**Two parallel tracks**

It will have two parallel tracks, a separate track for both side traffic. It has following benefits.

* Avoid accidents (head on collagen of cyclists)
* Stops people to just hang out on track (now they have just one way to go)
* Mixed use of track (for e.g. At night /less traffic one track can be used for the pedestrian ) it would become beautiful public space.

• Will avoid cycle traffic jam.

These benefits are considerable on behalf of the cost factor.

**Deck**

* **Frame**

The deck will be supported by steel box girders. Concrete beams are not used as it is very light structure so very less load will come on deck. Also, the idea of I-beam is dropped out as track have curves on the route and I-beam could not be used there. Now the problem with box girders is its cost and complexity of manufacture. And these both problems are solved when working on a large scale as cost per section comes down. Parapet will also be pre-joint to the girder.(Refer to sheet no 1)

Generally, continuous box girders are used where steel is material. But on this deck discontinuous girders will be used on behalf of increasing surface area on pillar top .now construction becomes fast and easy as factory made girders can be just assembled on site. Also, the structure becomes upgradable at any point new station or line extension can be added between any two pillars without disturbing whole structure.

Box girders are visually good .and less maintenance cost because it has less exposed surface.so weather does not affect much. (Refer to sheet no 1)

* **Base**

Pre-fabricated concrete (RCC) slab will be installed on top of steel frame .which will interlock with each other. Concrete will give stiffness to the base which steel plate or tiles cannot give because cycle track needs stiffness as compared to foot over bridge.

* **Parapet**

Parapet will be simple in design just metal pipe on top with perpendicular sticks connecting it with deck. use of the thinnest available material is preferable. No focus is given to parapet design as cityscape could be faded by doing so. Parapets are used for safety majors only.

* **Coating**

The base will be coated with rubber.It will give perfect grip to the cyclist. Asphalt is not used as it needs pressure to settle down and its light deck cannot bear that pressure. also, tiles are not used because tiles will dismantle due to the momentum of the cycles. Rubber has other benefits too. It comes in multiple colors which affects cyclist aesthetic .which is a very needful factor in this project. Orange, green or any other light color on track could be used. Colour could vary with change in location.

**Pillar**

All pillars will be made of concrete (RCC) . and will have wider top surface .because discontinuous girders will rest on top. Also on each pillar at the end, the conventional street light extension will be given.

For pillar, concrete is good option than steel (looking at dimensions and configuration of structure)

(Refer to sheet no 3) detailed and comparative study of the pillar will be considered later on in this text.

**Roof**

The roof is an element which is new and never used before for such projects. Because roads don’t need roof and pedestrian don’t need an elevated track. The elevated cycle track is the very new type of transport system. And roof on it makes it more complex. Even some of the operational elevated cycle tracks do not have roof .e.g. tracks of Xiamen, China, and Copenhagen, Denmark. One easy idea of roofing is to build track below any existing road or metro flyover .but there are very less probably that we find flyover on our route. And it will be inconvenient to change track location just because there is an existing flyover. The roof is an element which affects cyclist aesthetics the most. And in India, no attention is given to the base of the deck in flyovers. the cyclist will not prefer to ride below that undersigned and dirty part. Building elevated cycle track in Europe is very different to building such track in Delhi. There is no extreme summer or extreme rain in Europe so there is no need for a roof. The roof will also be used to cover some part of the city which is not visually good, which is common in Indian cities .and it can also be used to highlight some parts which are visually good.

So we have to design our own roof system. Now the problem with roofing is its columns on which roof rest it will give the track the feel of closed space. And will definitely affect cyclist aesthetics in a negatives sense. So we have to decrease the number of columns. Also, roof load cannot be given to deck as it is not strong enough. Somehow roof weight should be transferred to pillar directly.

Now challenges are which type of roof? what will it cover? how will it cover? till how much extent it will cover? The area-specific roof must be designed? or time specific? All of these questions can not be answered without experimental data.

**New idea of roofing**

Roofing will be done in two-phase. Phase 1 will be a framework, and will give support to phase 2. phase 2 will star after the whole project is completed and getting a review from the trial cyclist which help deciding type of roof.

For phase 1 we will make a diamond cross-section roof holder all above the path. It will follow the track like a shadow. And instead of resting on pillars, roof hanger will itself be hung from pylon via steel cables.

* Roof hanger.

It is consist of four hollow steel pipes parallel to each other. the Internally joint by triangular joint by small pipes to make a stiff long element of one-meter diameter(approx.) .there are three lower deck pillar between every two pylons. This much longer section is provided because any other column in between will spoil the view of the city experienced by a cyclist. This idea not only emphasizes on aesthetics but also saves material (concrete, steel).as the thickness of pillar of the deck is reduced because no weight of the roof is transferred on deck. Roof columns are replaced by cables. And pylons are made of hollow steel .which are strong enough and saves material too. And the best part of it it is visually attractive both for someone inside it or outside of the structure.

**Forces on roof hanger**

roof in hanging in the air like a cable-stayed bridge. cables must be in high tension for the stability of structure otherwise structure will swing in the air. Generally bridges weight is more so their cables are in high tension .but here roof hanger alone is very light structure. and it may swing when the wind blows . to get rid of this situation roof hangers is tied by secondary cables to small pillars below it .which adds virtual weight to the structure. Now due to this additional support [Span length to Pylon height ratio] increase hence material cost reduces. Now track goes through various curves .and this hang structure equilibrium will disturb due to the curve for this problem secondary cables are at placed at an angle. which bring back system in equilibrium. And the best part roof hanger is aerodynamic in shape so there will be less effect of wind.

**The docking port on roof hanger**

roof hanger has docking port at every few meter distance from which roof will be hang. Roof shape and size to be decided in phase 2. But here roof will have a large exposed surface area to wind. It may swing in the air so here alignment of docking port will interlock roof individual element .and as docking ports are at right angle to each other, so one force will not be transfer to another element. For further safety roof selected will go through the various aerodynamic test. And extension port given on pillars could be used for further security.

**Will it work for extreme curves?**

No . for extreme curves there is another proposed design in which each pillar have extra support for roof hanger. This design will be applicable for extreme curves and near stations also. But here material used is increased as can be compared to the relative diagram. (Refer to sheet no 3.)

**Various types of pillars**

There are basically three types of pillar .type 1,type2,and type 3. Type 1 and 2 perform the same function that is to take the load of the deck only .benifit of type 1 pillar is that it saves material cost . while type 2 saves space so it can be used to make track parallel to the road (pillar on the divider road). While there is special type 2 pillar also used in extreme curves, in this design material is used more but it has its own benefits. Type 3 pillar is a most crucial one because hollow steel pylon stands on top of it .so its shape change accordingly. Strength and direction of force affection shape and size of the pillar can be seen on (sheet no 4.)