



Vidya Vikas Education Trust's

# Universal College of Engineering

Gujarati Linguistic Minority Institution

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## The Benchmark

Issue 23: June 2020 Edition

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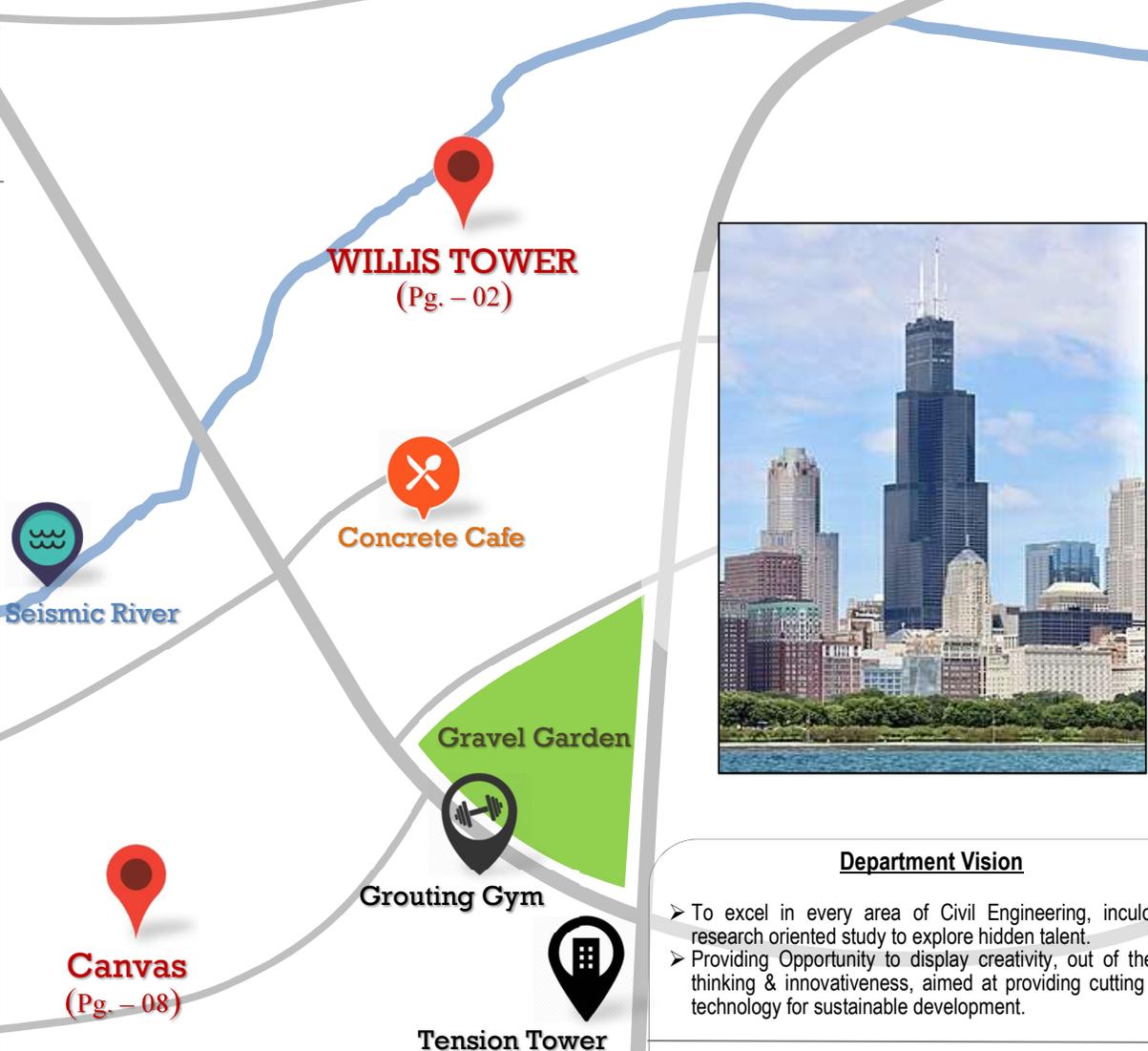
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**WILLIS TOWER**  
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**Seismic River**

**Volume Village**

### Editor's Desk

We are pleased to present June 2020 Edition of Benchmark. In this Edition you all will find an article on "Willis Tower" This edition focusses on quality management and some real time ways to overcome from the ongoing pandemic. Other contributions of students & faculties of Department of Civil Engineering in the month of May is highlighted

### Department Vision

- To excel in every area of Civil Engineering, inculcate research oriented study to explore hidden talent.
- Providing Opportunity to display creativity, out of the box thinking & innovativeness, aimed at providing cutting edge technology for sustainable development.

### Department Mission

- Providing qualified, motivated faculties to deliver the content using updated teaching methodology, inviting industry experts from various areas to disseminate subject knowledge in Civil Engineering.
- Motivating students to undertake the Research Oriented studies, participate in competitions at all levels, grasping new techniques and methods which can be improved on further.
- Conducting and participating in seminars, workshops and training programs with a view to make the students industry ready and improve their employability factor for global career ahead.
- To create quality professionals capable of planning, designing and analytical skills for better infrastructural development in the field of Civil Engineering.

# WILLIS TOWER

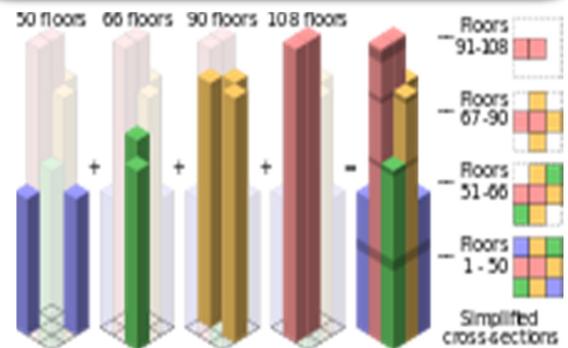
## Overview

- **The Willis Tower** is a 110-storey (442.1 m) skyscraper in Chicago, Illinois. At completion in 1973, it surpassed the World Trade Center in New York City to become the tallest building in the world, a title that it held for nearly 25 years. While it held the title of "Tallest Office Building" until 2014, it lost the title of "Tallest Man-Made Structure" after only 3 years. The CN Tower in Toronto, took over the title in 1976. The Willis Tower is considered a seminal achievement for architect Fazlur Rahman Khan. Each year, more than one million people visit its observation deck, the highest in the United States, making it one of Chicago's most popular tourist destinations.
- In 1969, Sears, Roebuck & Co. was the largest retailer in the world, with about 350,000 employees. Sears executives decided to consolidate the thousands of employees in offices distributed throughout the Chicago area into one building on the western edge of Chicago's Loop. Sears asked its outside counsel to suggest a location. The firm consulted with local and federal authorities and the applicable law, then offered Sears two options: the Goose Island area northwest of downtown, and a two-block area bounded by Franklin Street on the east, Jackson Boulevard on the south, Wacker Drive on the west and Adams Street on the north, with Quincy Street running through the middle from east to west.
- After selection of the latter site, permits to vacate Quincy Street were obtained. Attorneys from the Arnstein firm, headed by Andrew Adsit, began buying the properties parcel by parcel. Sears purchased 15 old buildings from 100 owners and paid \$2.7 million to the City of Chicago for the portion of Quincy Street the project absorbed.
- Sears, which needed 3,000,000 square feet (280,000 m<sup>2</sup>) of office space for its planned consolidation and predicted growth, commissioned architects Skidmore, Owings & Merrill (SOM). Their team of architect Bruce Graham and structural engineer Fazlur Rahman Khan designed the building as nine square "tubes". All nine tubes would rise up to the 50th floor of the building, where the northwest and southeast tubes terminate. The northeast and southwest tubes reach the 66th floor; the north, east, and south tubes end at the 90th. The remaining west and center tubes reach 108 floors. The building's total building area stands at 351,846 m<sup>2</sup> (3,787,200 sq. Ft).

## Photos



*The design of the tower allows the addition of extra height to the tower if necessary. The design was inspired by an advertisement for a package of cigarettes. The building leans about 4 in (10 cm) to the west due to its slightly asymmetrical design, placing unequal loads on its foundation. The Willis Tower remains the world's tallest steel-construction building. All taller buildings use concrete or composite construction.*



## DID YOU KNOW?

*The Colosseum in Rome, Italy is an elliptical amphitheater that was completed in 80AD. It is held around 50,000 spectators and was used for variety of events including gladiator contests, animal hunts and mythology-based dramas.*

To know more about The Willis Tower, Scan the QR Code



## Page 03: - Study of Lateral Torsional Buckling of Steel

One of the tasks engineers face, when designing beams with an open cross section is lateral-torsional buckling, often referred to as LT-buckling. LT-buckling can occur in major axis bending of a beam, where the stiffness about the minor axis is relatively small in comparison to the stiffness about the major axis. Before the steel yields, the compression flange buckles in the transversal direction to the load, pulling the beam sideways, while the flange in tension tends to hold the beam in place. This is called lateral-torsional buckling and the steel beam is no longer suitable for its original purpose.

When designing with respect to LT-buckling according to the design code EN 1993-1-1:2005, hereinafter referred to as Eurocode 3 and IS 800:2007, one parameter to be noticed is the relative slenderness of the beam. It is determined from two basic parameters; the plastic moment capacity of the cross section  $M_{pl}$ , and the elastic critical moment,  $M_{cr}$ . The lower  $M_{cr}$  is, the higher the relative slenderness will be. A higher relative slenderness implies a lower reduction factor, and the design moment capacity of the beam reduces. However, there is nothing stated about how to determine  $M_{cr}$  in Eurocode 3.

### The factors influencing $M_{cr}$ according to analytical expressions are:

- The stiffness about the minor axis
- The torsional stiffness
- The warping stiffness
- The length of the beam
- The boundary conditions
- The type of the load
- The vertical position of the loading
- Material parameters
- Degree of symmetry about the major axis

A considerable number of present-day commercial structural engineering software take lateral-torsional buckling into account, when evaluating the capacity of steel beams.

This means that it is possible for a designer to select a beam without putting an effort into understanding the LT-buckling mechanism.

Some software offers the possibility to design beams with a channel section with regard to lateral-torsional buckling, but the design rules are only valid if the channel beams are centrally loaded. It is noticed different results for  $M_{cr}$  depending on which software is used, even for the simplest cases. When the difference is significant, it makes the engineer raise doubts about the reliability of the results. For that reason, a good understanding of the problem at hand, as well as of the methods and assumptions that the available software use to obtain their results is vital.

It is of interest to study beams with a doubly symmetric I-section, monosymmetric I-section, channel section and built-up I-section. There exists an analytical expression, called the 3-factor formula in Eurocode 3, which is applicable for estimating  $M_{cr}$  for beams with an I-section. In IS 800:2007 an analytical expression for the calculation of  $M_{cr}$  is given. In order to take different loading and support conditions into account, three multiplication factors are applied and referred to as the C-factors.

In steel structures, beams with channel sections are often used and loaded on the web or the flanges. The shear Centre of channel sections is, on the other hand, located outside the cross section, which means that beams with such a section are often eccentrically loaded in practice. However, Eurocode 3 does not treat lateral-torsional buckling of eccentrically loaded beams

-Mr. Vikash Singh  
Asst. Professor UCoE



### Scratch Your Head!!

1) 1 GPa = \_\_\_\_\_

- |                          |                         |
|--------------------------|-------------------------|
| A. $10^3 \text{ N/m}^2$  | B. $10^6 \text{ N/m}^2$ |
| C. $10^3 \text{ N/mm}^2$ | D. $1 \text{ N/mm}^2$   |

# Page 04: - Pedagogy and Andragogy

Pedagogy is a Greek word means leading children. Pedagogy is also known as, “the art and science of teaching children”. Pedagogy theory assumes teachers take responsibility of what is learned, and how sessions will be delivered. It is considered teacher-centred learning.

Andragogy is a Greek word which means man-leading. Andragogy theory was adopted by an American educator called Malcolm Knowles. Andragogy is an adult learning theory, defined as, “the art and science of helping adults learn”. The Andragogy theory is considered student-centred learning and are intended to increase the effectiveness of adult learning in the classroom.

## Principles of Andragogy:

1. Adults need to be involved in the planning and evaluation of their instruction
2. Experience (including mistakes) provides the basic for the learning activities
3. Adults are most interested in learning subjects that have immediate relevance and impact to their job or personal life
4. Adults learning is problem-centred rather than content oriented

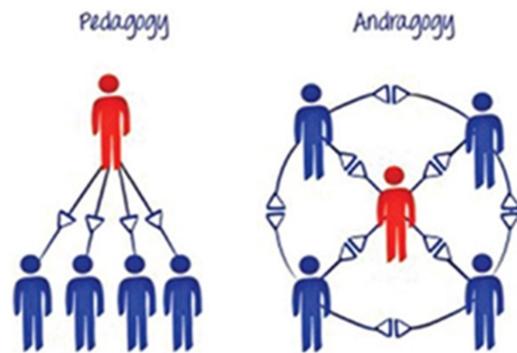
## Andragogical Program process:

1. The establishment of a climate conducive to adult learning
2. The creation of an organizational structure for participative planning.
3. The diagnosis of needs for learning.
4. The formulation of directions of learning (objective)
5. The development of a design of activities.
6. The operation of the activities
7. The redignosis of needs for learning (evaluation)

*The Pedagogy theory is concerned with the delivery of information and simple skills to children.*

## Pedagogy vs Andragogy (summary):

Pedagogy and andragogy are very different teaching models. Pedagogy is considered a content model, whereas andragogy is a process model. As a result, pedagogy focuses on conveying content. Andragogy encourages the teacher as facilitator, where the emphasis is on enabling the student to learn. These differences occur because pedagogy and andragogy are based on different assumptions about learners. (See Table 1).



## How Can I Use It?

Table 2 illustrates the differences between pedagogical and andragogical design

For adult learners and online students, who are increasingly non-traditional, andragogy may provide a more suitable teaching model. The maturity and experiences that adult learners have make andragogical principles the preferred option when designing a lesson. Additionally, with the tendency towards asynchronous delivery in online classes, students are increasingly self-directed. Planning a lesson or course around this model is conducive to this environment.

## Knowles recommends that teachers/facilitators:

- establish an environment conducive to learning;
- allow for mutual planning;
- assess learning needs;
- create learning objectives based on the student's needs;
- design learning experiences;
- implement learning experiences with appropriate techniques and materials; and
- evaluate learning outcomes and reassess learning needs

*“You cannot change your future, but you can change your habits and surely your habits will change your future.”*

*Dr. A.P.J. Abdul Kalam*

## Learning techniques to implement in an andragogical lesson include:

- Lectures: 15-20 minute sections interspersed with active learning activities.
- Problem-based learning, including case studies, educational games, and role play.
- Discussion.

Table 1

Assumptions About Learners		
	Pedagogy	Andragogy
<b>Self-Concept</b>	Dependency	Self-directiveness
<b>Experience</b>	Of little worth	Learners are a rich resource for learning
<b>Readiness</b>	Biological development social pressure	Developmental tasks of social roles
<b>Time Perspective</b>	Postponed application	Immediacy of application
<b>Learning Orientation</b>	Subject Centered	Problem Centered
<b>Motivation</b>	Extrinsic	Intrinsic

Source: Knowles, 1984

Table 2

Design Elements		
	Pedagogy	Andragogy
<b>Climate</b>	Authority-Oriented Formal Competitive	Mutuality Respectful Collaborative Informal
<b>Planning</b>	By teacher	Mutual planning
<b>Diagnosis of Need</b>	By teacher	Mutual self-diagnosis
<b>Formulation of Objectives</b>	By teacher	Mutual negotiation
<b>Design</b>	Logic of the subject matter/Content units	Sequenced in terms of readiness/problem units
<b>Activities</b>	Transmittal techniques	Experiential techniques
<b>Evaluation</b>	By teacher	Mutual re-diagnosis of needs/mutual measurement of program

Source: Knowles, 1973

-Mr. Sachin Pawar  
Asst. Professor UCoE

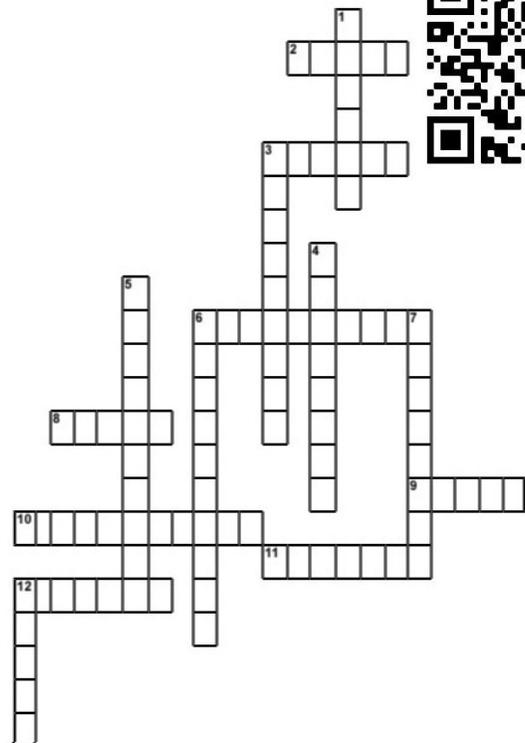


### Across:

- 2 bricks used as a building material
- a grey powder used in building that becomes very hard when you mix it with sand and water
- a long wooden board that is part of a wooden floor
- a thick black sticky substance used on roofs and ships to stop water getting through
- earth mixed with straw, used for making bricks to build houses
- a breeze block
- a type of very hard stone, used especially for building
- a black sticky substance made from petroleum, used for making roads and covering roofs

### Down:

- a substance used for repairing holes in walls and in wood
- wooden boards used for covering the outside of a building
- a substance that does not burn easily that was used in building materials in the past. It is now known to cause cancer and is no longer used.
- a layer of plastic material that is built into the bottom of the walls of a building to stop damp from rising up into the walls from the ground
- the American spelling of fibreboard
- strong and very sticky cloth that is often used for covering cracks or holes in pipes
- a long thin flat piece of wood, used especially for making floors and other parts of buildings



*Scratch Your Head!!*

2) The total domestic consumption in a city water supply is assumed

- A. 20%                      B. 50%  
C. 40%                      D. 60%

# An Expert Talk: Transport System Planning

An Online Expert lecture was Organized by Mr. Asir Khan, Assistant Professor of UCOE on 2nd May 2020 from 2.00 pm to 3.15 pm for the students of TE Civil availing Traffic Engineering course.

Expert Guest Dr. Gaurang J. Joshi Professor and Dean (Planning and Development) Transportation Engineering and Planning Department of Civil Engineering, S.V.N.I.T, Surat were invited to talk on Transport System Planning

As we all know Transportation plays an important part in economic growth and globalization. There should be proper system available for the transportation planning. During this lecture we learned about what is transportation planning and what are the importance of transportation planning. It is important because it enables communication, trade and other forms of exchange between people, that in turn establishes civilizations. Also, to reduce negative impact to the traffic that produce a pollution and to meet travel demand and response for all communities.

Urban transportation planning process involves planning of the next 20 to 25 years which comes under long term planning. The goal of urban transportation planning is to develop a plan for an efficient, balanced transportation system for an urban area which will promote a desirable pattern of human activities.

## ➤ The functions of the planning system are:

- To identify highway system components.
- To recall the process and purpose of construction planning design.

Now while designing any transportation system some problems may occur.

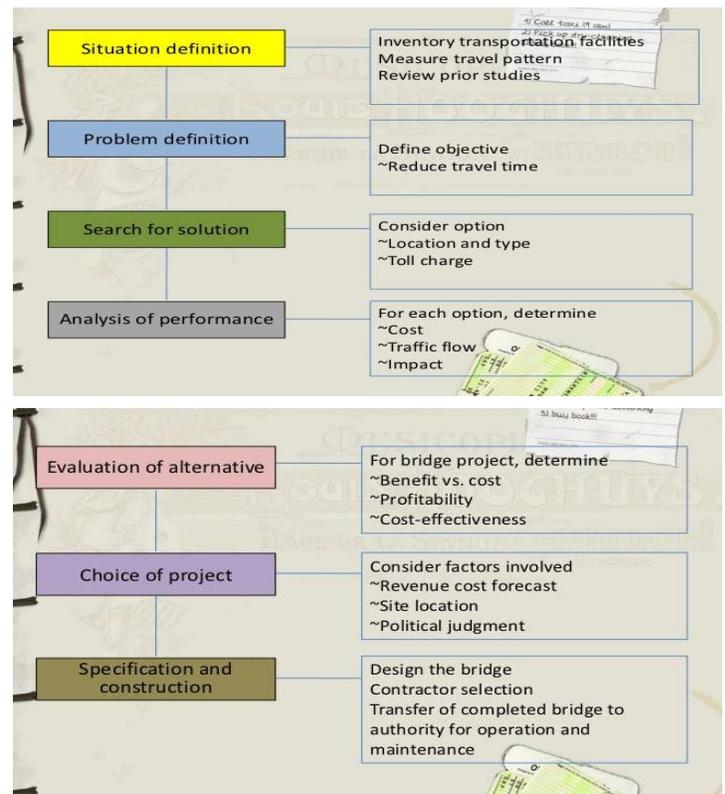
## **The most notable urban transport problems are:**

- Traffic congestion and parking difficulties
- Environmental impacts and energy consumption
- Public transport inadequacy
- Accidents and safety
- Land consumption
- High maintenance costs

## There are various methods of transportation planning process:

- Origin and destination studies
- Traffic volume studies
- Spot speed studies
- Travel time and delay studies

## ➤ Planning process



## **To reduce traffic congestion in urban areas the following elements have been introduced-**

- Capacity- widening access, traffic lights, sidewalks, parking
- Priority- priority to bus routes, trucks, pedestrian
- Resistance- access control, incentives to use public transport, car sharing, land use policy

## General policy of transportation planning-

- **Social aspects-** improve the social aspect as can be done safely and comfortably
- **Economic aspect-** With the existence variety of travel pattern, activities such as employment, population and household income will be increase
- **Physical aspects-** Create an efficient transportation system because there are various modes of transportation introduced.

Indian urban development is proceeding at a rapid pace which has made proper planning key ingredient to success. One of the main components is Urban Transport System which makes travelling easier and affordable as well as act as a catalyst for overall development.

# Page 07: - Social Activities & Awareness

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## **Boost Your Immunity to Fight COVID-19**

As we all are going through the pandemic of COVID-19, I want to share few health tips to boost our immunity to fight COVID-19. First, I want to discuss the daily routine of our life. After finishing our morning activity, we should give at least 30 minutes to keep our self-fit and healthy. First 5 minutes we should start with chanting 'OM' it relaxes our mind from other thoughts and we become more focused. Then we should perform Anulom- Vilom for next 10 minutes. In this process close your right nostril with right hand thumb and inhale from left nostril, now close left nostril with middle ring finger and remove thumb and exhale through right nostril, again inhale through right nostril, close with thumb and exhale through right nostril. Repeat the same for 10 minutes. It relieves the stress, improves the heart functioning and memory, increases concentration, also helps in arthritis.

Next yogabhyas is Kapalbhati, in this process we have to inhale and then we exhale slowly up to 1 minute. It helps in reducing sugar level and depression, it also helps in obesity, constipation and acidity. It improves the functioning of respiratory system and controls pulse rate and blood pressure. Then we should perform at least 10 Surya Namskar because it is a complete exercise for whole body. It helps in reducing the fat on stomach, thighs, hips and good for backbone. It also improves the functioning of lungs, blood circulation in the body and increases body metabolism.

If we spend every day 30 minutes for above activity then it will boost our immunity against COVID-19 as well as other diseases. We are aware from the sources that coronavirus first affects our throat section and stays there for some days and then find access to lungs and becomes life threatening. Hence if we can prevent it from going to lungs then we can protect many lives. For this we can take 500 ml water in one pot and add 10 leaves of NEEM and TULSI, one tea spoon turmeric, ginger and one spoon rock salt. Boil this solution till it reduces to half. Then use this lukewarm water for gargling purpose in the morning and evening. This will reduce formation of cough and throat infection, ginger and tulsi is good for soothing throat. NEEM and Turmeric have good antiseptic properties. If the same solution is provided to all the people like doctors, nurses, police staff, health workers then it will also help in protecting their lives. This is the old age practice we are following from our childhood that whenever we used to get affected by cough and cold then our grandmother used to give us lukewarm water with added salt for gargling twice a day and this helped us to remove all the cough from our body within 2-3 days. This will stop the formation of cough in our body which the first step of coronavirus infection. Even if it is unable to kill the virus but at least it will reduce its severity. We also need to make changes in our food habits, try to take healthy food in our diet and follow the instructions issued in public interest by Government of India, like using mask when we go outside and follow the social distancing, wash your hands frequently, Use Arroya Setu App prominently.



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*"To keep the body in good health is a duty, otherwise we shall not be able to keep our mind strong and clear."*

*-Buddha*

