

APT “AXIOMS”

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Accelerated Pavement Testing (APT): APT Axioms

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Axiom 1:

Deterioration visible on the surface of the APT test area (i.e. pavement or layered structure), from the materials *within the upper zone* of the pavement close to the surface (i.e. depth < radius of tyre contact area), is primarily controlled, determined and influenced by the applied magnitude and shape of the multi - dimensional tyre/pavement contact stress regime from the tyres.

Axiom 2:

Deterioration visible on the surface of the APT test area (i.e. pavement or layered structure) of origin from within the *lower layers* of the pavement (i.e. depth > radius of contact area) is primarily controlled, determined and influenced by the magnitude of loading applied to the pavement from the tyre(s).

Axiom 3:

APT is not a simulation of the functional performance of real world road pavements, but is simply a study of structural pavement behaviour, including bearing capacity, under quasi – controlled conditions of either:

- Applied loading configuration;
- Tyre/pavement contact stress;
- Environment (i.e. water, temperature);
- Pavement construction;
- Pavement surface and depth responses.

DO NOT expect 1:1 relationships between the functional performance of real world pavements and the structural performance under APT.

Axiom 4:

APT pavement response, together with a well designed and executed laboratory component, if well understood, could largely contribute and assist towards the development and calibration(s) of Mechanistic – Empirical (M-E) pavement design and analysis methods, based on specialized knowledge of the structural behaviour of pavements/test structures.

Axiom 5:

A “penny and cent” syndrome of pavement research and development activities cannot, adequately serve a billion dollar industry such as road networks. Think big.

Axiom 6:

Active APT programs in a country serve as one of the most important platforms for learning and debating the results of road pavement behaviour. Therefore, the educational & learning value of APT programs, when applied on a real world pavements, is virtually un-measurable.

Axiom 7:

APT should never stop before any kind of traffic associated deterioration or damage is visible on the road surface, complimented with quantified *in-depth* responses. This takes time, money and effort !. *Wise people harvest the crop only when it is ripe!* (Proverbs 10:5).

Axiom 8:

Wisdom and insight (i.e. understanding) into the structural behaviour of road pavements are of the most important APT outcomes, when founded on a dedicated and focused effort describing the “mechanism @ work” *before, during and after* an APT test.

Axiom 9:

APT programmes should be designed with the “end-in-mind” (Covey - 7 Habits...). If not, these programmes can potentially be a total waste of time, money and effort.

Axiom 10:

APT devices, results and data could be mis-used, mis-interpreted and mis-applied in a similar fashion to, or, exceeding those commonly found with “dirty politics”.

Axiom 11:

The value and usability of the outcomes of APT results, data, and outputs are directly proportional to the effort and dedication that went into the (holistic) planning of the APT programme and its execution.

Axiom 12:

APT is an extension of a well-designed & executed pavement material laboratory programme.

Axiom 13:

APT and its breakthroughs involves multi-disciplinary thinking, understanding and application. (IT, software, mechanisms of destruction, hydraulics, materials, tyres, etc.)

Axiom 14:

Limited “APT thinking”, limited reaping..... Therefore, limited budgets, limited successes.

Axiom 15:

The relationship between input and output of a well-designed and executed APT programme will easily exceed $1/\pi$. i.e. Benefit/Cost ratios $> \pi$.

Axiom 16:

The relationship(s) between applied load/stress levels in APT and associated pavement damage, involves much more than a simple power or exponential law.

Axiom 17:

Pavement “Damage” can be controlled by proper design of the APT test programme.

Axiom 18:

The most important aspect of a well-executed APT program, lies in the value addition and post mortem analysis/investigations of the same test and the associated response data.

Axiom 19:

Classical, or traditional (fatigue) failure of bound pavement materials occurs multi-directionally. The origin of this kind of failure, and its direction of evolution, are possible from within the top region, bottom region or middle region of the bound layer. However, reaching this state does NOT necessarily constitute “pavement failure”.

Axiom 20:

Traffic induced crack patterns visible on the surface of an APT structure (or road), in the near region of an unusual disturbance on or in the surface such as instrumentation, large stones, pot holes, etc., are directly related to the mode of failure and the integrity of the material properties/interfaces in the upper region of the pavement.

Axiom 21:

The diameter (size) of the APT induced “crocodile-cracking” pattern of initially bound surface layers relates directly to the depth of a weak interface/layer in the upper region of the pavement.

Axiom 22:

Under conditions of excessive (pore) water pressures (EWP), any known pavement (or layer) can be “failed” with APT devices available today.

Axiom 23:

The role of associated investigation tools (i.e. Dynamic Cone Penetrometer (DCP), Road Surface Deflectometer (RSD), Multi-Depth Deflectometer (MDD), visual inspections is as *important* as the APT device itself.

Axiom 24:

Pavement “failure” visible on the surface of the APT test pavement is directly related to the *mode of loading* application of the APT device.

Axiom 25:

Historical and current pavement design and analysis models or tools, should NOT dictate the design of the APT programme, but the APT programme, and its associated targeted outputs, should dictate/formulate the pavement design and analysis models/tools through proper understanding and interpretation of the APT results and data analysis.

Axiom 26:

The value of a well-designed and executed APT programme is exponentially proportional to the total value of input. This relationship is further strengthened with research staff committed towards higher education programmes at known institutions, such as Universities (i.e. Masters and Doctorates on the APT topic).

Axiom 27:

Well-designed and executed APT programmes narrow the gap between real world structural and functional behaviour of pavements much faster than those resulting only from the rather simplistic and limited traditional road material laboratory tests and associated experiences.

Axiom 28:

APT does not replace real world behaviour of pavements, but it simply enhances structural and derived functional behavioural characteristics of road pavements in a phenomenological (visible manifestation or appearance) way. “*APT is therefore an external Kantian experience*”.