Elevator Car Plunges, Does a = g?

Exploring the potential causes and scenarios that make passengers feel as if the elevator is plunging

by Lakshmanan Raja

Recently, there have been reports on social media about elevator incidents mentioning that the elevator car suddenly plunged, causing passengers to be thrown into the air and injured. This article is an attempt to explore the potential causes and scenarios that could make passengers feel like the elevator is plunging during the ride. It will then focus on the specific cause of passengers being thrown into the air, as reported in the media. The analysis involves using physics equations and algebraic calculations to understand the situation. The scope of the article is limited to traction elevators, as these are the type of elevators commonly found in high-rise buildings.

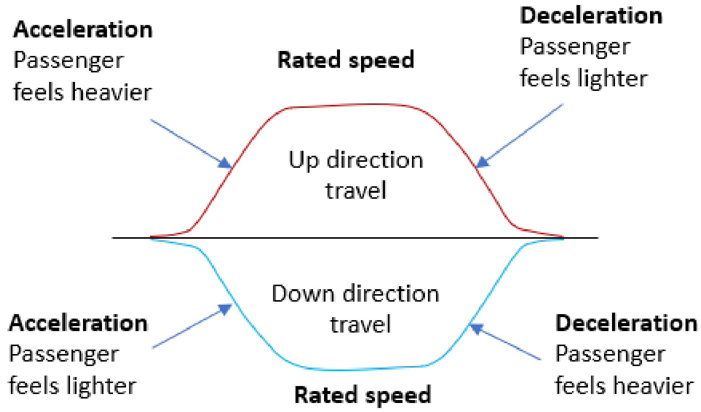

Figure 1: Speed profile of elevator system during normal operation

Learning Objectives

After reading this article, you should have learned how to:

- Summarize the possible situation that causes the passengers to feel like the elevator is plunging.
- Review the physics equations and relevant code information necessary to analyze such incidents.
- Apply the kinematics equations and free body diagram to calculate the important quantities of the elevator such as acceleration and velocity under the incident situation
- Assess the energy imparted and its effect on the elevator passenger in such situations.
- Understand the importance of the brakes, speed governor, safeties and suspension system

Plunge in an Elevator

The main purpose of the elevator in a building is to move people up and down. Most modern elevators use some form of speed control system. During normal operation, the elevator accelerates to the rated speed, travels at the rated speed and decelerates when approaching the landing. This speed profile is shown in Figure 1. Passengers traveling in the elevator usually can't feel the difference between a stationary elevator and one moving at a constant speed, i.e., the rated speed. Moving at a rated speed does not affect comfort, as the net force acting on the passenger is insignificant. Passenger comfort is affected by a change in speed (acceleration/deceleration) because the net force acting on them is significant during that time. Their apparent weight changes during this acceleration and deceleration, as shown in the speed profile of Figure 1. Passenger internal organs move within the body frame, which also affects comfort. The industry practice for ensuring passenger comfort during normal operations is to limit the acceleration/deceleration values of the speed profile to 1.2 m/s^2.[2]

In emergencies, passengers may experience higher acceleration/deceleration (retardation),

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Value: 1 contact hour (0.1 CEU)

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which can make them feel a sudden change in their weight, almost like a plunge. Components, such as the emergency brake, driving machine brake, braking system, safeties and buffers, are used to slow down and stop elevators in such situations. The upcoming paragraphs will outline the code requirements concerning the retardation rating of these components. But first, there will be a recap of basic mechanics in the following section.

Basic Mechanics

We use basic mechanics to understand the impact of acceleration/deceleration on passengers. The equations used are:

1. Newton's second law relates force to acceleration when the net force is not zero.
   $F_{net} = ma$
   F_{net} = Net force acting on a body
   m = Mass of the body
   a = acceleration of a body

2. Kinematic equations for one-dimensional motion with constant acceleration.
   $v_f = v_0 + at$
   $v_f^2 = v_0^2 + 2as$
   $x_f = x_0 + v_0 t + \frac{1}{2} at^2$
   x_0 = initial position; v_0 = initial velocity
   x_f = final position; v_f = final velocity
   a = acceleration; s = distance; t = time;

The actual weight of an object is the product of its mass and the gravitational acceleration, and it is measured in Newtons. When an elevator is in motion, the passengers experience acceleration and deceleration, as indicated in the speed profile in Figure 1. This causes the passengers to perceive a change in their weight, known as the apparent weight.

Actual weight = mg (Newton)

#Sign of a_y	Up Direction	Down Direction
Acceleration	+ (plus)	- (minus)
Deceleration	- (minus)	+ (plus)

Some possible situations that will use one of the below components or a combination to stop or slow down the elevator are explained in the next paragraph. When two components get activated simultaneously, then the overall retardation effect will be higher.

Possible Causes

Passenger discomfort is mainly caused by higher acceleration and deceleration, making passengers feel like they are plunging. The effect of discomfort on each person depends on age, physical and mental health and whether that person is prepared for that experience.

Acceleration in the upward direction of travel and deceleration in the downward direction of travel will make the passenger feel heavier and increase their apparent weight (Figure 1). During this time, the passenger may step on the car floor harder. Their knees will absorb the impact, and if the acceleration/deceleration is very high, they may squat down.

Similarly, deceleration in the upward direction of travel and acceleration in the downward direction of travel will make the passenger feel lighter and decrease their apparent weight (Figure 1). During this time, the passenger will feel lighter and may step on the car floor more lightly. If this deceleration and acceleration exceed 9.8m/s^2 (1 g), the passenger can experience floating in the air.

Electrical Protective Devices Activated in Rated Speed

While the elevator runs at its rated speed, certain electrical protective devices may get activated due to adjustment or wear issues. When these devices are activated, the drive machine brake and the braking system (if present) will engage, causing the elevator to come to an emergency stop with a higher deceleration than during normal operation. Especially for higher-speed lifts, the consequences are severe as the slowdown continues for more time until the car stops. It can happen in both up and down directions.

Relevant Code Information

Component	Relevant A17.1 – 2016 Rules	Retardation/ deceleration requirements
Emergency Brake	2.19.3.2 (h)	On activation, car average retardation is not to exceed 9.8 m/s^2 .
Driving machine brake	2.24.8.3 (c)	Any deceleration not exceeding 9.8 m/s^2 is acceptable.
Braking system	2.24.8.2.2	Any deceleration not exceeding 9.8 m/s^2 is acceptable.
Type B Safeties	2.17.3 8.2.6	0.35 g to 1 g (calculated from the min and max stopping distance from the governor tripping speed)
Type C safeties	2.17.8.2.2	On activation, car average retardation is not to exceed 9.81 m/s^2.
Oil Buffer	2.22.4.1.1	Average retardation of not more than 9.81 m/s^2
Elastomeric buffer	2.22.5.1 (a)	Average retardation of not more than 9.81 m/s^2

We commonly see this type of issue occurring when:

- The car door cam touches the landing door lock rollers due to misalignment, which opens the landing door contacts.
- The pressure of the landing door switch contact is inappropriate, causing it to open intermittently due to slight movements caused by wind pressure or someone touching the door panel from the lobby.
- There is an improper adjustment issue with the car door contact, emergency exit switch or car safety gear switch then it may open intermittently while the car is in motion due to vibrations.

Traction elevators use a counterweight to balance the cars. The counterweight equals the weight of the empty car plus 50% of the rated load. This means that, depending on the load inside, the car may become either heavier or lighter than the counterweight. During an emergency stop, the brake slows down the elevator car by using spring force, which remains fairly constant within its elastic range. Since the braking force is fixed, the deceleration caused by the brake and the stopping distance of the car depends on the load inside the car and the direction of its travel.

When we assume the deceleration by machine brake as 0.3 g, then the apparent weight = $m (g + a_y^{\#})$ while decelerating by braking in the:

- up direction will be = 75(g – 0.3 g) = 75(0.7 g) = 52.5 g (passenger feels lighter as 52.5 kg)
- down direction will be = 75(g + 0.3 g) = 75(1.3 g) 97.5 g (passenger feels heavier as 97.5 kg)

As long as the passenger has some apparent weight, he or she will be standing on the car floor and won't be flying in the air. However, this higher deceleration caused will make the passenger feel like the elevator is plunging.

The Elevator Machine Brakes or Worm Gear Engagement or Motor-Gear Coupling Fails

Since the counterweight in the traction elevators balances the car, the failure in the machine brake, worm gear or motor gear coupling, will allow the car to accelerate downward when it is loaded with more than 50% of its rated capacity. Referring to Figure 2, the sheave will turn anticlockwise.

In such a situation $M_{car}g > T$ and $T > M_{cwt}g$. Let us calculate the acceleration of the car for such a situation.

Referring to Figure 3 and Figure 4, applying Newton's second law, we get:

From Figure 2, $M_{car}a = M_{car}g - T$ ---------------------------(1)

From Figure 3, $M_{cwt}a = T - M_{cwt}g$ ---------------------------(2)

By adding equation (1) and (2), we got

$M_{car}a + M_{cwt}a = M_{car}g - T + T \neg - M_{cwt}g$

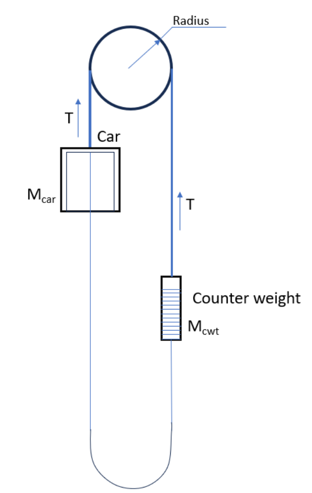


Figure 2: Traction lift system

M_{car} = Car mass
M_{cwt} = Counterweight mass
g = acceleration due to gravity = 9.8 m/s^2

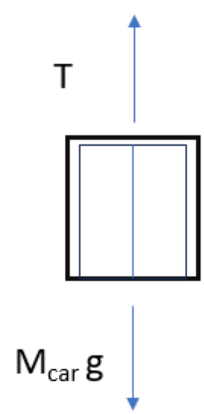


Figure 3: Free-body diagram of elevator car

$M_{car}g$ = weight of the car
T = tension on the suspension means.

Note:
For $T = M_{car}g$, the car is stationary or moving with constant velocity.
For $T > M_{car}g$, the car accelerates in the up direction.
For $T < M_{car}g$, the car accelerates in the down direction.

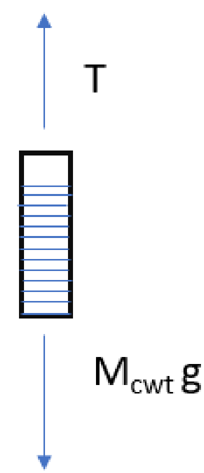


Figure 4: Free-body diagram of elevator counterweight

$M_{cwt}g$ = weight of the counterweight
T = tension on the suspension means.

Note:
For $T = M_{cwt}g$, the counterweight is stationary or moving with constant velocity.
For $T > M_{cwt}g$, the counterweight accelerates in the up direction.
For $T < M_{cwt}g$, the counterweight accelerates in the down direction.

Continued

Taking out the common terms and simplifying

$a\,(M_{car} + M_{cwt}) = g\,(M_{car} - M_{cwt})$

$a = (M_{car} - M_{cwt})\,g / (M_{car} + M_{cwt})$ -----------------------------(3)

If the car is loaded less than 50% of its rated capacity, as the counterweight is heavy, this will allow the car to accelerate in the up direction. In such a situation, $T > M_{car}g$ and $M_{cwt}g > T$.

Referring to Figure 3 and Figure 4, applying Newton's second law we get

From Figure 2, $M_{car}a = T - M_{car}g$ -----------------------------(4)

From Figure 3, $M_{cwt}a = M_{cwt}g - T$ -----------------------------(5)

By adding equation (4) and (5), we get

$M_{car}a + M_{cwt}a = T - M_{car}g + M_{cwt}g - T$

Taking out the common terms and simplifying

$a\,(M_{car} + M_{cwt}) = g\,(M_{cwt} - M_{car})$

$a = (M_{cwt} - M_{car})\,g / (M_{car} + M_{cwt})$ ---------------------------(6)

However, in the above calculation, we haven't included the moment of inertia of the drive sheave. If we consider the moment of inertia of the drive sheave, then the tension on both sides of the sheave is not the same and is shown in Figure 5.

As the tension is not the same, for a lightly loaded car, $T_1 > M_{car}g$. The car will accelerate up, using Newton's second law, and we get

$M_{car}a = T_1 - M_{car}g$

$M_{car}a + M_{car}g = T_1$ ------------------------------------(7)

Since the car accelerates up, $T_2 < M_{cwt}g$, the counterweight accelerates down, and we get

$M_{cwt}a = M_{cwt}g - T_2$

$T_2 = M_{cwt}g - M_{cwt}a$ -------------------------------------(8)

Now considering the rotational motion of the drive sheave;

Net torque on the drive sheave = inertia of the drive sheave × angular acceleration -------------------- (9)

Left hand side (LHS) of equation 9 can be expressed as:

Net torque on the drive sheave = Net force (difference in tension) × the perpendicular distance (radius of the sheave)

Right hand side (RHS) of equation 9 can be expressed as:

Inertia of the drive sheave = Mass × Radius^2 (Note: We treated the drive sheave as ring)

Angular acceleration = linear acceleration / Radius = a/R

Now substituting back into equation 9, we get:

Net force (difference in tension) x the perpendicular distance (radius of the sheave) = (Mass of the drive sheave x Radius^2) x a/R

As the car is lighter and it accelerates up, $T_2 > T_1$

$(T_2 - T_1)$ ~~Radius~~ = Mass of the drive sheave × ~~Radius~~^{2} × a/~~R~~

Substituting the values of T_1 and T_2 from equations 7 and 8

$(M_{cwt}g - M_{cwt}a) - (M_{car}a + M_{car}g)$ = Mass of the drive sheave × a

$(M_{cwt} - M_{car})\,g - (M_{cwt} + M_{car})\,a$ = Mass of the drive sheave × a

$(M_{cwt} - M_{car})\,g$ = (Mass of the drive sheave × a) + $(M_{cwt} + M_{car})\,a$

$(M_{cwt} - M_{car})\,g$ = (Mass of the drive sheave + $M_{cwt} + M_{car}$) a

$a = (M_{cwt} - M_{car})\,g / (M_{car} + M_{cwt}$ + Mass of the drive sheave) ---------(10)

Similarly for a heavier car case, the acceleration will be

$a = (M_{car} - M_{cwt})\,g / (M_{car} + M_{cwt}$ + Mass of the drive sheave) ---------(11)

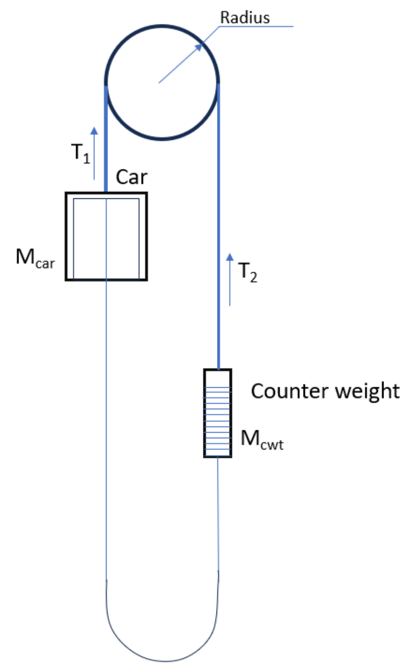


Figure 5: Traction lift system considering the inertia of the drive sheave

Equation (10) and (11) provide the expression for calculating acceleration during machine brake failure, worm gear engagement failure and motor-gear coupling failure with suspension means intact.

From those equations, we can deduce the following key points:

a) $a = 0$ when $M_{car} = M_{cwt}$
   - Acceleration will be zero when the car's mass is equal to the counterweight's mass. In this situation, the system is balanced and the net force acting on the car is zero.

b) $a \approx g$ when $M_{car} = 0$ or $M_{cwt} = 0$
   - Acceleration will be equal to or closer to gravitational acceleration only when either the mass of the car or counterweight is zero. This will happen only when the suspension breaks and the car and counterweight get separated. And in such a situation the car/counterweight will go into free fall.

c) For other situations, as long as the suspension means is intact, the acceleration of the car can never be equal to gravitational acceleration, and it will always be lesser than the free-fall acceleration of g.

Most suspension means failures are progressive, and it should be detected by the regular service visit if the maintenance is done properly. Hence, the likelihood of point (b) occurring is low. Let's delve further into point (c) with an example.

Example

The rated load of the lift is 1000 kg, its balancing factor is 0.5, and the empty car mass is 1800 kg. The lift-rated speed is = 3 m/s and serves 20 floors. (Ground floor to 20th floor). The drive sheave mass is assumed to be 150 kg.

Situation 1 (Counterweight heavy) - The mentioned elevator was loaded with three passengers and each weighed 75 kg. It went down to the ground floor but didn't open the door. The machine brake jammed on open condition and failed to hold the elevator car, and it started to accelerate upward since it was lightly loaded.

The acceleration of the upward-moving car (using equation (10)) is

$$= \frac{2300\text{kg} - 2025\text{kg}}{2300\text{kg} + 2025\text{kg} + 150\text{kg}} \times 9.8\ \text{m/s}^2 = 0.60\ \text{m/s}^2$$

The apparent weight each person feels during the up-direction travel will be

= 75(g + 0.06 g) = 79.5 kg (Passenger feels heavier.)

The elevator is accelerating up with an acceleration of 0.60 m/s^2. If the elevator is equipped with an Ascending Car Overspeed Protection (ACOP) feature, then it will trigger the emergency brake. The deceleration caused by the emergency brake is assumed to be 0.3 g then the apparent weight of the passenger is

= 79.5(g - 0.3 g) = 55.65 kg. (Passenger feels lighter but won't be flying inside the car.)

If we assume the ACOP stopping means it is not effective, then the car accelerates farther up. Let the height of each floor be 3 m. Hence, the travel distance is 60 m for 20 floors.

Now we know:

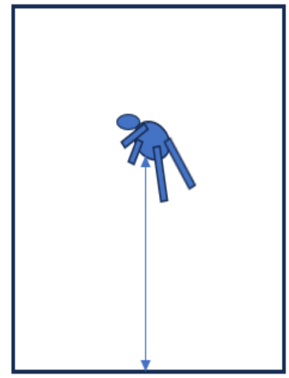
- the initial velocity is zero as the lift stopped at the ground floor before starting to accelerate up.
- the distance the elevator going to travel and its acceleration.

Then the final velocity is $v_f^2 = v_0^2 + 2as$

$$v_f = \sqrt{0^2 + 2 \times 0.60 \times 60} = 8.49\ \text{m/s}$$

When the car is accelerating upward, the counterweight accelerates downwards and hits the buffer at a speed exceeding 8.49 m/s (due to the extra run-by distance). This speed is much higher than the buffer's designed speed, which is 115% of the rated speed, causing damage to the buffer. Hence, the deceleration effect of the buffer can be ignored. This sudden stop (high deceleration) of the counterweight causes the car and passenger to jump. If the car is equipped with a compensation tied-down device, it will stop or reduce the car jumping to a certain extent *(As per A17.1-2016 - 2.21.4.2, the compensation means, connection, building structural members and fastenings shall be capable of withstanding the maximum forces to which they are subjected due to car or counterweight buffer engagement or safety application with a factor of safety of not less than 2.5.).*

The friction of the guide shoe, the weight of the traveling cable, stiffness in the steel wire rope and air drag on the car also play a role in reducing the car's jump. However, these factors won't prevent passengers inside the car from jumping, leaving them momentarily airborne. The height to which the passenger jumps is the difference between the car jump and the passenger jump. The following calculation considers the worst-case scenario, assuming the car stops abruptly without any jump.



Kinetic energy = gravitational potential energy

$$\frac{1}{2}mv^2 = mgh$$

$$\frac{1}{2}\cancel{m}v^2 = \cancel{m}gh$$

$$\frac{v^2}{2g} = h = \frac{8.49^2}{2 \times 9.8} = 3.67\text{m}$$

Figure 6: Car and passenger jump

Situation 2 (Car heavy) - Now we assume the same car is loaded with 10 passengers (750 kg), moving upward to the top floor due to the call, stopping at the top floor level, and not opening the door. The machine brake jammed on open condition, failed to hold the elevator and the elevator car started to accelerate down since it was heavily loaded.

Acceleration of the car in its downward travel (using equation (11)) =

$$\frac{2550\text{kg} - 2300\text{kg}}{2300\text{kg} + 2550\text{kg} + 150\text{kg}} \times 9.8\ \text{m/s}^2 = 0.49\ \text{m/s}^2$$

Apparent weight during the down-direction travel will be = 75(g - 0.049 g) = 71.33 kg (Passenger feels lighter).

For the elevator with a rated speed of 3 m/s, when the speed goes beyond 3.52 m/s, the governor switch will activate the emergency brake. (Reference: ASME A17.1 2016 – Table 2.18.2.1)

The distance at which the emergency brake gets activated is calculated by using the formula

$$v_f^2 = v_0^2 + 2as$$

$$3.52^2 = 0^2 + 2 \times 0.49 \times s$$

$$s = 12.64\ m \text{ from the top floor level.}$$

If the elevator doesn't slow down, the governor will trip the safety mechanisms at 3.7 m/s. (Reference: ASME A17.1 2016 – Table 2.18.2.1) The safety mechanism will get activated by the governor at a distance of

$$v_f^2 = v_0^2 + 2as$$

$$3.7^2 = 0^2 + 2 \times 0.49 \times s$$

$$s = 13.97\ m \text{ from the top floor level.}$$

If the safety mechanisms fail to grip the guide rails, then the elevator will continue to speed up, hitting the buffer at a speed higher than the intended, causing damage and abrupt stopping.

Continued

Learning-Reinforcement Questions

Use the below learning-reinforcement questions to study for the Continuing Education Assessment Exam available online at elevatorbooks.com or on p. 124 of this issue.

- State the common causes that result in elevator plunging situations.
- Not all plunging situation results in the passenger flying in the air. Explain.
- Explain how the empty elevator car's mass and the elevator's rated load affect the acceleration in uncontrolled situations.
- Calculate the final velocity of the upward traveling elevator when it crosses the top floor of a given building with the total number of floors and the floor height given.
- Explain the impact of the plunging situation on the passenger with the help of the energy conservation principle.

Accounting of Time for Article:

- Summarize the situation that causes passengers in an elevator to feel like the elevator is plunging.
30 Minutes (Pages 56 – 57)

- Review the physics equations and assess the energy imparted and its effect on the elevator passenger.
30 Minutes (Pages 57 – 64)

The speed at which the car hits the buffer is given by

$$v_f^2 = v_0^2 + 2as$$

$$v_f = \sqrt{0^2 + 2 \times 0.49 \times 60} = 7.67 \text{ m/s}$$

(Note: The speed will be more than this value due to the car run-by distance.)

As this speed is much higher than the buffer-designed speed, the deceleration effect of the buffer can be ignored. Once the car hits the buffer, it rebounds, and that rebounding distance depends on the rigidity and elasticity of the elevator car frame. Passengers will be pushed down onto the elevator floor due to increased deceleration in a downward direction. After the car hits the buffer, the possibility of passengers being thrown into the air depends on the energy absorbed by the elastic deformation of the elevator car frame.

Conclusion

The emergency stop at high speed can make passengers feel like they are plunging due to the intense deceleration. Suppose there is a failure in the brake or motor gear coupling. In that case, the car's acceleration, whether ascending or descending, will always be less than the free-fall acceleration of gravity if the suspension system is intact. However, during high deceleration exceeding 1 g, passengers may feel weightless when their apparent weight becomes zero. This occurs when the counterweight crashes into the buffer at a speed higher than the buffer's designed speed, leading to a car jump. This jump can also happen during a car collision with the buffer and due to the elastic deformation of the car frame. Our calculations are theoretical and assume constant acceleration; they do not account for elevator jumps during high deceleration. Nonetheless, they provide some insight into the acceleration experienced by passengers and the impact of being thrown into the air. Therefore, it is essential to regularly test and inspect the brake, safety systems and suspension system with the help of qualified elevator personnel.

References

[1] Young, Hugh D., Roger A. Freedman, and Albert Lewis Ford. *University physics with modern physics*. 13th edition.
[2] Barney, Gina, and Lutfi Al-Sharif. *Elevator traffic handbook: theory and practice*. Routledge, 2015.
[3] ASME A17.1-2016, Safety Code for Elevators and Escalators, American Society of Mechanical Engineers.

Lakshmanan Raja is an elevator professional with more than 25 years of experience in the industry. He has worked for AHJs and gained experience in conducting acceptance inspections, periodic inspections, accident investigations and new product evaluations. He has worked with the installation, testing and commissioning, maintenance and repair departments of various elevator and escalator companies. He holds a Master of Science in electrical engineering from the National University of Singapore.

ELEVATOR WORLD Continuing Education Assessment Examination Questions

Read the article **"Elevator Car Plunges, Does a = g?"** (EW, August 2025, pg. 56) and study the learning-reinforcement questions at the end of the article.

- To receive **one hour (0.1 CEU)** of continuing-education credit, answer the assessment examination questions found below online at elevatorbooks.com or fill out the ELEVATOR WORLD Continuing Education reporting form found overleaf and submit by mail with payment.
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1. A traction elevator system with an empty car weighing 1000 kg is designed to carry a rated load of 800 kg. The counterweight for that system is approximately
   a. 800 kg
   b. 1000 kg
   c. 1400 kg
   d. 2000 kg

2. A traction elevator system is designed for a rated load of 950 kg and balanced with a counterweight for 50% of its rated load. The car is loaded with two passengers, weighing 80 kg and 120 kg, and has a brake failure issue in which the brake fails to hold the car at floor level. Assuming the other safety features are not working, the elevator will
   a. move up
   b. plunge down
   c. stay stationary
   d. move up then down

3. The acceleration of 0.16 g is equal to
   a. 0.16 m/s^2
   b. 1.57 m/s^2
   c. 9.8 m/s^2
   d. 16 m/s^2

4. A passenger weighing 80 kg is riding an elevator moving upward with an acceleration of 0.12 g to reach its rated speed of 3 m/s. The elevator then decelerates at a rate of 0.10 g as it approaches the landing. What will the person's apparent weight be while the elevator is traveling at its rated speed?
   a. 72 kg
   b. 80 kg
   c. 83 kg
   d. 90 kg

5. When the rope tension on the car side is equal to the weight of the car plus the passenger weight then
   a. the car is accelerating up
   b. the car is accelerating down
   c. the suspension rope may break
   d. the car is moving with constant velocity

6. The acceleration of the car movement in the uncontrolled situation with the rope intact will always be (Note: g = acceleration due to gravity)
   a. in up direction with a = g
   b. in down direction with a = g
   c. lower than *g* irrespective of direction
   d. higher than *g* irrespective of direction

7. Assuming the same mass, a sheave/pulley with a larger diameter in comparison with a smaller diameter will have
   a. Same moment of inertia
   b. Higher moment of inertia
   c. Lower moment of inertia
   d. Depends on the direction of rotation

8. Two elevator cars, A and B, are designed to carry the same rated load. Car A has a higher empty mass compared to car B. If both cars, loaded with the same load, experience a brake failure issue in which the brake is unable to hold the car at the landing, find the correct statement.
   a. Acceleration of Car A will be lower.
   b. Acceleration of Car B will be lower
   c. Both car A and car B have the same acceleration.
   d. None of the above.

9. The rated load of the elevator is 1000 kg, its balancing factor = 0.5, the empty car mass = 1000 kg and the mass of the drive sheave = 100 kg. This elevator was loaded with two passengers, went down to the ground floor, stopped and didn't open the door. The brake jammed on open condition, failed to hold the elevator and the elevator started to move up. Calculate its acceleration (Assume each person weighs 75 kg).
   a. 1.0 m/s^2
   b. 1.25 m/s^2
   c. 1.78 m/s^2
   d. 1.84 m/s^2

10. If the elevator mentioned in Question 9 is used in a building with 10 floors, each floor height is assumed to be 3 m. The final velocity of the elevator when it crosses the 10th floor is.
   a. 5.33 m/s
   b. 8.66 m/s
   c. 9.32 m/s
   d. 10.12 m/s

ELEVATOR WORLD Continuing Education Reporting Form

Article title: **"Elevator Car Plunges, Does a = g?"** (EW, August 2025, pg. 56)

Continuing-education credit: This article will earn you one contact hour (0.1 CEU) of elevator-industry continuing-education credit.

Directions: Select one answer for each question in the exam. Completely circle the appropriate letter. A minimum score of 80% is required to earn credit.

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