

## FAN FALLING PROTECTION

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### ABSTRACT-

*With the increasing number of deaths due to the issue of the ceiling fan falling, it has become of utmost need to come up with some method to stop this from happening. Many methods have been used but have not been successful yet. Solutions are required to minimise the damage caused by these fans and make a sustainable structure that will resolve this issue.*

**Keywords** – deaths, damage, fan falling, sustainable.

### 1. INTRODUCTION:

A ceiling fan is mechanical device, mounted to the ceiling, usually electrically powered that uses hub mounted rotating blades to circulate air. These are typically used to cool to the air in a room and can be operated at various speeds. They are mounted to the wall by a specific mechanism using a couple of screw and bolts or a hook. While the fan is supposed to be a device to cool down the room and increase the comforts of human lives, the increasing cases of fan falling from the ceiling have caused a lot of injuries and in some severe cases, even deaths. This grave problem needs to be solved in order to avoid any more accidents.

A fan may fall due to a couple of reasons:

1. Tensile Failure
2. Compression Failure
3. Flexural or Bending Failure
4. Shear Failure
5. Fatigue Failure
6. Loose screws
7. Breaking of the mounting

## 2. METHODOLOGY:

### 2.1 Components Used:

#### 2.1.1. GI steel Rope-

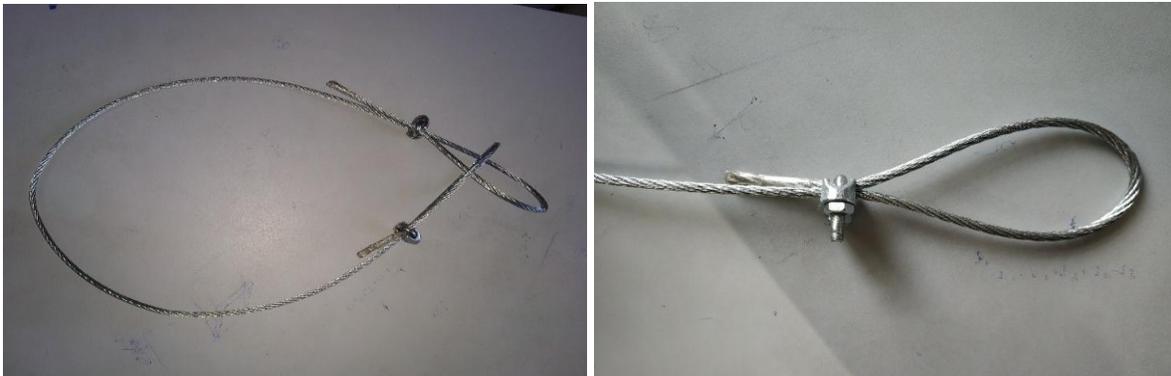
- Construction: 1 × 7 (Galvanized)
- Diameter: 3/8" (9.5mm)
- Tensile Strength: 18,000lbs.
- Packing: Coil Length per Coil: 6500ft (1981.2mtr)
- Breaking Strength: 69.4 tons

2.1.2 GI U Bolt- A U-bolt is a bolt in the shape of the letter U with screw threads on both ends. U-bolts have primarily been used to support pipework, pipes through which fluids and gasses pass. As such, U-bolts were measured using pipe-work engineering speak. A U-bolt would be described by the size of pipe it was supporting. U-bolts are also used to hold ropes together.

- Material type - bright zinc-plated mild steel
- Thread dimensions - M12 \* 50 mm
- Inside diameter - 50 mm - the distance between the legs
- Inside height -120 mm

#### 2.1.3 GI Hook –

It is a device for adjusting the tension or length of ropes, cables, tie rods, and other tensioning systems. It normally consists of two threaded eye bolts, one screwed into each end of a small metal frame, one with a left-hand thread and the other with a right-hand thread. The tension can be adjusted by rotating the frame, which causes both eye bolts to be screwed in or out simultaneously, without twisting the eye bolts or attached cables.



## 2.2 THEORY:

The GI Rope would probably be the best solution for such fan falling events. A loop is made at two ends of the GI rope and fastened using the GI U bolt. A GI hook is attached to the ceiling. The 1<sup>st</sup> loop is connected to the hook and the 2<sup>nd</sup> loop is connected to the rod of the ceiling fan. A similar arrangement is done on the other side of the fan, to give it full protection and stop it from falling.

The material used: Galvanised Iron Steel (GI), has been used to make this structure due to its excellent strength, ductile properties, susceptibility to strain – age embrittlement. Galvanised Iron is tested against other materials and was found the best for the fan protection structure.

Also, to add extra precaution we are adding extra electric circuit to ensure that when the tightened bolt over the screw moves a certain distance out and loosens due to the vibrations the electrical circuit that is open initially gets closed and the circuit gets completed. This gives indication that the bolt is moving out towards ends and its risky to continue using the fan.

This has far more applications rather just in fans. In industries we can use such circuits to ensure that the screw tightened in places which are not visible and accessible directly. Its helpful to locate the exact place in a device/ machine which bolt has actually loosen.

## 2.3EFFICIENCY:

Our galvanized strand product meets or exceeds ASTM Specifications A475 and ASTM A363.

Strands are tested for:

1. Minimum breaking force.
2. Elongation (High Strength 5%; Extra High Strength and Utilities Grade 4%).
3. Individual wire tolerances.
4. Wire coating weight – ASTM Method A90.
5. Wire wrap test for coating adherence.
6. Wire wrap test for steel ductility.
7. Preforming check.

**PHYSICAL PROPERTIES OF ZINC-COATED STEEL WIRE STRAND**

Nominal diameter of strand (in.)	Number of wires	Nominal diameter of coated wires (in.)	Approx. weight of strand (lb./1000 ft.)	UTILITIES GRADE	Minimum breaking force of strand (lb.)	
					HIGH STRENGTH GRADE	EXTRA-HIGH STRENGTH GRADE
3/16	7	.062	73	-	2,850	3,990
7/32	7	.072	98	-	3,850	5,400
1/4	7	.080	121	-	4,750	6,650
9/32	7	.093	164	-	6,400	8,950
5/16	7	.104	205	-	8,000*	11,200*
3/8	7	.120	273	11,500*	10,800*	15,400*
7/16	7	.145	399	18,000	14,500*	20,800*
1/2	7	.165	517	25,000	18,800*	26,900*
1/2	19	.100	504	-	19,100	26,700
9/16	7	.188	671	-	24,500	35,000
9/16	19	.113	637	-	24,100	33,700
5/8	7	.207	813	-	29,600	42,400
5/8	19	.125	796	-	28,100	40,200
3/4	19	.150	1,155	-	40,800	58,300
7/8	19	.177	1,581	-	55,800	79,700
1	19	.200	2,073	-	73,200	104,500
1 1/8	37	.161	2,691	-	91,600	130,800
1 1/4	37	.179	3,248	-	113,600	162,200

\*ASTM A363 (weldless) is also available in these sizes and grades upon request.

**2.4APPLICATION:**

The Application of this is any of the ceiling fans at home, in schools, offices and also in public places. On a larger scale these can also be used to provide protection the large ceiling fans in public places like airports and even in some malls that cover a large distance and have blades of almost 10 metres. The protection of such fans is even more important, because they are heavy and can cause a lot of destruction.

**3. LIMITATIONS:**

This project prevents any injuries incase the fan falls, but it does not solve the problem of the fan falling. Once a fan falls, one will have to get it repaired so that it starts working again. The problem that needs to be resolved that if it gives a prior warning when the fan is about to fall, this could create save a lot of money and can be cost effective as well.

#### **4. FUTURE SCOPE:**

We can install certain sensors in the fan that will sense if the screws in the fans are loose or not and thus will notify us beforehand, so no such tragedy will take place.

#### **5. CONCLUSION:**

The structure made of the Steel wire is strong enough to take the load of the fan and hence, does not allow the fan to fall down on the people and cause any accidents. The LED near the fan will glow in case one of the screw is loose and will notify us and hence we can get it repaired. In this way we are giving a two-way protection system, i.e. mechanical protection and electrical protection.

#### **6. ACKNOWLEDGEMENT:**

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