

Protection and Preservation of Asphalt Surface of Runway, Taxiway & Roads Using Steel Guard XL Technology

1. Definition of Asphalt :-

- Asphalt is a natural and/or/ refined product derived from oil. Asphalt is used extensively for mixing with aggregates to pave roads, airports pavements, parking lots and other pavement surfaces.
- Asphalt is often chosen because it has low cost and excellent binding properties acting as the “glue” to hold the aggregates together





- The asphalt on the very top of the pavement acts as the protective layer or “umbrella” by preventing water intrusion and keeping the asphalt pavement and the underlying aggregate base dry and stable.
- Various forms of refined and modified asphalts have become popular as they offer even more improved performance. However, asphalt does have its limitations



2. Key Consideration for Protection :-

- Exposure to :
- Air (Wind)/ Oxidation
- Sun (Temperature)
- Rain (Strom/water)
- Wear & tear from Heavy traffic.



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- **Exposure to Aircraft Jet Blast**



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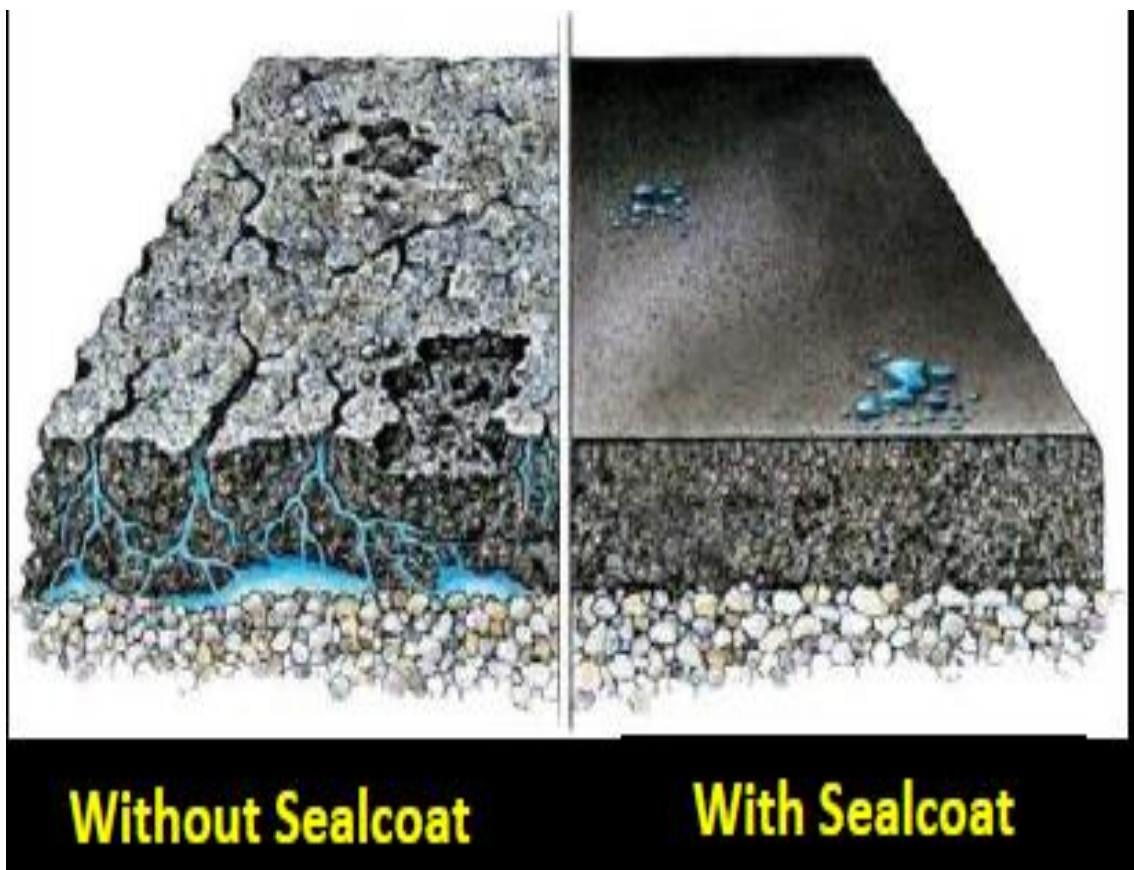
- **Exposure to Ultra pressure water blasting Rubber removal**



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- Loss of aggregate fines and a weakened binder leads to cracks. Over time water will penetrate pavement which leads to larger failures.

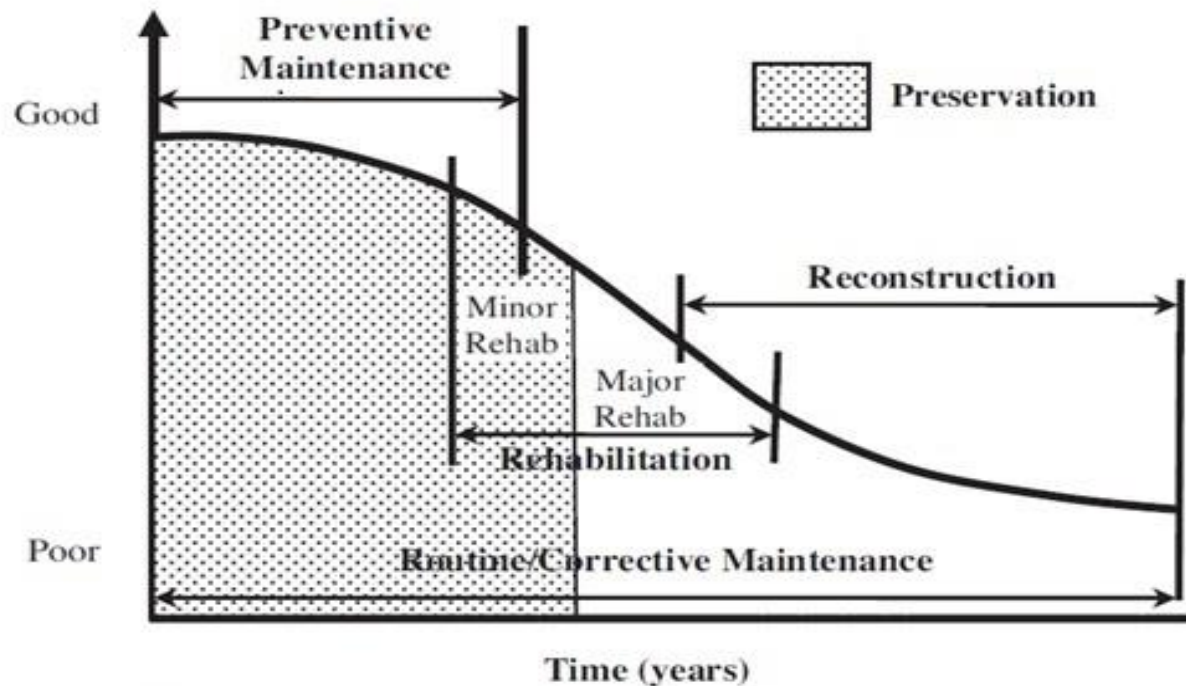


Without Sealcoat

With Sealcoat

3. Why Protect Pavements :-

- Routine maintenance can prolong the life of pavement.
- Extended life of pavement = overall reduced cost.
- Difficult Choice for decision makers – when to do maintenance and what type of treatment.
- Preservation Technology to increase the life of the pavement between 2 Maintenance cycle, thus cost of delaying Major Re-carpeting work
- To ensure the safety requirements on control of FOD (Foreign object debris) generation & enhancement of friction & durability
- To minimise the Major shut down jobs such as Runway closures
- To minimise the utilisation of Natural resources such as Aggregates, sand, petroleum products
- Need a Environment friendly materials
- Over all saving in the Time and Cost



Source: Adapted from Peshkin et al. 2007.



Protecting ways:-

- Several categories of surface protecting strategies, known as sealcoats, Micro surfacing using 6mm down aggregates etc; have been developed over the years to protect existing asphalt pavements.
- While these layers are thin, they do not have to provide structural stability so they are able to contain a much higher percentage of asphalt (18 to 22%) than the asphalt pavement they protect (typically 5.5%).
- Also these layers may not be able to withstand the Aircrafts loading (especially impact loading). Ultra pressure water blasting to remove the rubber and Paints on the Runways pavements

4. The Technology- **Steel Guard XL**

- Steel Guard is a Polymer Modified, Asphalt emulsion based, dense graded and cold mixed quick setting asphalt resurfacing materials.
- it is designed to be applied in a semi liquid condition with a specialised mixing and Paving Machine
- By design, it chemically changes from a semi-liquid material to a dense cold mix material that is able to carry normal traffic within 2 to 3 hrs
- It is a thin coat of application to fill up the rough and porous /voids depth between 3mm to 6mm as against conventional 50 mm thick bituminous concrete
- ideal for providing new riding surface and high skid resistance
- It retains the profile of the RWY, TWY and Road and does not disturb the drainage
- Fills cracks, voids, Porous & stop spalling
- Quick Application, On site mixing process-half km in 20 minutes
- Quick setting time & normal traffic flow within 2 hrs after laying
- Cold process, energy saving, non polluting, environment friendly

- No damage to road furniture, no disturbance to drainage
- High skid resistance, waterproof surface-protection of base
- Expected life 3 to 5 years

What is Steel Guard XL?

An **Asphalt Emulsion** based material with Engineered chemistry (**Rayen polymer**) and **Fine crushed aggregates(Rayngrit)**

- **Asphalt Binder (Emulsion)**

- Blend of high quality liquid asphalt base, mixed to desired hardness based on a project's climate.
- Blend of Emulsifiers and additional components provide a high degree of dispersion of asphalt particles.
- **Aggregate Fines**
 - Combination of selected crush aggregates.
 - Chosen by particle size and shape, and chemical composition.
 - Adds high suspension and cross linking characteristics.
- **Which means:**
 - A faster curing process.
 - A tougher surface.
 - A longer lasting treatment.

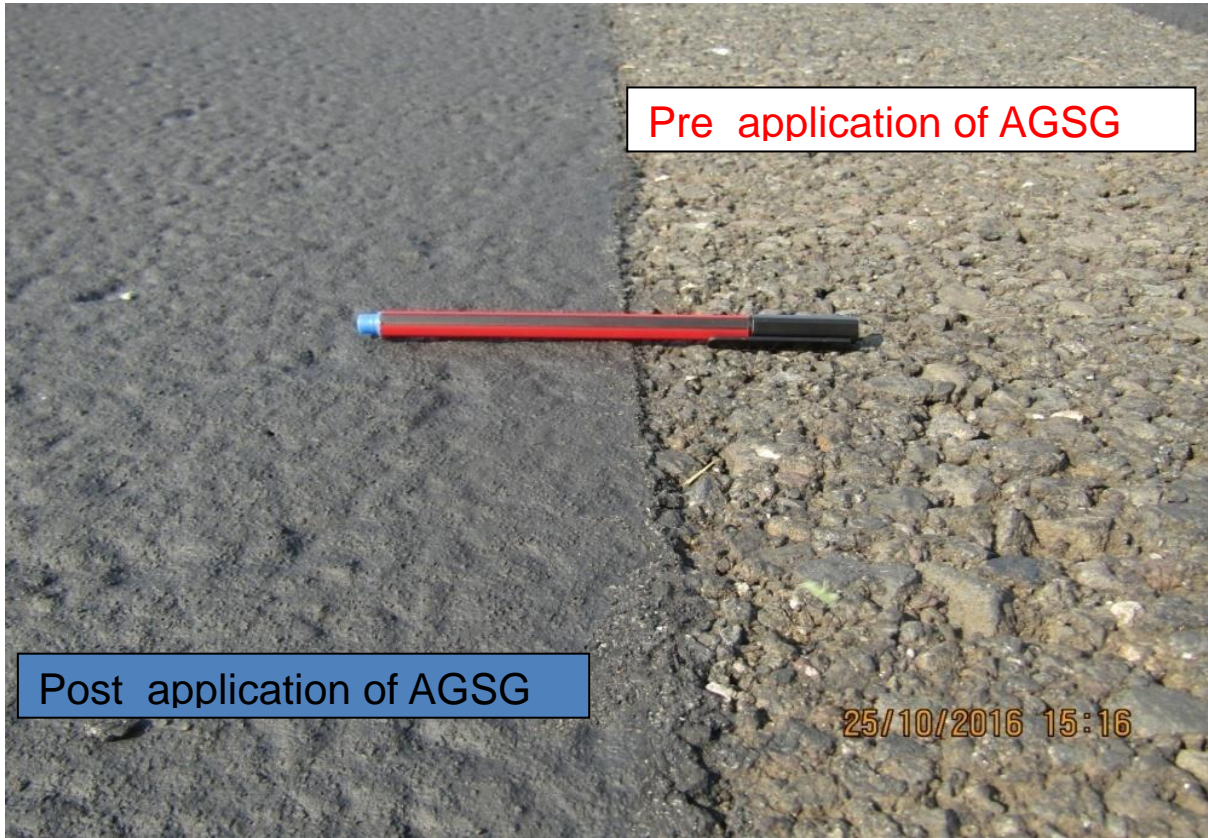
- **What are Raven Polymers?**

- Add tenacity and toughness to the final treatment surface.
- Speed up curing time in cold & humid locations. Used for nighttime work also.
- To “cure” all water in SteelGuard XL needs to evaporate once the material is applied. This is a major challenge.
- **Example** – Puerto Williams Airport in Chilean Antarctic. Daytime temp 7°C Nighttime temp -4°C. (Antarctic region)
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• What is RAYNGRIT ?

- Formulated blend of crushed and fine aggregates. May offer greater friction by improving macro texture.
- RaynGrit particles are crushed for angularity.
- Particles then coated with semi-ceramic coating for additional strength

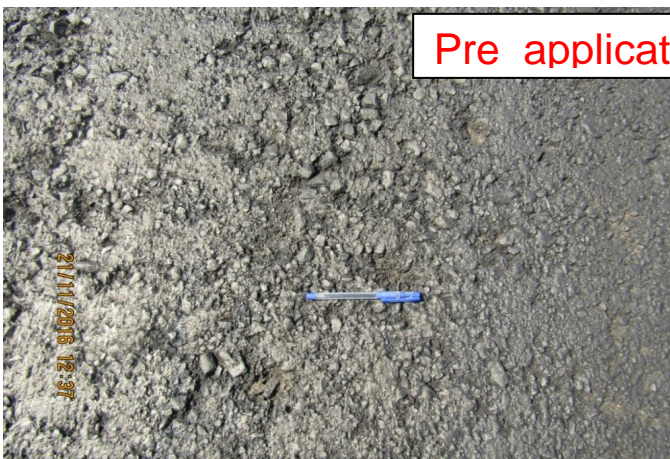




Pre application of AGSG



Pre application of AGSG





5. Why Steel Guard XL (Total Solution A+B+C+D)

- A. Efficiency
- B. Flexibility
- C. Adaptability
- D. Quality
- E. Safety



- **A. Efficiency**

- Easy to use. Can spray or squeegee onto surface.
- Cheaper alternative than other methods.
- Lower setup costs than conventional maintenance techniques.



- **B. Flexibility**

- Streets
- Highways/Freeways
- Airport Runways
- Other Facilities





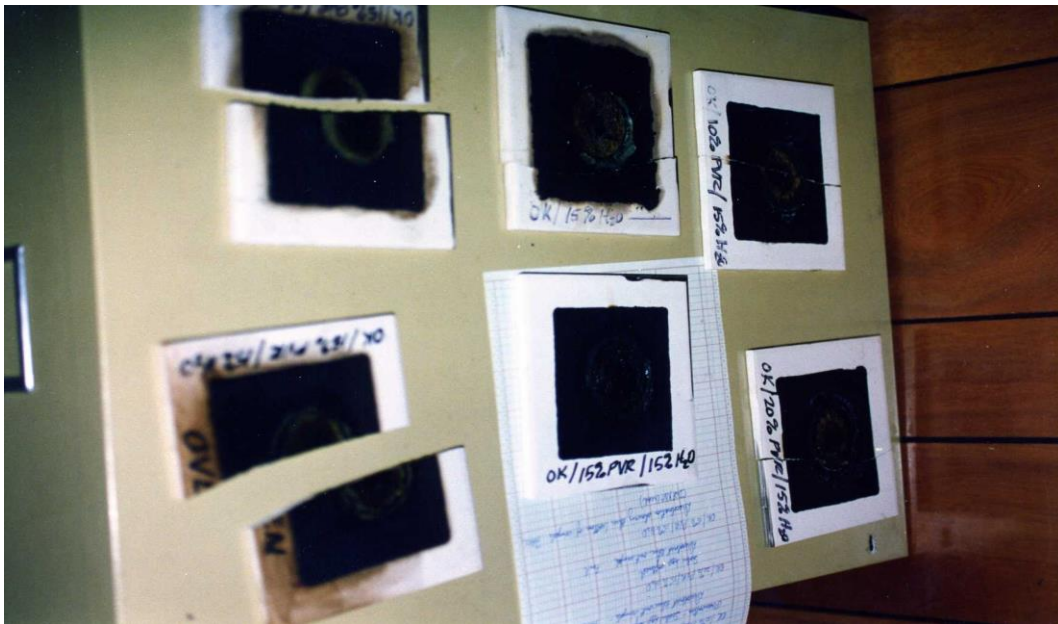
• C. Adaptability

- Add Raven polymers for tenacity, fast curing or greater binding.
- Add RaynGrit aggregate for increased macrotexture (friction).



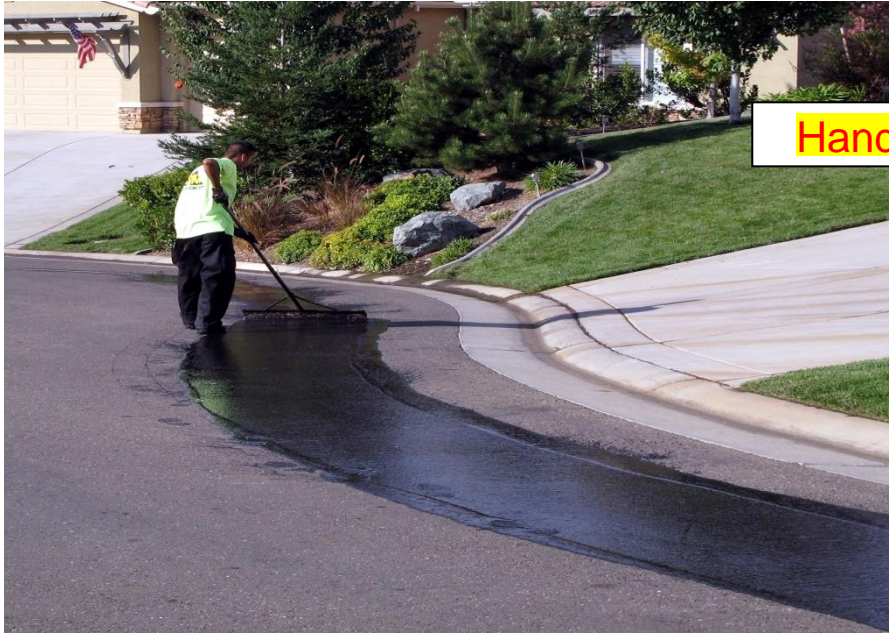
• D. Quality

- Strict quality assurance program.
- Lab certified prior to shipping.
- **Industry Leading Laboratory Testing**
- Stringent testing of all SteelGuard XL products.
- No material is shipped without passing all applicable standards.
- Follow ASTM standards.



6.How to Apply Steel Guard XL:--

1. Hand Squeegee
2. Machine Squeegee
3. Machine Spray
4. Spray Wand
5. Or Combination



Hand Squeegee



Machine Squeegee



Machine Spray



Spray Wand

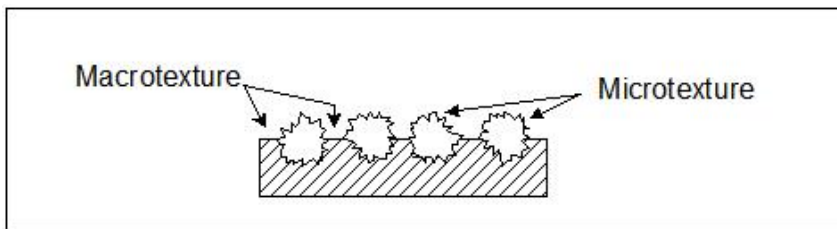


7.AGSG- Airport Grade Steel Guard XL

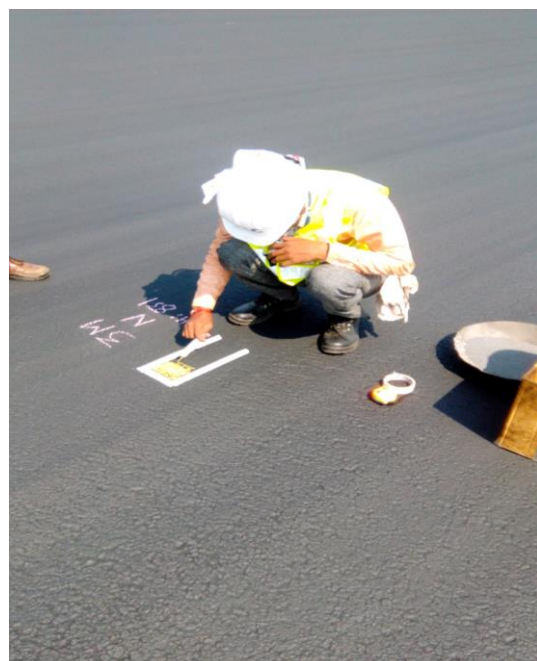
Desired for Runway Properties

- Durable, long wearing weatherproof surface.
- Free from FOD.
- Good friction.
- Withstand heavy Aircraft loading and shear stresses.
- Resistance to fuel spillage.
- Easy to maintain.
- Keep runway open during maintenance.

Challenges Runway Friction



- **Macro texture** and **micro texture** properties of the runway both assist in good friction. Especially important in wet conditions.
- Heavy loads and shear stress of aircraft, contaminants, rubber deposits and weather deteriorate pavement and impact macro texture and micro texture.
- Any preservation treatment **should not** affect existing friction numbers.



Measuring Friction

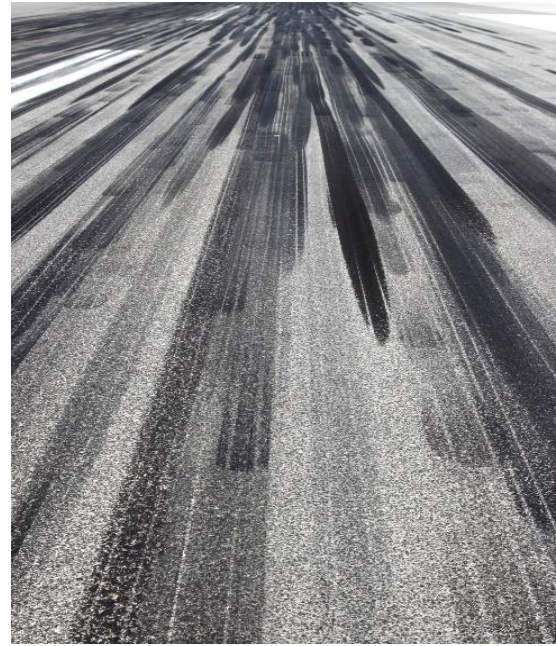
- Mu numbers can be used as guidelines for evaluating surface friction deterioration.
- Should use Continuous Friction Measuring Equipment (CFME) when measuring Mu .
- Goal for preservation treatment to never be below original Mu rating.
- SteelGuard XL has proven to improve friction numbers in many cases.

	65km/h			95km/h		
	Minimum	Maintenance Planning	New Design/ Construction	Minimum	Maintenance Planning	New Design/ Construction
Mu Meter	.42	.52	.72	.26	.38	.66



Challenges Rubber & Paint Build Up

- Reduces macro texture / friction properties.
- Extreme cases - creates uneven surface.
- Surface becomes very smooth



Challenges Contaminant Removal Damage

- Incremental but severe runway damage can occur through mechanical removal of rubber deposits.
- High velocity impact removal techniques loosen aggregate fines which fastens deterioration of pavement.
- Chemical removal techniques can be toxic and harmful to environment.
- Water blasting techniques can be effective.



Challenges Fuel Resistance

- Fuel spillage can detrimentally affect the condition of the pavement. Lead to premature failure.
- Using Raven polymers, SteelGuard XL can be modified to provide effective protection against fuel spillage.
- More \$\$\$ than standard SteelGuard XL.



Challenges Damage from Afterburners

- Excessive heat from military afterburners can severely impact pavement.
- Jet blast from the Commercial flights while taking off makes lot of damages control to the Pavements

- SteelGuard XL with its high percentage of asphalt and synthetic binders can withstand these stresses better than the existing pavement.



8. Summary of Preservation and Protection of Pavement using Steel Guard XL Technology

- **Water tightness of the surface**
- **Ensures macro texture for better drainage and Friction values**
- **Quick application and saves 65% of time in comparison to HMA overlay**
- **Less number of resources**
- **Surface can be handed over after 45 -60 min post application**
- **Overall saving on the Cost and Time**
- **Environment friendly**
- **Increasing the life of the pavement f=between 2 Major Maintenance cycle**
- **Ensuring the safety of the users**