

Product Knowledge Document

Windscreen Wiping System

QUALITY



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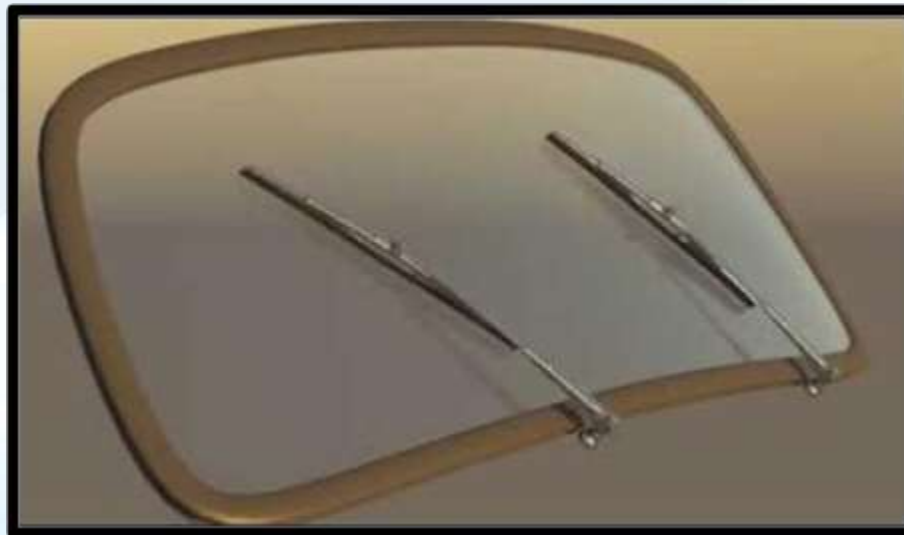
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INTRODUCTION

A windscreen wiper or windshield wiper is a device used to remove rain, snow, ice and debris from a windscreen or windshield. Almost all motor vehicles, including cars, trucks, train locomotives, watercraft with a cabin and some aircraft, are equipped with such wipers, which are usually a legal requirement.

A wiper generally consists of a metal arm, pivoting at one end and with a long rubber blade attached to the other. The arm is powered by a motor, often an electric motor, although pneumatic power is also used in some vehicles. The blade is swung back and forth over the glass, pushing water or other precipitation from its surface. The speed is normally adjustable, with several continuous speeds and often one or more "intermittent" settings.



INDIAN STANDARDS FOR WINDSCREEN WIPING SYSTEM INDUSTRY

There are three standards that is to be followed by the Indian “Windscreen Wiping System” manufacturers as CENTRAL MOTOR VEHICLES RULES - TECHNICAL STANDING COMMITTEE , SET-UP BY MINISTRY OF ROAD TRANSPORT & HIGHWAYS (DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS) GOVERNMENT OF INDIA , 22 May 2015.

The below mentioned are the Standards –

- 1. AMENDMENT NO. 1 (22 May 2015) of AIS-045:2004** Automotive vehicles - Windscreen wiping system for 3 wheeler vehicles and Vehicles treated as such.
- 2. AMENDMENT NO. 1 of AIS-011/2001** Automotive Vehicles – Testing Procedure for Windscreen Wiping System for 4 wheelers other than M1 Category of Vehicles.
- 3. AIS-002/ 2001** Automotive Vehicles - Rear View Mirrors - Installation Requirements IS 15636 : 2012

INDIAN STANDARDS FOR WIPER ASSEMBLY INDUSTRY

AMENDMENT NO. 1 (22 May 2015) of AIS-045:2004

Scope - Automotive vehicles - Windscreen wiping system for 3 wheeler vehicles and Vehicles treated as such.

AMENDMENT NO. 1 of AIS-011/2001

Scope - Automotive Vehicles – Testing Procedure for Windscreen Wiping System for 4 wheelers other than M1 Category of Vehicles.

AIS-002/ 2001

Scope - Automotive Vehicles - Rear View Mirrors - Installation Requirements IS 15636 : 2012.

For Other Applicable Standards

<https://www.iso.org/ics/43.040.65/x/>

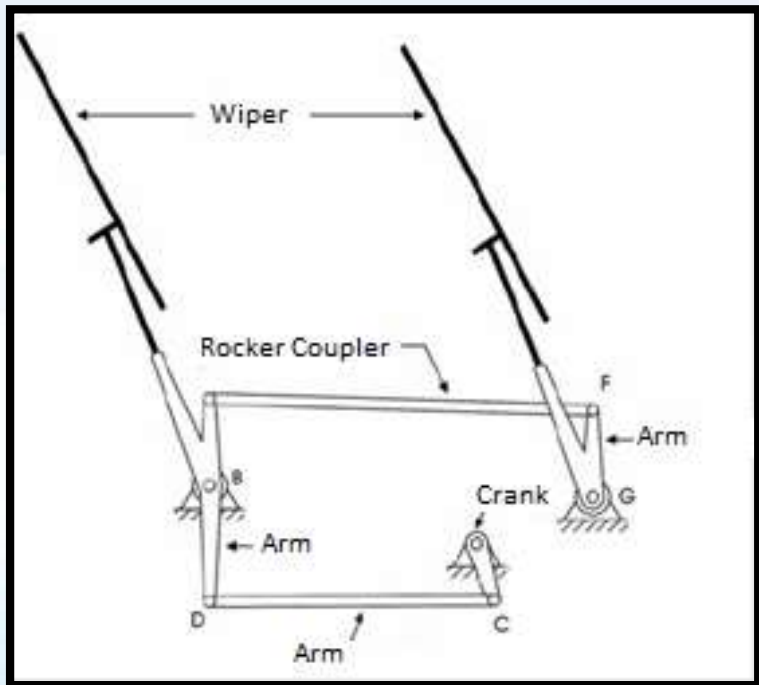
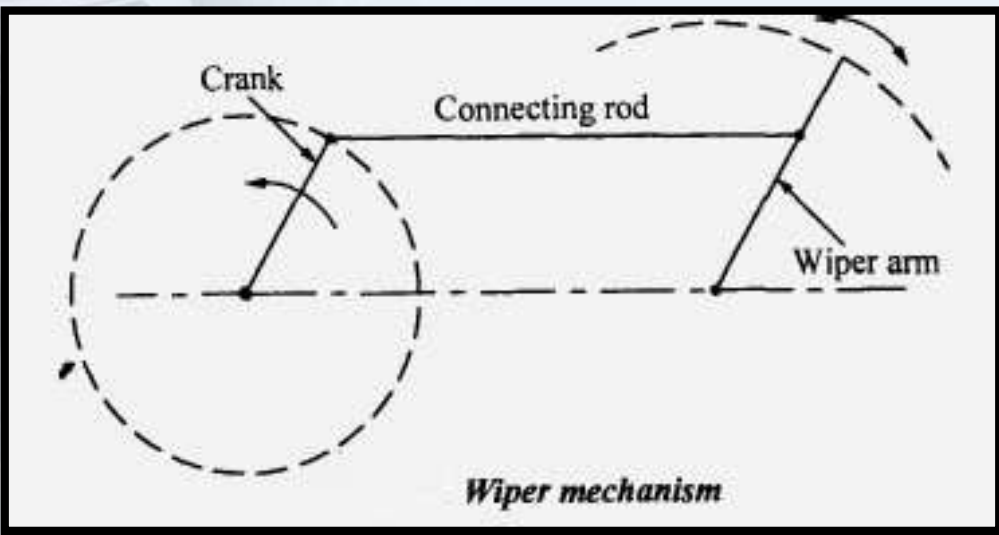
WINDSCREEN WIPING SYSTEM

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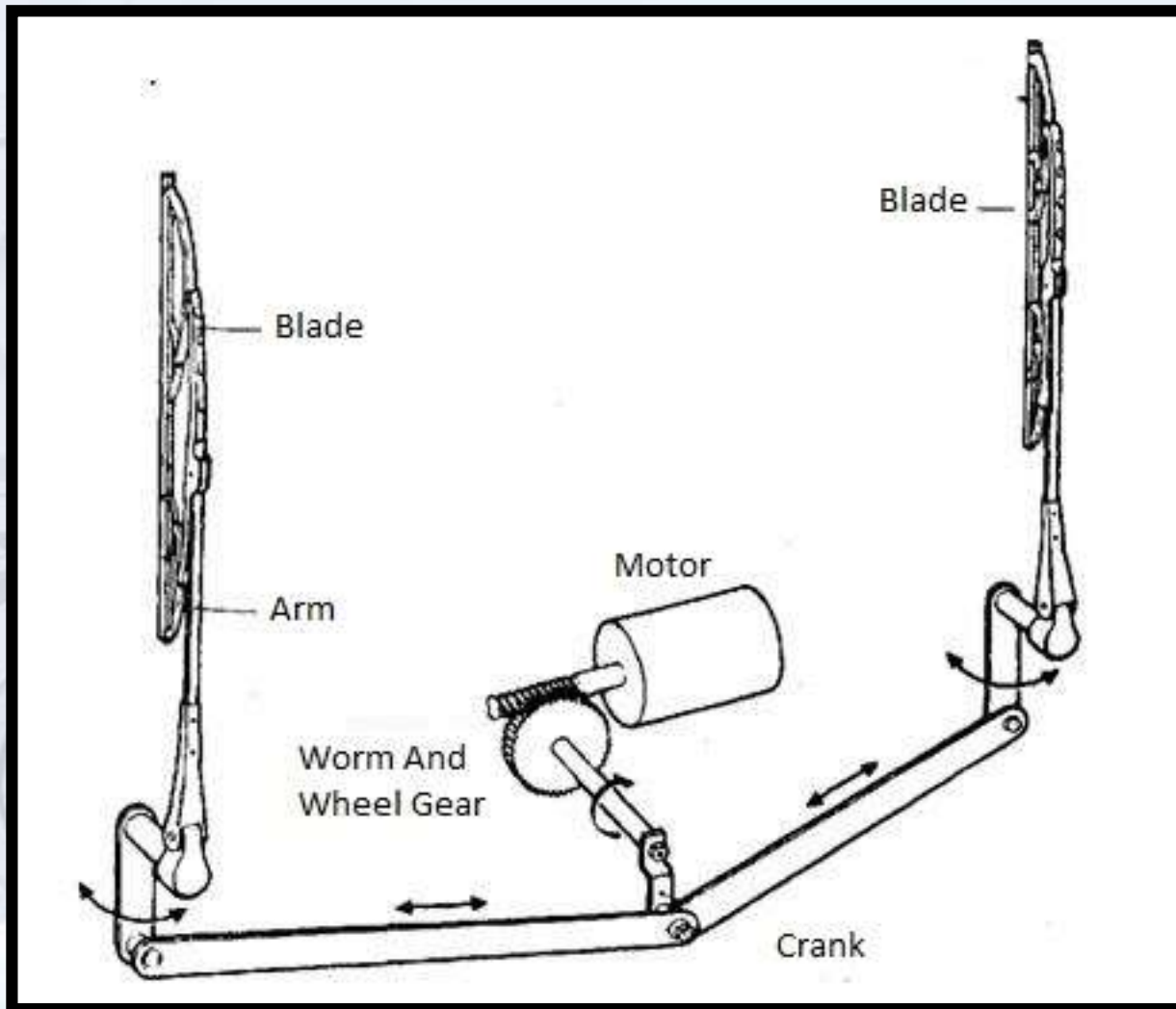


Basic Working Principle

It uses a principle of four-bar mechanisms. It is using a worm and gear to reduce the speed and to increase the torque up to 50:1. It uses a brush-less stepper motor. It consists of a crank which rotates about its center and a connecting rod which converts rotary movement to linear movement of the linkage . An end of a connecting rod is connected to the crank and other with wiper arm. Rotation of crank causes connecting rod to impart an oscillatory motion to wiper arm.



Windscreen Wiping System



Windscreen Wiping System consist of-

1. Wiping Blade setup / Assembly
2. A series of mechanical components/ Mechanical linkage (to transfer and convert motion-ie Crank, Arms etc)
3. Electric motor/ Cam attached to output shaft of the gear reduction.

Requirements of Wiping System

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SOME MAJOR REQUIREMENTS OF WIPER SYSTEM AS PER AIS - 011/2001,

1. The wiper system shall be capable of attaining the minimum operating frequency of 30 cycles per minute regardless of engine load and engine Speed. if the windscreen wiper is having two or more sweep frequencies then;
 - (a) one of them shall not be less than 45 cycles/min (a cycle being the forward and return movement of the windscreen wiper.
 - (b) one of them shall not be less than 10 and not more than 55 cycles/min.
 - (c) The difference between the highest and the least one of the lower sweep frequencies must be at least 15 cycles/min.

2. The minimum windscreen wiped area is described by three specific areas as percentage on defined areas on the exterior windscreen glazing surface , See details AIS - 011/2001 Annexure A.

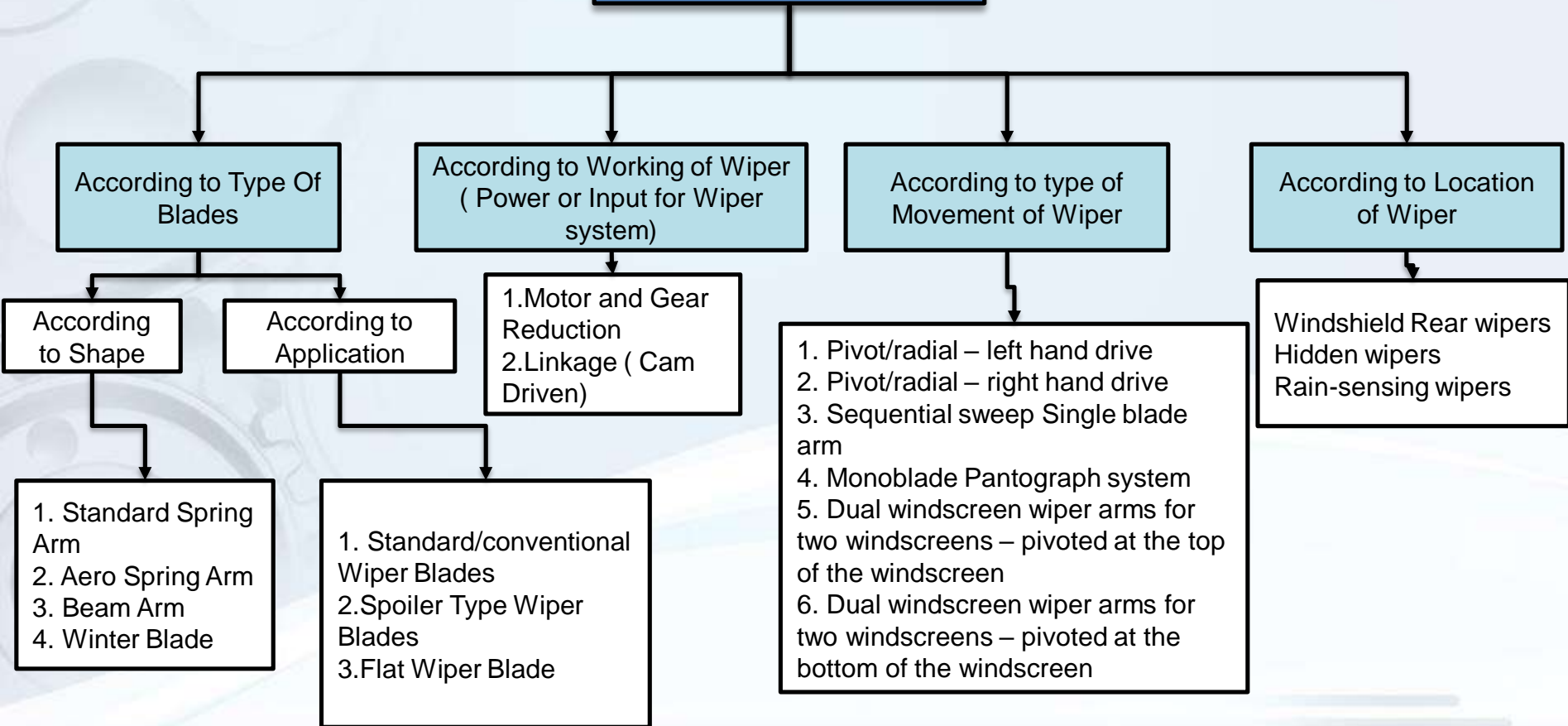
SOME MAJOR REQUIREMENTS OF WIPER SYSTEM AS PER AIS - 011/2001,

3. The windscreen wiper system shall be capable of operating between temperatures $55 \pm 3^{\circ}\text{C}$ and $0 \pm 3^{\circ}\text{C}$,

4. The wiper blade element of the wiper blade assembly shall withstand the ozone test- AIS - 011/2001 Clause 6.6

5. A section of the wiper blade element when placed in a 50% solution of either methyl or isopropyl alcohol for a period of 24 hours shall not exceed by more than 2% weight change.

Windscreen Wiping System



Classification – According to Type Of Blades- “Shape”

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Wiper Classification – According to Shape of Blade

1. Standard Spring Arm

This is the traditional wiper blade where the wiper arm applies spring pressure to the center mounting point on the blade. The blade frame distributes the force evenly across the blade to individual spring arms that hold the rubber insert. Each spring arm can rotate on its pivot, allowing the blade to flex slightly

Advantages: Inexpensive

Disadvantages: Lifts off the windshield at high speeds. Can pack with snow and ice in winter, preventing the spring arms from exerting pressure. That results in uneven wiping.



2. Aero Wiper Blade

This is a modified spring arm blade that's designed with a lower profile and sharper edges to prevent blade lift at high speeds.

Advantages: Won't lift off your windshield at highway speeds

Disadvantages: Packs with ice and snow in winter, causing uneven wiping



Wiper Classification – According to Shape of Blade

3. Beam Wiper Blade

A beam blade eliminates all the problems associated with spring arms and snow and ice pack. It's made from a piece of spring steel with the rubber squeegee bonded to the steel with an adhesive. A beam blade provides uniform tension across the entire blade.

Advantages: Uniform wiping force. No snow pack issues

Disadvantages: Higher cost. Rubber can separate from the beam. Chatter and skipping on large blades



4. Winter wiper blade

A winter blade is typically a standard spring arm blade that's fitted with a rubber boot to prevent snow and ice buildup. The rubber boot is thin and flexible so any snow or ice that accumulates on the boot quickly breaks off as soon as you operate the wipers.

Advantages: No snow or ice pack in winter. Self cleaning

Disadvantages: May lift off the window at high speeds due to it's bulk. Unattractive



Classification – According to Type Of Blades- “Application”

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Wiper Classification – According to Application

1. Standard/conventional Wiper Blades

Standard wiper blades are the most common type of windscreen wiper, often referred to as looking like a coat hanger and are still fitted to the majority of new vehicles, although this is in decline. They are usually attached to the vehicle using a hook shape wiper arm fitting. Sizes range from 10" to 28" and it is not uncommon to have different sizes fitted to the drivers and passengers sides of the windscreen



2. Spoiler Type Wiper Blades

These types of wiper blades feature a Full Spoiler that runs the length of the blade. This helps to keep the blade closer to the windscreen at higher speeds and is usually designed for the drivers' side only. Again they are usually attached to the vehicle by means of a hook shaped wiper arm fitting.



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Wiper Classification – According to Application

3. Flat Wiper Blade Upgrade (or Retrofit)

Flat wiper blades feature a totally new style and technology and are fast becoming the standard fit on new vehicles. These types of wiper blades do not have a metal 'coat hanger' shaped frame. Instead they have a tensioned metal strip running within the rubber structure of the wiper blade. This design allows for a flatter aerodynamic shape which reduces wind noise. The internal metal strip applies constant pressure along the length of the blade and has a built in spoiler. Being smaller than a conventional wiper it also provides less obstruction to the driver's field of vision



Classification – According to movement of Wiper blade

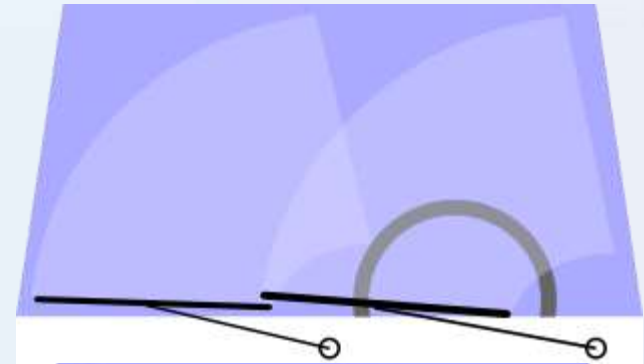
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Wiper Classification – Based on movement of Wiper Blade

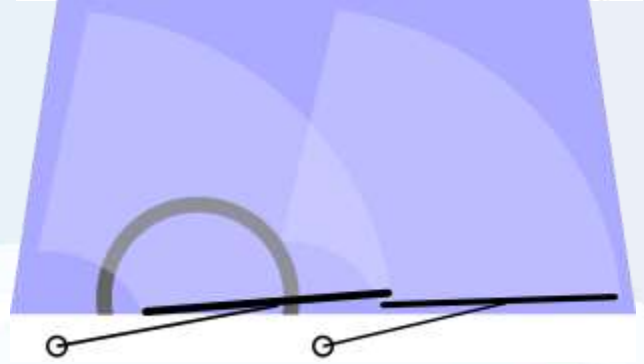
1. Pivot/radial – Left hand drive

The blade for this windscreen wiper is secured to a single arm which is attached to the motor. It moves in a parallel motion and is most commonly found on left handed cars.



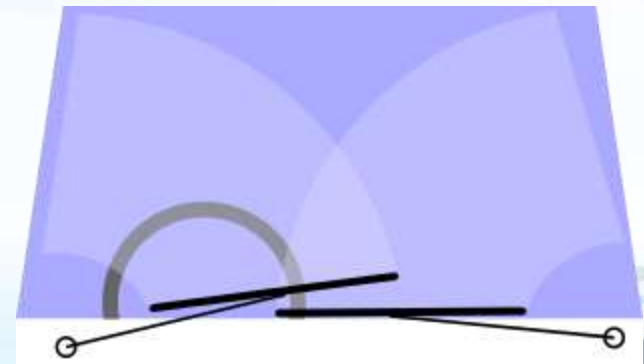
2. Pivot/radial – Right hand drive

This is the mirror reverse of the first windscreen wiper and is mainly found on right handed cars.



3. Sequential sweep

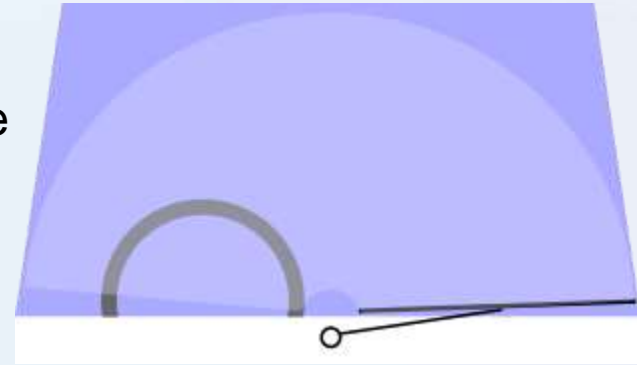
The mechanism behind this type of windscreen wiper is far more complicated than other designs as the wipers move in opposite directions at the same time. This allows the blades to cover as much of the windscreen as possible, minimising the risk of a large unwiped corner on the front passenger side of the windscreen.



Wiper Classification – Based on Movement of Wiper Blade

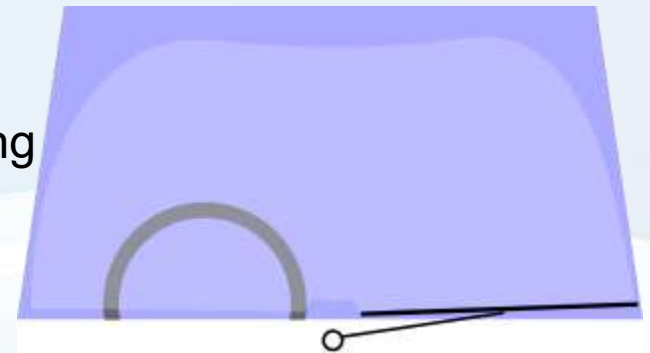
4. Single blade arm

The Most commonly used on rear windscreens, this single windscreen wiper glides back and forth with a centre pivot to ensure as much coverage as possible.



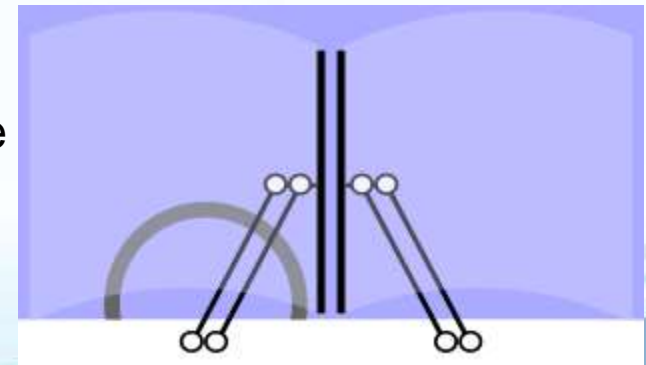
5. Monoblade

This type of windscreen wiper is attached to a single arm which extends upwards to reach the top corners of the windscreen and glides in at each end and the middle of the windscreen to create an 'M' shape. Rather than using two wipers, the single blade allows for wider coverage, moving any excess streaks away from the centre of the windscreen and out of the driver's line of vision



6. Pantograph system

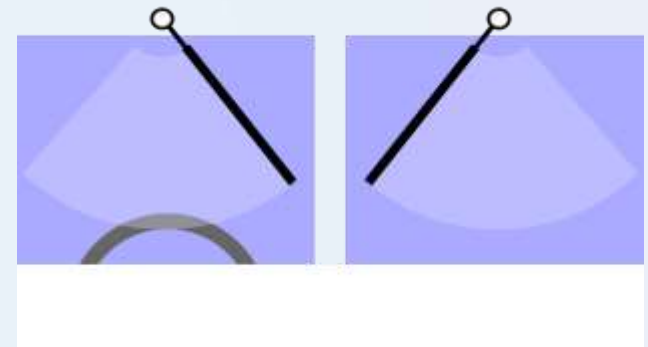
Used on commercial vehicles with larger windscreens, such as buses and coaches, pantograph systems feature two arms for each wiper blade. Supported by a vertical bar, one arm is attached to a motor and the other is on a pivot.



Wiper Classification – Based on Movement of Wiper Blade

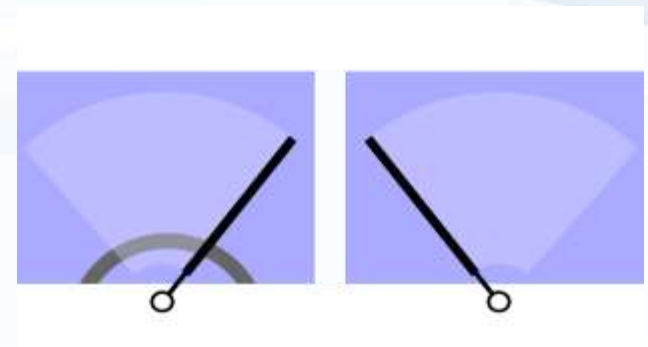
7. Dual windscreen wiper arms for two windscreens – pivoted at the top of the windscreen

Vehicles which feature two windscreens, such as US military wheeled vehicles, jeeps and utility vehicles, use dual wiper arms. These operate on a pivot from the top of the vehicle rather than the conventional way, allowing for better coverage towards the bottom of the windscreen.



8. Dual windscreen wiper arms for two windscreens – pivoted at the bottom of the windscreen

Most commonly found on older models of car with two front windscreens, this system uses a simple radial design. However, rather than operating on a pivot from the top of the vehicle like the windscreen wipers, they work in the conventional way; this allows for better coverage towards the top of the windscreen.



Classification – According to Working of Wiper (Power or Input for Wiper system)

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Classification – According to Power Input to Wiper System

The wipers combine two mechanical technologies to perform their task:

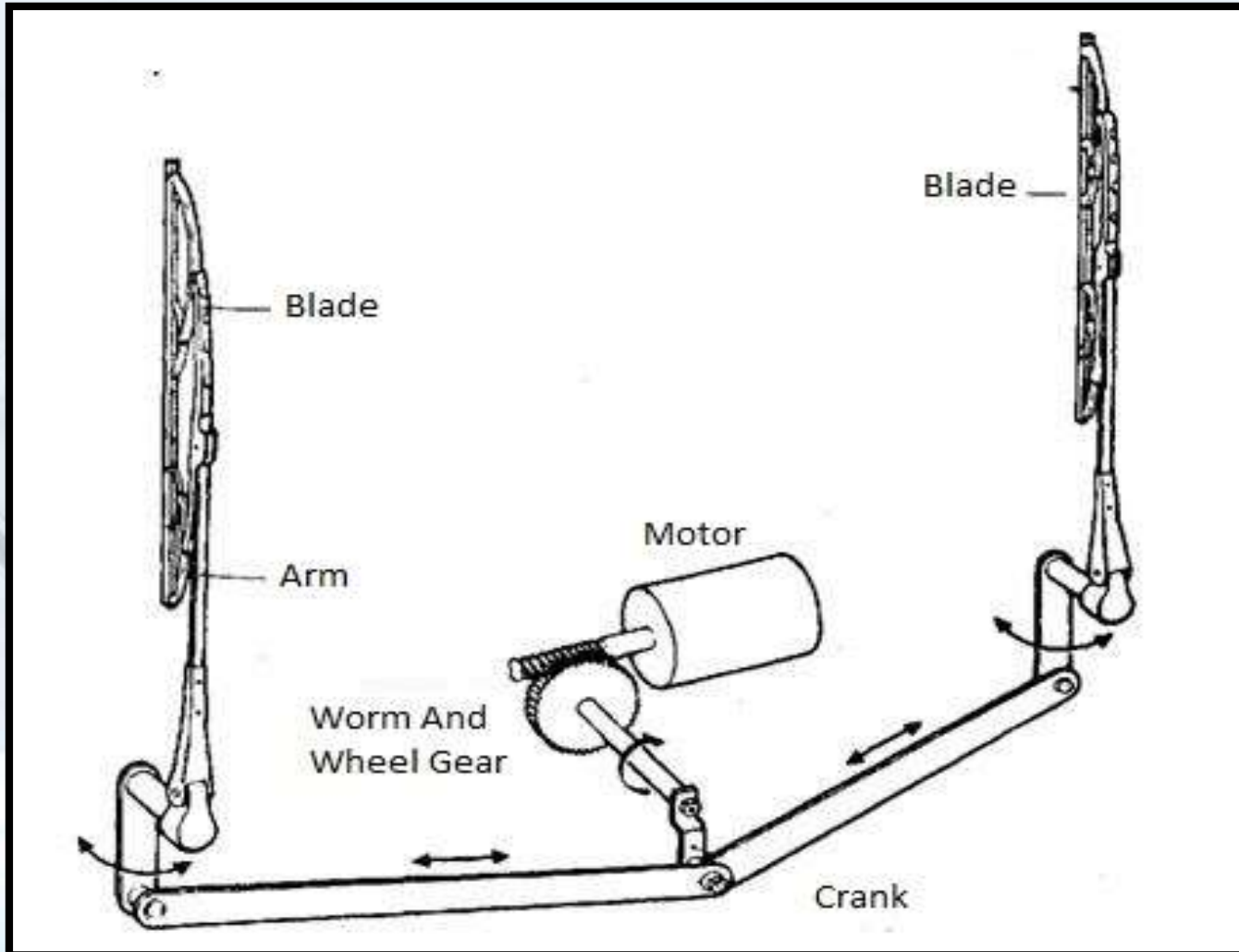
A. A combination electric motor & worm gear reduction provides power to the wipers.

It takes a lot of force to accelerate the wiper blades back and forth across the windshield so quickly. In order to generate this type of force, a worm gear is used on the output of a small electric motor. The worm gear reduction can multiply the torque of the motor by about 50 times, while slowing the output speed of the electric motor by 50 times as well.

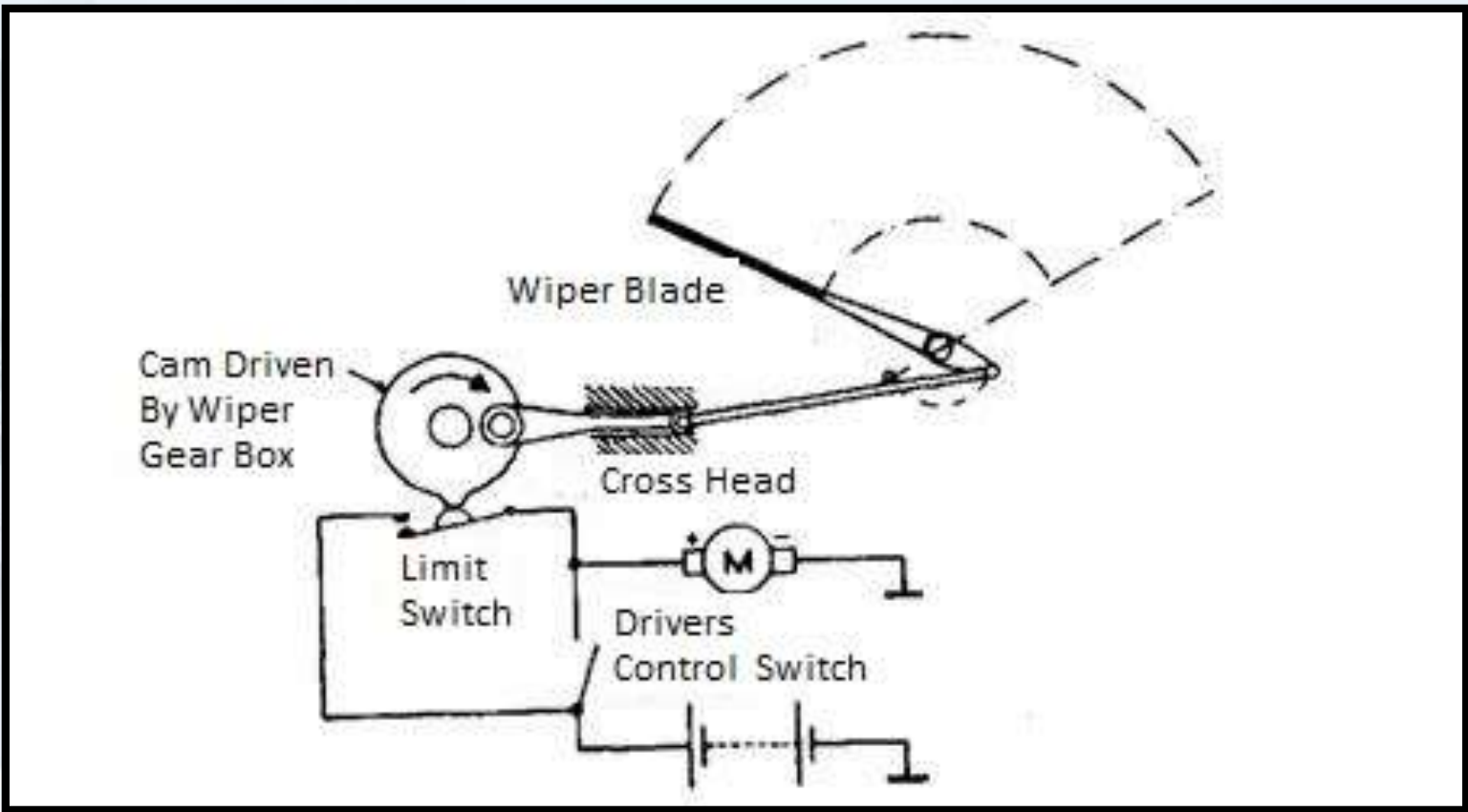
2. A neat linkage converts the rotational output of the motor into the back-and-forth motion of the wipers

A short cam is attached to the output shaft of the gear reduction. This cam spins around as the wiper motor turns. The cam is connected to a long rod; as the cam spins, it moves the rod back and forth. The long rod is connected to actuates the wiper blade on the driver's side. Another long rod transmits the force from the driver-side to the passenger-side wiper blade.

A. A combination Electric motor & Worm gear reduction provides power to the wipers.



B. A neat linkage converts the rotational output of the motor into the back-and-forth motion of the wipers



Classification – According to Location of Wiper

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Wiper Classification – Based on Location of Wiper

1. Rear Wipers

Rear-window wipers are typically found on Station wagons, Sport utility vehicles, minivans, and other vehicles with more vertically-oriented rear windows that tend to accumulate dust.



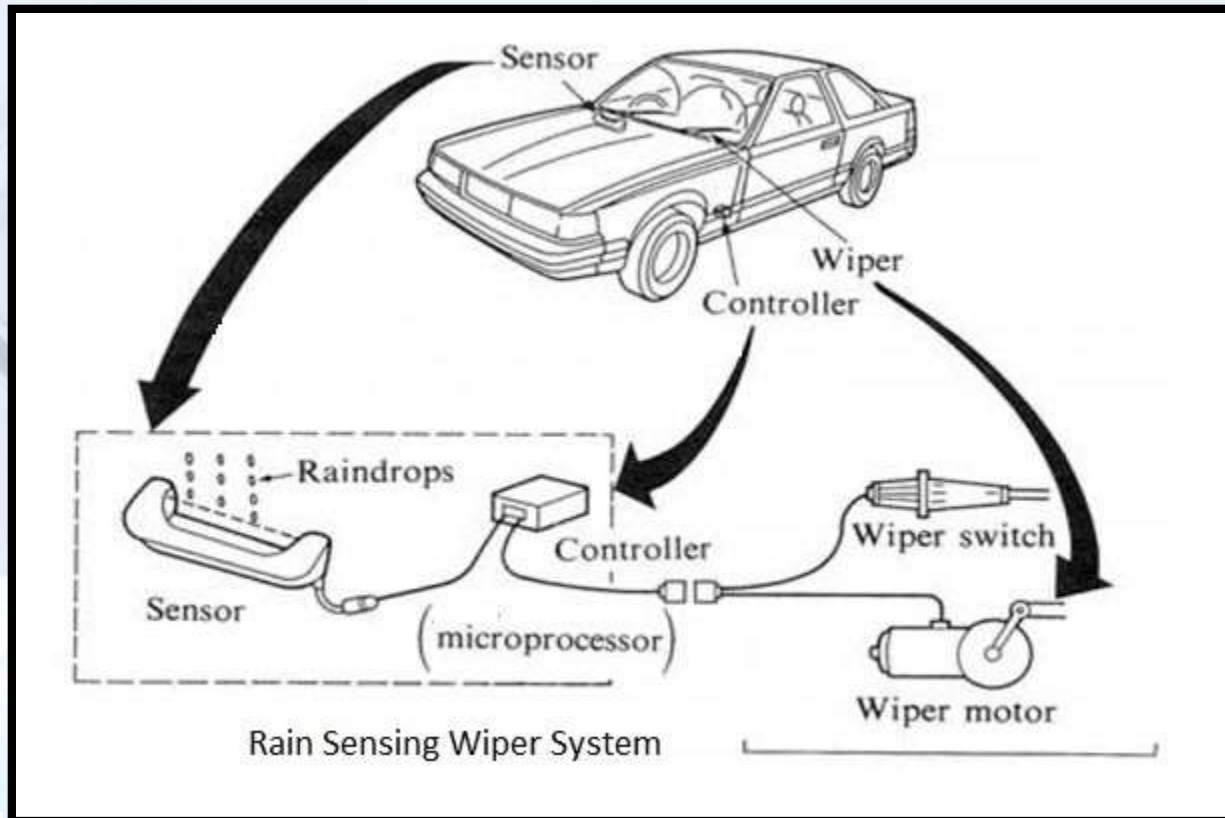
2. Hidden Wipers

When wipers are switched off in standard non-hidden designs, a "parking" mechanism or circuit moves the wipers to the lower extreme of the wiped area near the bottom of the windscreen, but still in sight. For designs that hide the wipers, the windscreen extends below the rear edge of the hood, and the wipers park themselves below the wiping range at the bottom of the windscreen, but out of sight.



3. Rain-sensing wipers

Driver programmable intelligent (automatic) windscreen wipers detect the presence and amount of rain using a rain sensor. The sensor automatically adjusts the speed and frequency of the blades according to the amount of rain detected. These controls usually have a manual override provision.



Additional Information, Standards, Videos, Case study references



Reference Websites details-

For Standard- AIS-011/2001

<https://araiindia.com/hmr/Control/AIS/5~15~2008~11~34~54~AM12%20AIS-011.pdf>

For Standard AIS-045:2004 22 May 2015

https://araiindia.com/hmr/Control/AIS/522201570341PMAmd_n_AIS-045.PDF

For Testing Procedure for Windscreen Wiping System-

<https://araiindia.com/hmr/Control/AIS/5~15~2008~11~34~54~AM12%20AIS-011.pdf>

For Working of Windscreen Wiping system Video-

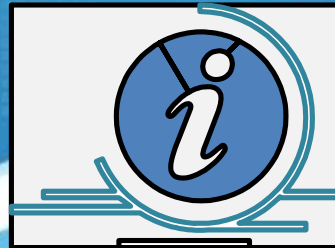
<https://www.youtube.com/watch?v=UnD1N7BrCsl>

For Other Applicable Standards

<https://www.iso.org/ics/43.040.65/x/>

THANK YOU

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Are there any Questions?

