a track for racing of go karts almost in 1/3rd of the actual cost, by constructing a race track built by pavers (Cobblestones), hence the Project title “Designing of go karting race track using Pavers”. To be sanctioned by the FIA with a license to accommodate a variety of international racing categories, the consistency of curve trajectory, braking zones and track-side impact protection all have to align with required standards[8]. From the drawing stage through to the final inspection of the completed track, it all has to comply before being issued a license and grade.

Materials Used in Construction of Paver Track:

- Pavers - An interlocker is a concrete block paver which is designed in such a way that it locks in with the next paver. The locking effect allows for a stronger connection between pavers and with this interlocking effect the paving itself is resistant to movement under traffic
- Moorum Soil - Moorum is also a type of soil, mostly used for construction purposes. Generally, it is deep brown or red in color. Moorum is used in plinth filling, road pavements, backfilling in trenches, footing pits, etc. The soil is defined as a complex mixture of minerals, gravels, organic matters, rock particles, etc.
- Wetmix Macadam - Wet Mix Macadam (WMM) work includes laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared GSB layer or existing pavement as per the requirement of the project.

- Sand/Chipping - Uniform sand has been used for sub-base layers in pavement construction during the last decade. During this period, the performance of these kind of structures has been satisfactory, without deterioration. They can be used for roads to carry light and medium traffic.

Construction Equipment:

- JCB Excavator
- Roller: to harden the material below
- Leveling machine: to level the material on the landscape
- Vibrator: to settle the pavers
- Trucks: for transportation

Proposed Methodology:

- Cleaning/ scarifying: Clearing is defined as removing and disposing of all unwanted surface material, such as trees, brush, grass, weeds, downed trees, and other material. Grubbing is defined as removing and disposing of all unwanted vegetative matter from underground, such as stumps, roots, buried logs, and other debris.
- Ground Leveling: Taking rail levels existing before track renewals to finalize final rail level profile including vertical curves. It is also useful in construction of roads, to calculate CUT & FILL in a road project, deciding slope on side for draining purpose
- Moorum rolling: Each Layer shall be compacted with Leveling-Spreading of Murom with JCB etc. – Watering with Tankers
- Wetmix macadam Rolling: For *Wet Mix* Macadam material is well mixed with water and then *rolled* to a dense mass. It should be laid on one or more layers as per line.
- Sand Levelling: Before laying the pavers, a layer of bedding sand is placed over the compacted base material. This layer provides a bed into which the pavers are set. The sand bedding also helps to protect the sand joints from being eroded away. Lay down one inch diameter PVC pipe across the base material.
- Pavers: Laying of the pavers should be done with utmost precision and care, as they are manually laid.
- Vibrating machine: Compactors are used to settle and compact the base for laying pavers on a patio, and to level the pavers and settle sand between the joints after they are laid. A vibrating plate compactor is best for installing pavers.
- Kerbstone Laying: Kerb casting will be laid on firm foundation of minimum 150 mm thickness of cement concrete of M10 grade cast-in-situ and extending 50mm beyond the kerb stone or over WMM surface as per site condition. Before laying the foundation with lean concrete, the base will be leveled and lightly watered to make it damp
- Safety barrier: especially with high-speed activities like go-karting. Impact resistance is the key to decreasing injuries and vehicle damage. Our 24-inch low-profile barricades link securely together to form a continuous wall and create a clearly delineated track. The strong, flexible material can withstand heavy use, weather, and impact.

Design of Paver Track:

A track is not designed by putting a succession of bends and straights. It starts from the trajectory. Bends, throttle-off braking, chicanes, straights... These elements form the basis of every track's appeal and provide emotions to drivers and spectators. However, someone has to think up, design and then translate them into solid pavement.

Compressive Strength Requirements of Concrete Paver Blocks ^[2]

S.No	Grade of Paver Blocks	Minimum Average 28 Days Compressive Strength N/mm ²
1	2	3
I	M-30	> fck + 0.825 x established standard deviation (rounded off to nearest 0.5 N/mm ²
II	M-35	
III	M-40	
IV	M-50	
V	M-55	

Merits:

- Paver track can be built in almost 1/3rd of the cost, without changing the standards and specifications as of the conventional go karting track.
- Paver track is more durable for go karting than the asphalt track.
- Paver track is self draining and has low maintenance in the rainy seasons.
- Paver track has life of 12-16 years.
- If any paver is mislaid or damaged it can be easily replaced within hours without hampering any other side of the track.

- Pavers are portable and reusable from one location to other.

Demerits:

- Not sure whether racing organizations accredit such tracks for racing.
- Slightly more vibrations than that of conventional track.

Applications:

- Can be built in schools to promote motor racing.
- Can be pitched to amusement parks for a budget track.
- Can be used to promote amateur riders.
- Pulls more crowd towards and provides affordable racing.
- Help in developing initial driver skills

Cost Estimation (Self Estimated):

Table:

S.No	Particulars	Units	Unit Price	Amount
1	Cleaning	1	20000	20000
2	Landscaping JCB	16 hrs	950	15200
3	Paving	26000sqft	72	1872000
4	M chipping/ Sand	2500sqft x 4 inch	3000	50000
5	Roller	16hrs	1200	19200
6	Electrical works	1	1	53000
7	Barriering	4000 tyres	60	240000
8	Kerbstone	560	140	78400
	Total			2347800 Inr

Conclusion:

Go Kart racing track using paver blocks thought is the first of its kind in India, it is purely meant for entertainment purpose, with all safety measures, it may help lot of amusement parks and entertainment sectors to have such a track with affordability and comfortness.

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