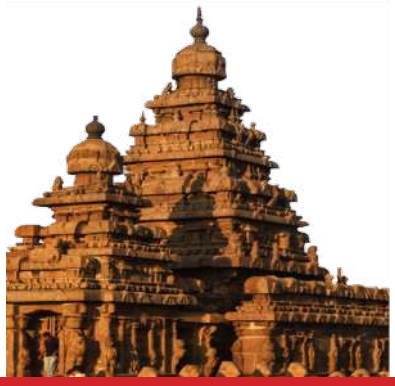

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அகில இந்திய தலைவர்
திரு. Mu. மோகன் அவர்களின்
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CONTENTS

ஆசிரியர் மடல்

அன்புடையீர் வணக்கம்,

இந்திய விடுதலைப் போரின் ஆளுமை மிக்க சக்தியாக திகழ்ந்த மாபெரும் தலைவர் நேதாஜி சுபாஷ் சந்திரபோஸ். இவர் 1897ல் ஜனவரி 23ம் நாள் இன்றைய ஒடிசா மாநிலத்தில் உள்ள கட்டக்கில் பிறந்தார். இங்கிலாந்து சென்று லண்டனில் ICS (Indian Civil Service) படித்து அதில் தேர்ச்சி பெற்ற நிலையிலும் இந்தியாவில் ஆங்கிலேய அரசின் கொடுமைகளை எதிர்த்து அவ்வரசின் கீழ் பணியாற்ற விரும்பாமல் சுதந்திர போராட்டத்தில் பங்கேற்றார்.

இவர் கல்லூரியில் படிக்கும் காலத்திலே வெள்ளையின பேராசிரியர்களின் நிறவெறிப் போக்கினை எதிர்த்து மாணவர்களை ஒன்று திரட்டி போராடியவர். காலரா போன்ற பெருந்தொற்று காலத்தில் நண்பர்களை ஒன்று சேர்த்து களப்பணியில் ஈடுபட்டதோடல்லாமல் இறந்தவர்களின் பிணங்களை தூக்கிச் சென்று இறுதிச் சடங்குகளை செய்தவர். இவர் செய்த பொதுப்பணிகளால்தான் மிகவும் இளம் வயதிலேயே கல்கத்தா நகர மேயராகவும், காங்கிரஸ் கட்சியின் தேசியத் தலைவராகவும் தேர்ந்தெடுக்கப்பட்டார். காந்திஜியின் மீது பெரும் மதிப்பு கொண்டிருந்த போஸ் அவர்கள் காந்தியின் அகிம்சை வழி போராட்டத்தையும், பொருளாதார கொள்கையையும் முழுமையாக ஏற்கவில்லை. மாறாக நேதாஜி சோஷலிஸ கொள்கை, தொழில்மயமாக்கல் ஆகியவற்றை ஆதரித்தார்.

போஸ் அவர்கள் ஆங்கிலேயர்களால் பலமுறை சிறையில் அடைக்கப்பட்டார். தமிழகத்தில் சென்னை சிறையில் அடைக்கப்பட்டிருந்த போதுதான் விடுதலை போரில் விடுதலைக்கு போராடிய புரட்சியாளர்களை ஒன்று திரட்டும் நோக்கத்தில் ஃபார்வேர்ட் பிளாக் என்ற கட்சியைத் துவங்கினார். சென்னை மற்றும் மதுரை பொது கூட்டங்களில் மக்கள் வெள்ளமென திரண்டார்கள். நேதாஜி அவர்களின் நினைவை போற்றிடும் வகையில் சென்னையில் பிரதான சாலைக்கு NSC Bose Road என பெயரிடப்பட்டுள்ளது.

ஆங்கிலேய அரசின் தீவிர கண்காணிப்பினையும் மீறி ஜெர்மனி சென்றடைந்த போஸ் இரண்டாம் உலகப்போரின் போது இந்திய தேசிய ராணுவம் போஸின் தலைமையில் இயங்கத் துவங்கியது. அப்போதுதான் "நேதாஜி" (மரியாதைக்குரிய தலைவர்) என்கிற அடைமொழி வழங்கப்பட்டது. அவர் வாழ்ந்த காலத்தில் தனது எழுத்தாலும், பேச்சாலும் இந்தியாவிற்கு எத்தனையோ வழிகாட்டுதலை வழங்கியிருக்கிறார்.

1945ல் ஆகஸ்ட் 18ல் ஒரு விமான விபத்தில் அவர் மரணமடைந்ததாக ஜப்பான் அரசு அறிவித்தது. ஆனால் இன்று வரை அவருடைய மரணத்தின் உண்மை நிலை யாருக்கும் புரியாத புதிராக உள்ளது.

நேதாஜி சுபாஷ் சந்திரபோஸ் அவர்களின் 125வது பிறந்தநாளை தேசிய வல்லமை தினமாக மத்திய அரசு அறிவித்திருக்கிறது. தேச நலனுக்காக தனது வாழ்வையே அர்ப்பணித்த ஒரு மாபெரும் வீரரை நினைவு கூர்வதற்கு இத்தருணத்தில் நாம் கடமைப்பட்டிருக்கிறோம்.

என்றும் அன்புடன்

S. அய்யநாதன்

அன்பார்ந்த நண்பர்களே வணக்கம்,

கடந்த 06.01.2021 அன்று நமது மய்யத்தின் 70ம் ஆண்டு வருடாந்திர பொதுக்குழு கூட்டம நமது அலுவலக வளாகத்தில் அமைந்திருக்கும் பத்மபூஷன் A. ராமகிருஷ்ணா அரங்கில் நடைபெற்றது. கொரோனா பெருந்தொற்றால் இப்பொதுக்குழு கூட்டம் தாமதமாக நடைபெற்றாலும் மிகச் சிறப்பாக நடைபெற்றது. 2019-20ம் ஆண்டிற்கான ஆண்டறிக்கை சமர்ப்பிக்கப்பட்டது. சபையில் அற்பணிப்பு உணர்வோடு சிறப்பாக செயலாற்றிய முன்னாள் மய்யத்தலைவர் திரு. S. இராமப்பிரபு மற்றும் அவரோடு பணியாற்றிய நிர்வாகிகள் பாராட்டப்பட்டனர். மூத்த உறுப்பினர்கள் கலந்து கொண்ட இக்கூட்டத்தில் இப்பெருந்தொற்று காலத்திலும் ஏராளமாக உறுப்பினர்கள் கலந்து கொண்டு சிறப்பித்தனர்.

20.01.2021 அன்று கட்டுநர் தின விழா குழுத்தலைவர் திரு. G திவாகர், துணைத்தலைவர் திரு. R. பாலசுப்பிரமணியன் ஆகியோரது ஏற்பாட்டில் Park In Beach Resortல் மிகச் சிறப்பாக நடைபெற்றது. அன்று தொழிலாளர்களுக்கான மருத்துவ முகாம் குழுத்தலைவர் திரு. A.சத்தியநாராயாணா, திரு. K. கோபிநாதன் ஆகியோர்களால் ஏற்பாடு செய்யப்பட்டிருந்தது. 400க்கும் அதிகமாக கட்டுநர் தொழிலாளர்கள் கலந்து கொண்டு பயனடைந்தனர். மருத்துவ முகாமினை சிறப்பாக நடத்திக் கொடுத்த அரசு கண் மருத்துவமனை, சவிதா பல் மருத்துவ பல்கலைக்கழகம், மற்றும் அப்பல்லோ மருத்துவமனை ஆகியவற்றைச் சேர்ந்த மருத்துவர் மற்றும் செவிலியர் குழுக்கள் பாராட்டப்பட்டு நினைவுப் பரிசு வழங்கி கவுரவிக்கப்பட்டனர். கட்டுநர் தின விழாவின் ஒரு பகுதியாக 12.01.2021 அன்று Safety is not Expensive - It is Priceless என்ற தலைப்பின் கீழ் நடைபெற்ற பேச்சுப்போட்டியில் வெற்றி பெற்ற மாணவர்களுக்கு பரிசும், நினைவுச் சான்றிதழும் பங்கு கொண்ட கல்லுரிகளுக்கு சான்றிதழும் வழங்கப்பட்டன. பீஷ்மா திரு. R. இராதாகிருட்டிணன் அவர்கள் முன்னிலையில் நடைபெற்ற இவ்விழாவில் தொழிலக பாதுகாப்பு மற்றும் சுகாதார இயக்குனர் திரு. M.V.செந்தில் குமார் அவர்கள் கலந்து கொண்டு உரையாற்றினார். சிறப்பு பேச்சாளராக முனைவர் I.S. பர்வின் சுல்தானா அவர்கள் சிறப்புரையாற்றினார். சிறப்புரையாற்றியவர்கள் விழாவில் கவுரவிக்ககப்பட்டனர்.

நமது மய்யத்திலிருந்து 29 ஆண்டுகளுக்குப் பிறகு அகில இந்திய கட்டுநர் சங்கத்தலைவராக போட்டியின்றி தேர்ந்தெடுக்கப்பட்டு தனது தன்னலமற்ற சேவையால் உயர்ந்து நிற்கும் நமது மரியாதைக்குரிய தலைவர் திரு. Mu. மோகன் அவர்களின் ஒப்பற்ற சேவைக்காக வாழ்த்து மடல் வழங்கி கவுரவிக்கப்பட்டார். பெருமளவிலான தொழிலாளர்கள் மற்றும் உறுப்பினர்கள் கலந்து கொண்டு விழாவினை சிறப்பித்தனர். அனைவருக்கும் பரிசு, அறுசுவை உணவு வழங்கப்பட்டது.

அகில இந்தியாவிலும் வேறு எந்த மய்யத்திற்கும் இல்லாத வகையில் நம் மய்யம் கொண்டுள்ள பெருமைக்குரிய கட்டிட வளாகத்தில் முதல் முறையாக 72வது குடியரசு தினம் நமது அகில இந்திய முன்னாள் தலைவர் பீஷ்மா திரு. R. இராதாகிருட்டிணன் அவர்கள் தேசியக் கொடியேற்ற நமது அகில இந்தியத்தலைவர் திரு. Mu. மோகன் அவர்களின் முன்னிலையில் சிறப்பாக கொண்டாடப்பட்டது. மய்ய நிர்வாகிகளுடன் செயற்குழு, மற்றும் பொதுக்குழு உறுப்பினர்கள் பெருந்திரளாக இவ்வரலாற்று சிறப்புமிகு விழாவில் கலந்து கொண்டனர். அனைவருக்கும் காலைச் சிற்றுண்டி வழங்கப்பட்டது.

29.01.2021 அன்று நடைபெற்ற பொதுக்குழு கூட்டத்தில் 2021-22ம் ஆண்டிற்கான தேர்தல் முடிவுகள் அறிவிக்கப்பட்டன. இதில் தற்போதுள்ள மய்யத்தலைவர் மற்றும் நிர்வாகிகள் மீண்டும் தொடரும் முகமாக போட்டியின்றி ஒருமனதாக தேர்ந்தெடுக்கப்பட்டனர். நம் மீது பெரும் நம்பிக்கை வைத்து நம்மையே மீண்டும் மய்ய நிர்வாகிகளாகத் தொடர ஒரு மனதாக தேர்ந்தெடுத்த நமது மய்ய உறுப்பினர்களுக்கு நாம் அனைவரும் ஒன்றுபட்டு இன்னும் சிறப்பாக சேவை செய்து நமது மய்யத்தின் பெருமையை மென்மேலும் உயர்த்த அயராது பாடுபடுவோம் என உறுதியளிக்கிறேன்.

என்றும் அன்புடன்
L. சாந்தகுமார்

SEISMIC DESIGN OF REINFORCED CONCRETE STRUCTURES

A.R.Santhakumar
Former Emeritus Professor,
Department of Civil
Engineering IIT Madras

Key words:
Seismic, R.C.Design, Earthquake, Frame, Wall, Demand, Capacity, Detailing, Code Provisions

Abstract:
This lecture covers various aspects of seismic design of R.C.Structures. The requirement of larger ductility for seismic design represents the principal departure from the design for gravity or wind. Hence a major part of the discussion is devoted to consideration associated with providing ductility in members and structures, The concept of seismic demand and capacity are elaborated. Specific provisions for design of members are presented. Detailing provisions given in the specifications are identified and commented based on behaviour witnessed during simulated classical tests drawn from literature.

1.0 Introduction:

The process of design consists of determining the expected demands and providing the necessary capacity for a structure. While it is sufficient to provide adequate stiffness and strength for Wind, in case of Earthquake resistant dsign a third basic requirement that of ductility (in-elastic deformation capacity) must be considered. Even when wind loading governs the design (for drift or strength), the structure should comply with seismic detailing provisions to resist earthquake effects. Because of the requirements for ductility, which represents a principal departure from the conventional design for gravity and wind loading, a major part of discussion in this paper, is devoted to considerations concerned with providing ductility for members and structures.

2.0 Parameters influencing ductility

a. Ductility Vs Yield level

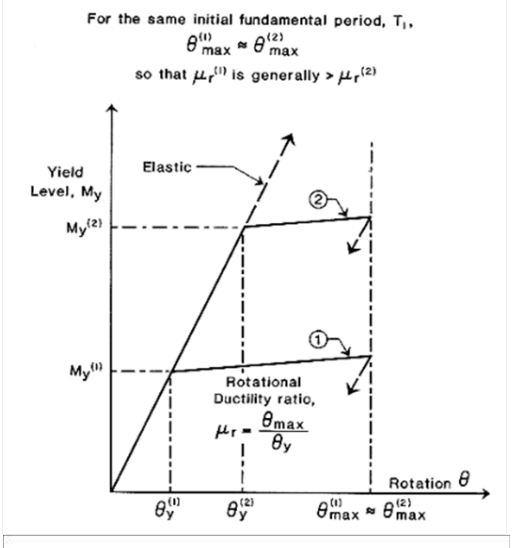

Fig.1 Decrease in ductility ratio demand with increase in yield level or strength of a structure.

Consider two cantilever walls having same fundamental period but different yield moments. For the same mass and mass distribution both walls will have same stiffness properties initially up to yield. Fig. 1 shows the force-deformation behaviour of the two walls marked (1) and (2).The analyses (Ref 1 and 2) shows the maximum lateral deflection of the structures with the same period T and properties except for yield level.

Note that $(\theta max/\theta_y^{\,2} < \theta_{max}/\theta_y^{\,1})$ (1)

Thus a decrease in ductility demand ratio μ with increase in yield capacity M_y of the structure is evident.

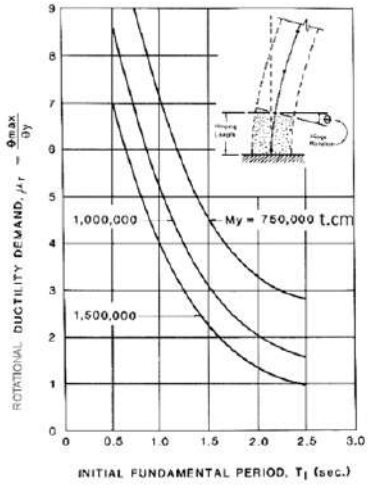

Fig.2 Rotational ductility demand as a function of initial fundamental period and yield level of 20-story structural walls.

Consider a cantilever wall (See insert of Fig.2) with initial fundamental period T1 and having a moment capacity My . This wall will need a ductility demand of $\mu=\theta_{max}/\theta_y$ where θ is the base hinge rotation. Fig.2 shows a plot of variation of rotational demand with base moment strength My and initial fundamental period T. Note that strength and ductility have inverse relationship. Larger yield capacity needs smaller ductility demand.

This s the basis of specifying larger lateral design forces for members,structures and systems that have less available ductility. IS 1893 (Part 1):2016 specifies larger reduction factors R for systems with larger ductility. R= 3 for OMRF and 5 for SMRF. Note also decrease in ductility demand for with increase in initial fundamental period T_1 of the structure. Making the structure flexible will reduce the ductility demand.

b. Ductility demand ratio, absolute rotation, curvature ductility and displacement ductility

Consider two walls having same strength but different stiffness. The stiffer wall has a stiffness of $(M_y/\theta_y^{\,1})$. The flexible wall has a stiffness of $(M_y/\theta_y^{\,2})$. Based on dynamic analysis with My=600 kg.m but different stiffness leads to fundamental periods of T_1=0.8 Sec (Stiff structure) and

T_2=2.0 Sec (Flexible structure) leads to the behaviours shown in

M_y = 600 kg.m

	Yield Rotation $\theta_{y(rad.)}$	Max. Rotation $\theta_{max.(rad.)}$
1	.00014	.00135
2	.00070	.00448

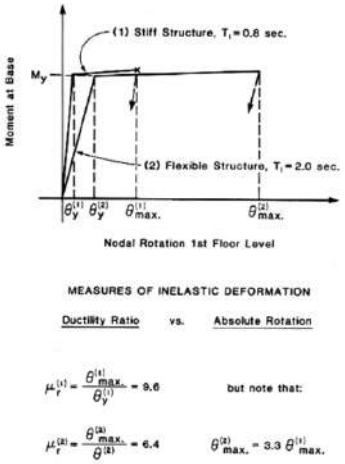

Fig.3 Rotational ductility ratio versus maximum absolute rotation as measures of inelastic deformation.

It shows results of dynamic analysis of two isolated structural walls having the same yield level (M=600kg.m) but different stiffnesses, as reflected in the lower initial

fundamental period T_1 of the stiffer structure. Both structures were subjected to the

E-W component of the 1940 El Centro record. Even though the maximum rotation for the flexible structure (with T_1 = 2.0 sec) is 3.3 times that of the stiff structure, the ductility ratio for the stiff structure is 1.5 times that of the flexible structure. The latter result is, of course, partly due to the lower yield rotation of the stiffer structure.

The term "curvature ductility" is also a commonly used term which is defined as rotation per unit length. Another important distinction worth noting with respect to ductility is the difference between displacement ductility and rotational ductility. The term displacement ductility refers to the ratio of the maximum horizontal (or

transverse) displacement of a structure to the corresponding displacement at first yield. In a rigid frame or even a single cantilever structure responding in-elastically to earthquake excitation, the lateral displacement of the structure is achieved by flexural yielding at local critically stressed regions. Because of this, it is reasonable to expect that rotational ductilities at these critical regions are generally higher than the associated displacement ductility. Thus, overall displacement ductility ratios of 3 to 6 may imply local rotational ductility demands of 6 to 12 or more in the critically stressed regions of a structure.

c. Effects of Different Variables on the Ductility of Reinforced Concrete Members

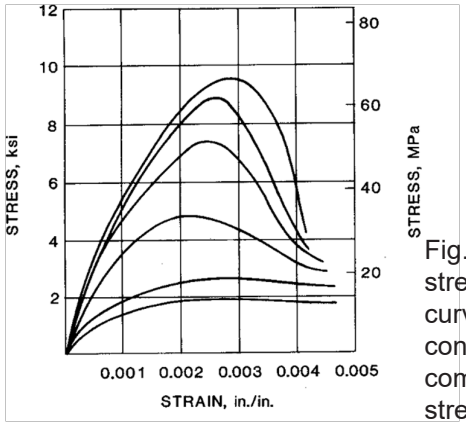

Fig.4 Typical stress-strain curves for concrete of varying compressive strengths.

The steeper downward slope beyond the point of maximum stress of curves

corresponding to the higher strength concrete is worth noting. The greater ductility of the lower strength concrete is apparent.

Typical stress-strain curves for the commonly available grades of reinforcing steel, with nominal yield strengths are shown in Fig5.

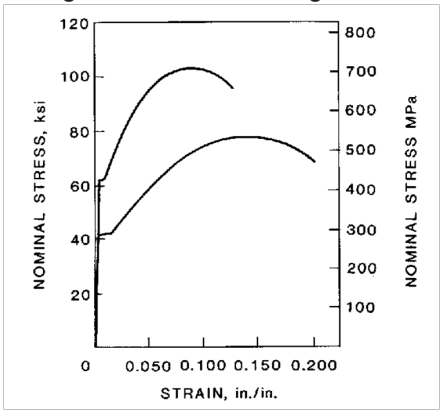

Fig 5. Typical stress-strain curves for ordinary reinforcing steel.

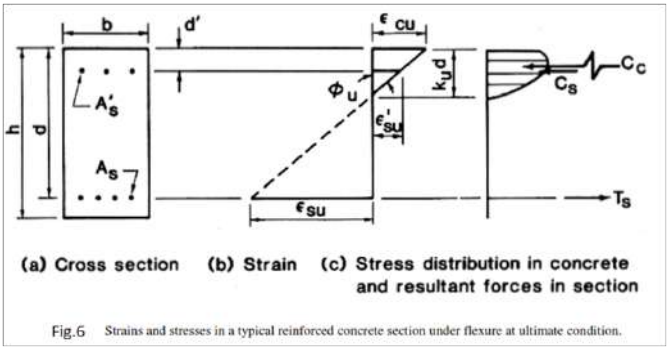

Fig.6 Strains and stresses in a typical reinforced concrete section under flexure at ultimate condition.

Note in the figure that the ultimate stress is significantly higher than the yield stress. Since strains well into the strain-hardening range can occur in hinging regions of flexural members, stresses in excess of the nominal yield stress (normally used in conventional design as the limiting stress in steel) can develop in the reinforcement at these locations.

IS 1786:2008 has introduced two new types of bars with D and S classification. These ensure larger yield strain simultaneously placing a limit on tensile strength to yield strength ratio. These bars can be used in plastic hinge regions.

d. Confinement Reinforcement

IS 456:2000 specifies a maximum usable compressive strain in concrete, e of 0.0035. Lateral confinement, whether from active forces such as transverse compressive loads, or passive restraints from other framing members or lateral reinforcement, tends to increase the value of e. Tests have shown that e cu , can range from 0.0025 for unconfined concrete to about 0.01 for concrete confined by lateral reinforcement subjected to predominantly axial (concentric) load. Under eccentric loading, values of e for confined concrete of 0.05 and more have been observed.

In reinforced concrete members, the confinement commonly takes the form of lateral ties or spiral reinforcement covered by a thin shell of concrete. The

passive confining effect of the lateral reinforcement is not mobilized until the concrete undergoes sufficient lateral expansion under the action of compressive forces in the longitudinal direction. At this stage, the outer shell of concrete usually has reached its useful load limit and starts to spall. Because of this, the net increase in strength of the section due to the confined core may not amount to much in view of the loss in capacity of the spalled concrete cover. In many cases, the total strength of the confined core may be slightly less than that of the original section. The increase in ductility due to effective confining reinforcement, however, is significant.

The confining action of rectangular hoops mainly involves reactive forces at the corners, with only minor restraint provided along the straight unsupported sides. Because of this, rectangular hoops are generally not as effective as circular spiral reinforcement in confining the concrete core of members subjected to compressive loads. However, confinement in rectangular sections can be improved using additional transverse ties. Square spirals, because of their continuity, are slightly better than separate rectangular hoops.

3.0 Beams

A convenient measure of the ductility of a section subjected to flexure or combined flexure and axial load is the ratio μ of the ultimate curvature attainable without significant loss of strength, f_u , to the curvature corresponding to first yield of the tension reinforcement, f_y. Thus

Sectional ductility, $\mu = (f_u/f_y)$ (2)

Fig.6 , which shows the strains and resultant forces on a typical reinforced concrete section under flexure, corresponds to the condition when the maximum usable compressive strain in concrete, ecu is reached.

The corresponding curvature is denoted as the ultimate curvature, f_{cu}

It will be seen in the figure that

$.f_{cu}=(e_{cu}/k_u d)$ (3)

The variables affecting sectional ductility may be classified under three groups, namely:

(i) material variables, such as the maximum usable compressive strain in concrete, particularly as this is affected by confinement, and grade of reinforcement;

(ii) geometric variables, such as the amount of tension and compression reinforcement, and the shape of the section;

(iii) loading variables, such as the level of the axial load and accompanying shear.

Under earthquake loading, beams will generally be most critically stressed at and near their intersections with the supporting columns. An exception may be where a heavy concentrated load is carried at some intermediate point on the span. As a result, the focus of attention in the design of beams is on these critical regions where plastic hinging can take place.

At potential hinging regions, the need to develop and maintain the strength and ductility of the member through a number of cycles of reversed inelastic deformation calls for special attention in design. This special attention relates mainly to the lateral reinforcement, which takes the form of closed hoops or spirals. As might be expected, the requirements governing the design of lateral reinforcement for potential hinging regions are more stringent than those for members designed for gravity and wind loads, or the less critically stressed parts of members in earthquake-resistant structures. The lateral reinforcement in hinging regions of beams is designed to provide

(i) confinement of the concrete core,

(ii) support for the longitudinal compressive reinforcement against inelastic buckling, (iii) resistance, in conjunction with the confined concrete, against transverse shear.

4.0 Columns

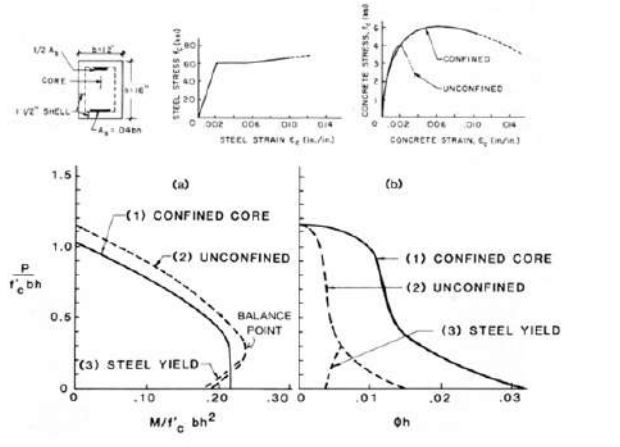

Fig.7 Axial load-moment interaction and load-curvature curves for a typical reinforced concrete section with unconfined and confined cores.

Fig.7 shows axial-load—moment- strength interaction curves for a reinforced concrete section subjected to a compressive axial load and bending about the horizontal axis. Both confined and unconfined conditions are assumed. The interaction curve provides a convenient way of displaying the combinations of bending moment *M* and axial load *P* which a given section can carry. A point on the interaction curve is obtained by calculating the forces *M* and *P* associated with an assumed linear strain distribution across the section, account being taken of the appropriate stress— strain relationships for concrete and steel. Figure 10-11 also shows the variation of the ultimate curvature fu (in units of 1/h) with the axial load *P*. It is important to note the greater ultimate curvature (being a measure of sectional ductility) associated with values of P less than that corresponding to the balance condition, for both unconfined and confined cases. The significant increase in ultimate curvature resulting from confinement is also worth noting in Fig7 b.

5.0 Shear walls

a. In many tall buildings shear walls provide major lateral load resistance for wind and seismic effects. Their incorporation into the architectural plan is dictated by functional requirements. The geometry of the wall is usually decided based on architectural and functional requirements.

For wind loading the governing design criteria is invariably top storey deflection. When the drift limitations

are satisfied it is only necessary to satisfy the strength requirements for a prescribed load factor.

In case of seismic loading in addition to satisfying the limit states of strength and deflection the requirement of ductility becomes important. During earthquakes shear walls, in addition to providing lateral load resistance should allow energy dissipation through post-elastic deformations. It becomes necessary to design shear walls for the required lateral load resistance and also satisfy the ductility demands during cyclic loading.

Shear walls when designed and detailed properly gives the greater degree of protection against non-structural damage during moderate earthquake while assuring survival during major events. This has been demonstrated time and again during past earthquakes (3).

b. Potential Failure Modes and Geometry

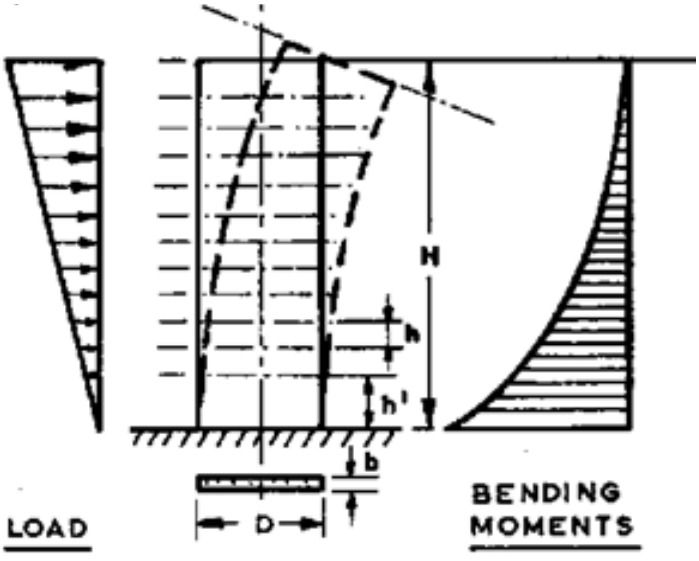

Fig.8 : A Cantilever Shear Wall

A single cantilever shear wall is shown in Fig. 8. It behaves similar to a concrete beam. Lateral instability may arise due to plastification. However, the floor slab give adequate lateral support.

Such shear walls, a large cantilever, will be subjected to bending moment and shear force from lateral loads and axial compression induced by vertical gravity load. Accordingly, the flexural strength of the critical section can be evaluated and designed using axial load, moment interaction. The vertical reinforcement in the web portion is also used for resisting flexure. However, it is important to avoid premature failure due to shear or inadequate foundation design. It is also necessary to provide sufficient connection to all the floors to transmit horizontal forces.

In shear walls with moderate heights, especially there in areas of medium seismicity like Chennai, vehicle reinforcement is usually distributed over the whole section. Such arrangement does not efficiently utilize the reinforcement when developing ultimate moment. In this case, ultimate curvature and hence curvature ductility will be limited

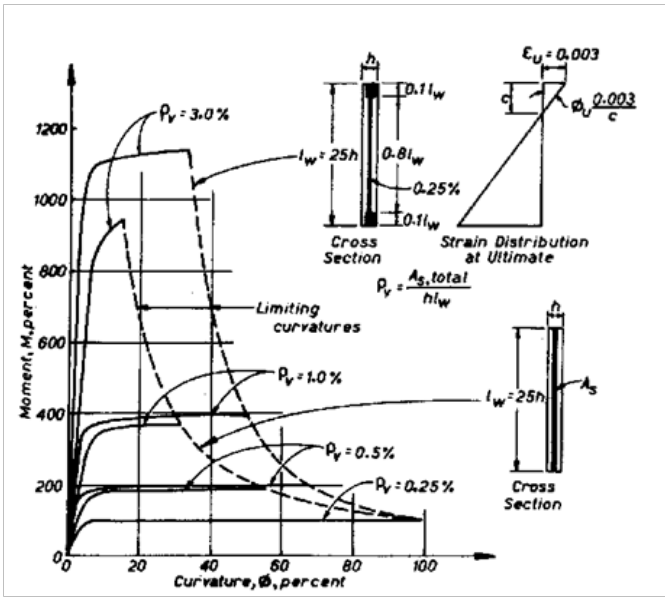

Fig. 9: The Effect of the Amount and the Distribution of Vertical Reinforcement upon Ultimate Curvature

Fig. 9 shows the improvement in ductility if the reinforcement is placed near the edges. Such arrangement will be able to resist alternate flexural compression which is inevitable during seismic loading. Since the shear wall carries large gravity load also, it is necessary to provide confinement reinforcement to improve ductility to adequate levels. Closely spaced transverse ties are provided around the vertical flexural steel which may suffer softening during cyclic loading due to Banschinger effect and open cracks. Ties spacing in such cases should be even less than that recommended by the codes

The shear strength of shear walls, with height to depth ratio of more than 3, can be assessed the same way as that of beams. At the base of the wall, where yielding of flexural reinforcement in both faces of the section occur, the shear strength to contribution of concrete should be neglected where axial compression on gross-section is less than 12% of the concrete strength. This is because the low compression may be overcome by the vertical accelerations included by earthquake leaving the whole wall under tension. Moreover, the cyclic shear produces sliding shear and pinching of hystensis loop.

Thus, the horizontal stripes in the walls stored to be designed to resist the whole shear force generated by lateral load in the plastic hinge region. The plastic hinge may extend even a whole storey height.

The plastic hinge length should be not less than overall depth D (see Fig. 8) of the shear wall section.

It is very important to supper the shear failure in the shear wall. This can be done only if all the over strength parameters of flexural steel- including the strength offered by secondary steel are assessed properly and web reinforcement provided such that it does not yield before flexural steel plastifies.

c.Moment-Axial Load Interaction for Shear Wall Section

Flanged walls normally behave better. When significant gravity compression is present the whole area of the flange may be in compression when steel (tension)

yields. Under such circumstances it is necessary to provide secondary confi--- reinforcement in the compression flanges. Flanged walls give rise to large flexural capacity. In such cases appropriate horizontal and vertical shear reinforcement must be provided so that the shear stirrups do not yield.

The moment capacity of unsymmetrical wall sections, in the presence of axial load, needs to be assessed for each possible direction of the loading. It is worthwhile to construct a load-moment interactive curve. This enables the selection of appropriate steel at various sections of the wall. Note that there are four quadrants of the P-M curve.

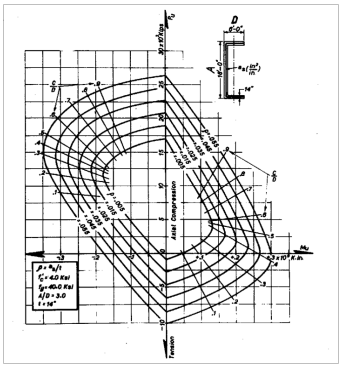

Fig. 10: Axial Force-Moment Interaction Relationship of a Channel Shaped Shear Wall Section

Fig. 10 shows such a chart for a channel shaped wall with a section aspect ratio of 3 in which vertical reinforcement is uniformly distributed. The radiating lines C indicate the position of neutral axis from the compression edges as a fraction of depth D of the section. This shows the extent of compression area at the time of attainment of strength. In this region confining reinforcement is required.

d. Coupled Shear Walls

Many shear walls contain one or more rows of openings. Examples are shear cores, lift wells, stair wells etc. The walls are connected by beams which are short and deep. An realized shear wall structure and its deformations due to lateral loading is shown in Fig.11

Assessment of Behaviour and Effectiveness of Coupling

While analyzing coupled shear walls, it is necessary

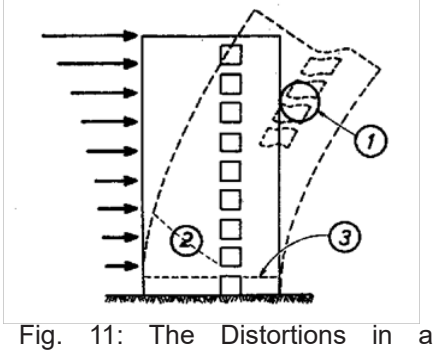

Fig. 11: The Distortions in a Laterally Loaded Coupled Shear Wall

to consider apart from flexural deformation of various components, the axial deformation of the walls and shear deformation of the beams need to be considered. In a standard computer programme with a available modification these can be incorporated.

In a mathematical model proposed by Beck Rosman the discrete beams are replaced by an equivalent lamina. This idealization enables the shear force in the beams to be expressed as a continuous function along the height. The solution is now well documented and is extensively used.

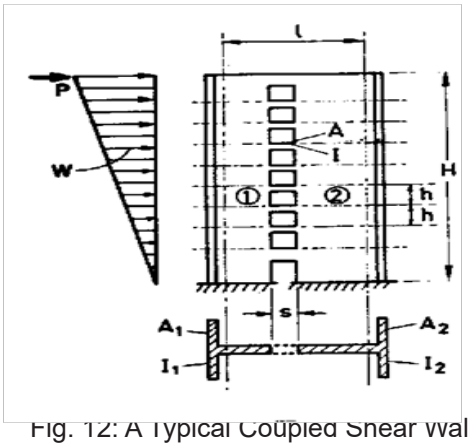

Fig. 12: A Typical Coupled Shear Wall Subjected to Lateral L

The overturning moment Mo, is resisted by (see Fig. 12) (a) a moment induced in wall 1, (b) a moment induced in wall 2 and (c) equal and opposite axial forces T generated in both walls (one in compression and the other in tension). The corresponding equilibrium equation is

$$Mo = M_1 + M_2 + IT \quad (2)$$

The axial force induced in the walls result force the accumulation of shear from beams. If shear transfer is efficient IT component will be large. This is desirable since large internal lower arm I will ensure that moment capacity is maintained. Efficient coupling provides for greater stiffness used minimize ------ reflection.

A high coupling throws more moment on walls. One may say that the coupling is efficient if more than 50% of Mo is resisted by 'IT'.

The pattern of cracking significantly reduces the stiffness of beams. Hence allowance has to be made for cracking while evaluating the design forces.

Conclusion

The principles of design of RC structures were discussed. The behaviour of shear walls were analyzed. Finally, the principles for the design of coupled shear walls explained.

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Tax Corner

திரு. S.D. கண்ணன்
Taxation Committee

Budget Highlights 2021

- **Expenditure:** The government proposes to spend Rs 30,42,230 crore in 2020-21, which is 12.7% higher than the revised estimate of 2019-20.
- **Receipts:** The receipts (other than net borrowings) are expected to increase by 16.3% to Rs 22,45,893 crore, owing to higher estimated revenue from disinvestments.
- **GDP growth**: The government has assumed a nominal GDP growth rate of 10% (i.e., real growth plus inflation) in 2020-21. The nominal growth estimate for 2019-20 was 12%.
- **Deficits:** Revenue deficit is targeted at 2.7% of GDP, which is higher than the revised estimate of 2.4% in 2019-20. Fiscal deficit is targeted at 3.5% of GDP, lower than the revised estimate of 3.8% in 2019-20. Note that the government is estimated to breach its budgeted target for fiscal deficit (3.3%) in 2019-20 and the medium term fiscal target of 3% in 2020-21. This does not include off-budget borrowings (0.9% of GDP in 2020-21)
- **Ministry allocations:** Among the top 13 ministries with the highest allocations, the highest percentage increase is observed in the Ministry of Communications (129%), followed by the Ministry of Agriculture and Farmers' Welfare (30%) and the Ministry of Home Affairs (20%).

Tax proposals in the Finance Bill

In addition to changes in tax laws, the Finance Bill, 2020 also proposes certain non-tax changes to the Prohibition of Benami Properties Transactions Act, 1988.

- **No Change in income tax rates**: **Option for lower tax rates**: The Income Tax Act was recently amended to give an option to domestic companies to avail of 22% tax rate if they did not claim certain deductions. The list has been expanded to include other deductions, such as those under Section 80G (donations to charities). Also, a similar facility has been provided to co-operatives.
- **Benefits to corporates**: Currently, domestic manufacturing companies have an option to pay income tax at the rate of 15% if they do not claim certain deductions under the Act. This benefit has been extended to domestic companies engaged in electricity generation.
- **Dividend Distribution Tax**: Currently, companies have to pay a tax of 15% on dividends distributed by it to shareholders. This has been removed and the dividend income will now be taxable in the hands of the recipient.
- **Limit on deductions for social security contributions**: Currently, there is no combined limit for the purpose of deductions on the amount of

contribution made by an employer towards a recognised provident fund, an approved superannuation fund and the National Pension Scheme. A combined ceiling of Rs 7.5 lakh is being introduced on deductions which may be claimed towards such contributions.

- **Residence in India**: The Income Tax Act, 1961 specifies various conditions for determining the resident status of an Indian citizen or a person of Indian origin. A person will be considered a resident, i.e. their global income is taxable in India, if they are in India for more than 182 days. This has been reduced to 120 days. In addition, any Indian citizen who is not liable to tax in any other country or territory by reason of domicile or residence shall be deemed to be a resident of India.
- **TDS on e-commerce transactions**: TDS of 1% will be levied on e-commerce transactions.
- **Housing incentives**: Currently, an exemption is provided on profits or gains arising out of building affordable houses if the project was approved by March 31, 2020. Further, an additional tax deduction of up to Rs 1,50,000 is provided on interest paid on loans for self-occupied house owners if the loan was sanctioned by March 31, 2020. The deadline in both cases has been extended to March 31, 2021
- **Tax changes for start-ups**: Start-ups are allowed to get a full tax waiver on profits for any three consecutive years out of their first seven years, if they are incorporated between April 1, 2016 and March 31, 2021, and their turnover does not exceed Rs 25 crore. The waiver has been extended to start-ups for any three years out of their first ten years. In addition, the turnover threshold has been increased from Rs 25 crore to Rs 100 crore.
- Further, the tax on ESOPs (stock options) held by employees of start-ups will be payable only on the earliest of the following events: (i) expiry of 4 years from the end of the assessment year, (ii) sale of the options, or (iii) till the employee leaves the company.
- **Excise**: The rate of central excise duty on certain tobacco products such as cigarettes, chewing tobacco, and tobacco extracts has been increased. For example, the rate of duty on chewing tobacco has been increased from 10% to 25% per kg. Further, crude petroleum has been included at a rate of duty of Rs 50 per tonne.

- **Customs:** Customs duty has been raised on some items such as tableware and kitchenware, footwear, fans, and toys.
- **Health cess on customs**: A health cess will be levied (in addition to customs duty) on certain medical devices, such as X-ray machines,

imported into India. This cess may be utilised for the financing of health infrastructure and services.

- **Obligations on charities**: Charitable organisations get an exemption from taxation under Section 12AA, and donations to them get exemptions under Sections 10(23C), 35, and 80G. From now, the approvals under these sections will be valid for a maximum of five years. Any entity having these approvals has to get them re-issued.
- **Commodities Transaction Tax:** Currently, the commodities transaction tax on commodity derivatives is 0.01%. The Bill creates three tax rates: (i) 0.01% payable by the seller on sale of commodity derivatives based on its price or price index, (ii) 0.0001% payable by the buyer on the sale of an option in goods resulting in the delivery of the goods, and (iii) 0.125% payable by the buyer on the sale of an option in goods resulting in cash payment.
- **Indian Stamp Act, 1899**: Stamp duty will not be charged in the case of transactions in stock exchanges and depositories established in international financial centers set up under the Special Economic Zones Act, 2005.
- **Sovereign wealth funds**: Income arising out of investments made by the Abu Dhabi Investment Authority and other notified sovereign wealth funds in certain infrastructure facilities will be exempt from tax. This exemption is available if the investment was made before March 31, 2024, and with a minimum lock-in period of three years.
- **The Prohibition of Benami Property Transactions Act, 1988:** The Act constitutes an adjudicating authority on issues related to benami properties. The qualifications for the chairperson and members of the authority are that they must have been: (i) a member of the Indian Revenue Service as Commissioner of Income-tax or equivalent, or (ii) a member of the Indian Legal Service as Joint Secretary or equivalent. The Bill states that an individual qualified for the position of District Judge may also be the chairperson or a member of the authority.
- **Removal of tax exemptions on certain allowances**: Certain exemptions on facilities to current and former members of the Union Public Service Commission and the Election Commission such as rent-free residence, conveyance allowance, and medical facilities are exempt from tax. This exemption has been removed.

Policy Highlights

- **Legislative Changes**: The Banking Regulation Act, 1949 will be amended for better governance of cooperative banks. The limit for NBFCs to be

eligible for debt recovery under the SARFAESI Act, 2002 will be reduced. The asset size will be reduced from Rs 500 crore to Rs 100 crore, and loan size will be reduced from one crore rupees to Rs 50 lakh. The Deposit Insurance and Credit Guarantee Corporation has been permitted to increase deposit insurance coverage for a depositor, which will now be one lakh to five lakh rupees, per depositor. The Factor Regulation Act, 2011 will be amended to enable NBFCs to extend invoice financing to MSMEs. The PFRDA Act will be amended to separate NPS trust for government employees for PFRDAI. Laws where there is criminal liability for acts that are civil in nature will be examined and amended. Contracts Act, 1872 will be strengthened to ensure that contracts are honoured.

- **GST Compensation**: GST compensation balances for 2016-17 and 2017-18 will be paid in two instalments. From now, transfer to GST Compensation Fund will be only through the compensation cess.
- **Disinvestment**: The government will sell a part of its holding in LIC through an Initial Public Offer. The government also plans to sell the balance of its holding in IDBI Bank.
- **Investment**: Certain specified categories of government securities will be opened fully for non-resident investors. The limit for Foreign Portfolio Investment in corporate bonds will be increased from 9% to 15% of the outstanding stock of corporate bonds. It has been proposed to set up an Investment Clearance Cell which will provide "end to end" facilitation and support, such as pre-investment advisory at the central and state level.
- **Commerce and Industry**: A scheme focused on encouraging manufacturing of mobile phones, electronic equipment, and semi-conductor packaging has been proposed. The National Technical Textiles Mission will be implemented from 2020-21 to 2023-24 with an outlay of Rs 1,480 crore. A scheme will be launched for the refund of duties and taxes on exported products, which are not getting exempted under any other existing mechanism.
- **Infrastructure and Urban Development**: The government will build 6,500 projects under the National Infrastructure Pipeline. These projects will include housing, safe drinking water, and healthcare, among others. A National Logistics Policy will be released which will clarify the roles of the central government, state governments, and key regulators. Further, it will create a single window e-logistics market. Five new smart cities will be developed in collaboration with states in public-private partnership mode.
- **Transport and Energy**: Four railway station re-development projects and operation of 150 passenger trains will be done through public-private partnership mode. The government will encourage states to replace

conventional energy meters with prepaid smart meters by 2023. It has been proposed to expand the national gas grid from 16,200 km to 27,000 km.

- **Agriculture and allied activities**: The government will expand the Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan scheme to help 20 lakh farmers in setting up stand-alone solar pumps. Viability gap funding will be provided for setting up warehouses at the block level. All eligible beneficiaries of Pradhan Mantri Kisan Samman Nidhi will be covered under the Kisan Credit Card scheme. The government will propose comprehensive measures for 100 water stressed districts.
- **Technology**: A policy will be introduced to enable private sector to build data centre parks. Fibre to the Home connections through Bharatnet will link one lakh gram panchayats in 2020. A new National Policy on Official Statistics has been proposed which will use latest technology including Artificial Intelligence. An outlay of Rs 8,000 crore has been proposed for the National Mission on Quantum Technologies and Applications, over a period of five years.
- **Education**: The new National Education Policy will be announced. Steps will be taken to enable sourcing of External Commercial Borrowings and Foreign Direct Investment for education. Degree level online education programme will be started by institutions who rank within top 100 in the National Institutional Ranking framework.
- **Health**: Jan Aushadhi Kendra scheme will be expanded to all districts and 2,000 medicines and 300 surgicals will be offered by 2024. Viability gap funding window has been proposed for setting up hospitals in the public-private partnership mode.
- **Social Justice**: Legislative and institutional changes will be made to ensure that there is no manual cleaning of sewer systems or septic tanks. Rs 28,600 crore has been allocated for programs specific to women.
- **National Recruitment Agency**: National Recruitment Agency will be set up for recruitment of non-gazetted posts in government and public sector banks.

- Expenses which bring a change to the government's assets or liabilities (such as construction of roads or recovery of loans) are capital expenses, and all other expenses are revenue expenses (such as payment of salaries or interest payments).
- In 2020-21, **capital expenditure** is expected to increase by 18.1 % over the revised estimates of 2019-20, to Rs 4,12,085 crore. On the other hand, **revenue expenditure** is expected to increase by 11.9% over the revised estimates of 2019-20 to Rs 26,30,145 crore.

- From 2010-11 to 2020-21, capital expenditure had an annual average growth of 10.2%, while revenue expenditure had an annual average growth of 9.7%.
- **Disinvestment** is the government selling its stakes in Public Sector Undertakings (PSUs). In 2019-20, the government is estimated to meet 62% of its disinvestment target. The disinvestment target for 2020-21 has been set at Rs 2,10,000 crore.

- **Indirect taxes:** The total indirect tax collections are estimated to be Rs 10,96,520 crore in 2020-21. Of this, the government has estimated to raise Rs 6,90,500 crore from GST. Out of the total tax collections under GST, 84% is expected to come from central GST (Rs 5,80,000 crore), and 16% (Rs 1,10,500 crore) from the GST compensation cess.
- **Corporation tax:** The collections from taxes on companies are expected to increase by 11.5% in 2020-21 to Rs 6,81,000 crore. The revised estimates of 2019-20 indicate a 20.3% shortfall in collections from corporation tax over the budget estimates of 2019-20. This shortfall may be due to a cut in the corporate tax rates made earlier during the financial year.
- **Income tax:** The collections from income tax are expected to increase by 14% in 2020-21 to Rs 6,38,000 crore. The 14% growth is despite a reduction in tax rates. That is, income tax is estimated to grow at 21%, if not for the Rs 40,000 crore revenue foregone due to the reduction in tax rates.
- **Non-tax receipts:** Non-tax revenue consists of interest receipts on loans given by the centre, dividends and profits, external grants, and receipts from general, economic, and social services, among others. Non-tax revenue is expected to increase by 11.4% over the revised estimates of 2019-20 to Rs 3,85,017 crore.

Expenditure on Subsidies

In 2020-21, the total expenditure on subsidies is estimated to be Rs 2,62,109 crore, a decrease of 0.5% from the revised estimate of 2019-20. This is largely due to a decrease in expenditure on fertiliser subsidy. Details are given below:

- **Food subsidy:** Allocation to food subsidy is estimated at Rs 1,15,570 crore in 2020-21, a 6.3% increase as compared to the revised estimate of 2019-20. In 2019-20 budget, Rs 1,84,220 crore was allocated to food subsidy. However, the revised estimate is much lower than the

budgeted estimate at Rs 1,08,688 crore. This is due to a 41% cut (Rs 75,532 crore in amount) in the allocation to food subsidy for 2019-20 from the budgeted stage to the revised stage.

- **Fertiliser subsidy:** Expenditure on fertiliser subsidy is estimated at Rs 71,309 crore in 2020-21. This is a decrease of Rs 8,689 crore (10.9%) from the revised estimate of 2019-20.
- **Petroleum subsidy:** Expenditure on petroleum subsidy is estimated to increase by 6.1% to Rs 40,915 crore in 2020-21. Petroleum subsidy consists of subsidy on LPG (Rs 37,256 crore) and kerosene subsidy (Rs 3,659 crore). In 2020-21, while the LPG subsidy is estimated to increase by Rs 3,170 crore over the previous year, kerosene subsidy is estimated to decrease by Rs 824 crore.
- **Other subsidies:** Expenditure on other subsidies includes interest subsidies for various government schemes, subsidies for the price support scheme for agricultural produce, and assistance to state agencies for procurement, among others. In 2020-21, the expenditure on these other subsidies has decreased by Rs 1,987 crore (5.5%) over the revised estimate of 2019-20. Table 4 provides details of subsidies in 2020-21.

Expenditure by Ministries

The ministries with the 13 highest allocations account for 53% of the estimated total expenditure in 2020-21. Of these, the Ministry of Defence has the highest allocation in 2020-21, at Rs 4,71,378 crore. It accounts for 15% of the total budgeted expenditure of the central government. Other Ministries with high allocation include: (i) Home Affairs, (ii) Agriculture and Farmers' Welfare, (iii) Consumer Affairs, Food and Public Distribution, and (iv) Rural Development. Table 5 shows the expenditure on Ministries with the 13 highest allocations for 2020-21 and the changes in allocation as compared to the revised estimate of 2019-20.

Sources: Expenditure Budget, Union Budget 2020-21; PRS.

- **Ministry of Home Affairs:** Allocation to the Ministry of Home Affairs increased by Rs 28,142 crore (20.2%) in 2020-21, over the revised estimate of 2019-20. This is mainly on account of grants provided by the Ministry to the newly formed union territories of Jammu and Kashmir (Rs 30,757 crore), and Ladakh (Rs 5,958 crore).
- **Ministry of Communications:** Allocation to the Ministry of Communications increased by Rs 46,208 crore (129.3%) in 2020-21, over the revised estimate of 2019-20. This is mainly on account of capital infusion of Rs 20,410 crore in BSNL and MTNL for 4G spectrum, and Rs 13,184 crore of grants provided to them for Voluntary Retirement Scheme.

- **Ministry of Agriculture and Farmers' Welfare:** Allocation to the Ministry of Agriculture and Farmers' Welfare increased by 30.1% to Rs 1,42,762 crore in 2020-21 over the previous year. This is primarily due to an increase of Rs 20,630 crore in allocation to the PM-KISAN scheme. In 2019-20, the Ministry was allocated Rs 1,38,564 crore, which has been revised down by 21% to Rs 1,09,750 crore (due to Rs 20,630 crore of estimated underspending in PM-KISAN).
- **Ministry of Consumer Affairs, Food and Public Distribution:** Allocation to the Ministry increased by Rs 7,245 crore (6.2%) over the previous year. In 2019-20, the Ministry was expected to spend Rs 1,94,513 crore, which has been revised down by 40% to Rs 1,17,290 crore (due to Rs 75,532 crore cut in allocation to the food subsidy).

- Among schemes, the PM-KISAN scheme (income support to farmers) has the highest allocation in 2020-21 at Rs 75,000 crore. Allocation to the scheme has increased by 37.9% from the revised estimate of 2019-20. However, in 2019-20, allocation to the scheme has been cut by Rs 20,630 crore (28%) from the budgeted stage to the revised stage. In 2018-19, expenditure on the scheme saw a 94% cut, from an estimate of Rs 20,000 crore at the revised stage to an actual expenditure of Rs 1,241 crore.
- The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) has the second highest allocation in 2020-21 at Rs 61,500 crore. This is a decrease of Rs 9,502 crore (13.4%) from the revised estimate of 2019-20. In 2019-20, allocation to the scheme has increased by 18% from Rs 60,000 crore at the budgeted stage to Rs 71,002 crore at the revised stage.

- Allocation to the Pradhan Mantri Gram Sadak Yojana has increased by 38.6% over the revised estimate of 2019-20 to Rs 19,500 crore. In 2019-20, allocation to the scheme has been cut by Rs 4,930 crore (26%) from the budgeted stage to the revised stage.

- Programmes for the welfare of women and children have been allocated Rs 2,39,504 crore in 2020-21, an increase of 3.9% over the revised estimate of 2020-21. These allocations include programmes under all the ministries.
- The sub-plans for Scheduled Castes and Scheduled Tribes have been allocated a total of Rs 1,36,909 crore in 2020-21, a 12% increase over the revised estimate of 2019-20.

Fiscal Responsibility and Budget Management targets

Fiscal deficit is an indicator of borrowings by the government for financing its expenditure. The estimated fiscal deficit for 2020-21 is 3.5% of GDP.

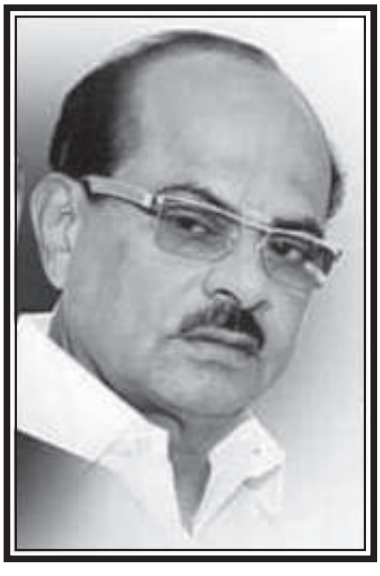
Revenue deficit is the excess of revenue expenditure over revenue receipts. Such a deficit implies the government's need to borrow funds to meet expenses which may not provide future returns. The estimated revenue deficit for 2020-21 is 2.7% of GDP.

Primary deficit is the difference between fiscal deficit and interest payments. It is estimated to be 0.4% of GDP in 2020-21.

Extra-Budgetary Resources: In addition to the expenditure shown in the budget, the government also spends through extra-budgetary resources. These resources are raised by issuing bonds and through loans from the National Small Savings Fund (NSSF). In 2020-21, the government estimates an expenditure of Rs 1,86,100 crore through such extra-budgetary resources. This includes an expenditure of Rs 1,36,600 crore by the Food Corporation of India financed through loans from NSSF.

Since funds borrowed for such expenditure remain outside the budget, they do not get factored in the deficit and debt figures. If borrowings made in the form of extra-budgetary resources are also taken into account, the fiscal deficit estimated for the year 2020-21 would increase from 3.5% of GDP to 4.4% of GDP. Similarly, the fiscal deficit for the year 2019-20 would increase from 3.8% of GDP to 4.6% of GDP due to extra-budgetary borrowings of Rs 1,72,699 crore.

இரங்கல் செய்தி



20.01.2021 அன்று கும்பகோண மய்ய முன்னாள் தலைவரும், தென்னக மய்ய உறுப்பினருமான **திரு. N. சண்முகம் அவர்கள்** *இறைவனடி சேர்ந்தார். அன்னாரது மறைவிற்கு தென்னக மய்யம் தனது ஆழ்ந்த இரங்கலைத் தெரிவித்துக் கொள்கிறது.*

சுருக்கம்

நகர்ப்புற வளர்ச்சி – 20.10.2016 அன்று அல்லது அதற்கு முன்னர் பதிவு செய்யப்பட்ட மனைப்பிரிவில் அமையும் விற்கப்பட்ட மற்றும் விற்கப்படாத அனைத்து மனை மற்றும் மனைப்பிரிவுகளை வரன்முறைப்படுத்த ஏற்கனவே வெளியிடப்பட்ட அரசாணைகளில் குறிப்பிடப்பட்டுள்ள அனைத்து விதிகளுக்கு உட்பட்டு எவ்வித மாற்றமும் இல்லாமல் 28.02.2021 வரை கால நீட்டிப்பு செய்தல் – ஆணை வெளியிடப்படுகிறது.

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வீட்டுவசதி மற்றும் நகர்ப்புற வளர்ச்சித் [ந.வ.4(1)] துறை

அரசாணை (நிலை) எண்.16

நாள்: 25.01.2021.
சார்வரி, தை 12,
திருவள்ளுவர் ஆண்டு 2052

படிக்கப்பட்டது:

1. அரசாணை (நிலை) எண்.78, வீட்டு வசதி மற்றும் நகர்ப்புற வளர்ச்சித் துறை, நாள் 04.05.2017.
2. அரசாணை (நிலை) எண்.172, வீட்டு வசதி மற்றும் நகர்ப்புற வளர்ச்சித் துறை, நாள் 13.10.2017.
3. அரசாணை (நிலை) எண்.55, வீட்டு வசதி மற்றும் நகர்ப்புற வளர்ச்சித் துறை, நாள் 02.05.2018
4. அரசாணை (நிலை) எண்.21, வீட்டு வசதி மற்றும் நகர்ப்புற வளர்ச்சித் துறை, நாள் 05.02.2019.
5. நகர் ஊரமைப்பு இயக்குநர் அவர்களின் கடித எண்.ந.க.எண்.7671/2020/T, நாள் 13.01.2021.
6. உறுப்பினர் செயலர்(பொ), சென்னை பெருநகர வளர்ச்சிக் குழுமம் அவர்களின் கடித எண்.மனைப்பிரிவு/14941/2017, நாள் 13.01.2021.

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ஆணை:

பார்வை 1–இல் படிக்கப்பட்ட அரசாணையில் எந்தவொரு அனுமதியற்ற மனைப்பிரிவு ஏற்படுத்தப்பட்டு அதில் குறைந்தபட்சம் ஒரு மனையாவது விற்கப்பட்டு அதற்கான விற்பனைப்பத்திரம் 20.10.2016 அன்று அல்லது அதற்கு முன்னர் பதிவு செய்யப்பட்டிருப்பின் அந்த மனைப்பிரிவில் அமையும் விற்கப்பட்ட மற்றும் விற்கப்படாத அனைத்து மனை மற்றும் மனைப்பிரிவுகளை வரன்முறைப்படுத்த 03.11.2017 வரை ஆறு மாத காலம் அவகாசம் வழங்கி அரசு ஆணை வெளியிட்டிருக்கிறது.

2. பார்வை 2 மற்றும் 3–இல் படிக்கப்பட்ட அரசாணைகளில் மனை மற்றும் மனைப்பிரிவிற்கு வரன்முறைப்படுத்த 16.11.2018 வரை அவகாசம் வழங்கி அரசு ஆணை வெளியிட்டிருக்கிறது.

3. பார்வை 4–இல் படிக்கப்பட்ட அரசாணையில் மனை மற்றும் மனைப்பிரிவுகளை வரன்முறைப்படுத்த அரசானது எந்தவொரு அனுமதியற்ற மனைப்பிரிவிலும் குறைந்தபட்சம் ஒரு

மனையை வரன்முறை செய்வதற்கான விண்ணப்பம் மேற்காண் கால அவகாசத்திற்குள் இணையதளம் வாயிலாக பதிவு செய்யப்பட்டிருந்தால், அந்த குறிப்பிட்ட மனைப்பிரிவில் அமையும் எஞ்சிய விற்கப்பட்ட மற்றும் விற்கப்படாத மனைகள் அனைத்தையும் எப்பொழுது வேண்டுமானாலும் தனியே விண்ணப்பம் செய்து காலதாமதத்திற்கான உரிய கட்டணம் செலுத்தி வரன்முறை செய்து கொள்ளலாம் என ஆணை வெளியிட்டிருக்கிறது.

4. பார்வை 5–இல் படிக்கப்பட்ட கடிதத்தில் நகர் ஊரமைப்பு இயக்குநர் அவர்கள் வரன்முறைத்திட்டத்தின் கீழ் விண்ணப்பம் செய்ய தவறிய பல அனுமதியற்ற மனைப்பிரிவு உரிமையாளர்கள் மற்றும் வெவ்வேறு அமைப்புகள் விண்ணப்பம் சமர்ப்பிக்க வழங்கப்பட்ட கால அவகாசத்தை நீட்டித்து விடுபட்டுள்ள தங்கள் மனைகளுக்கும் வரன்முறை ஆணை பெறுவதற்கு மீண்டும் ஒரு வாய்ப்பு வழங்க வேண்டி கோரிக்கைகள் வரப்பெற்றுள்ளன. அரசு முதன்மைச் செயலர், வீட்டு வசதி மற்றும் நகர்ப்புற வளர்ச்சித் துறை அவர்களால் CREDAI – தமிழ்நாடு அமைப்பு மற்றும் சில ரியல் எஸ்டேட் சங்கத்தினருடன் காணொளிக் காட்சியில் 25.06.2020 அன்று இப்பொருள் குறித்து கருத்துக்கள் கேட்டறியப்பட்டது. அதில் பங்கேற்றோர் கால அவகாச நீட்டிப்பு செய்யுமாறு வலியுறுத்திக் கூறினர்.

திட்டத்திற்கான கால அவகாசம் முடிவுறுவது பற்றிய விழிப்புணர்வு இல்லாததாலும், கால அவகாசம் நீடிக்கப்படும் எனத் தவறாக கருதியதாலும் பலர் விண்ணப்பிக்கத் தவறிவிட்டனர் என அறியப்பட்டது. அவ்வாறு விண்ணப்பிக்கத் தவறியவர்களுக்கும் மற்றும் வரன்முறைப்படுத்தாமல் விடுபட்ட மனைகளை வரன்முறைப்படுத்துவதற்கு ஒரு வாய்ப்பளிக்கும் விதமாக விண்ணப்பம் சமர்பிக்க மேலும் ஆறு மாத கால அவகாசம் வழங்க ஆணை வழங்கப்படலாம் என தெரிவித்துள்ளார்.

பார்வை 6–இல் படிக்கப்பட்ட கடிதத்தில் உறுப்பினர் செயலர்(பொ), சென்னை பெருநகர வளர்ச்சிக் குழுமம் அவர்கள் 20.10.2016 அன்றோ அல்லது அதற்கு முன்போ அனுமதியற்ற மனைப்பிரிவு ஏற்படுத்தப்பட்டு அதில் குறைந்தபட்சம் ஒரு மனையாவது விற்கப்பட்டு அதற்கான விற்பனைப்பத்திரம் 20.10.2016 அன்று அல்லது அதற்கு முன்னர் பதிவு செய்யப்பட்டிருப்பின் அந்த மனைப்பிரிவில் அமையும் விற்கப்பட்ட மற்றும் விற்கப்படாத அனைத்து மனை மற்றும் மனைப்பிரிவிற்கும் வரன்முறைப்படுத்த பொதுமக்கள் மற்றும் மனை உரிமையாளர்களிடமிருந்து கோரிக்கை பெறப்பட்டுள்ளதாகவும் எனவே இணையவழி மூலம் மனை மற்றும் மனைப்பிரிவிற்கு வரன்முறைப்படுத்த மேலும் ஒருமுறை வாய்ப்பு வழங்கலாம் எனத் தெரிவித்துள்ளார்.

5. அரசானது நகர் ஊரமைப்பு இயக்குநர் மற்றும் உறுப்பினர் செயலர்(பொ), சென்னை பெருநகர வளர்ச்சிக் குழுமம் அவர்களின் கருத்துருவினை கவனமுடன் பரிசீலனை செய்து அங்கீகாரமற்ற மனை மற்றும் மனைப்பிரிவுகளை விவரம் தெரியாமல் வாங்கியவர்களுக்காகவும் (Innocent Purchaser) மற்றும் ஏற்கனவே வெளியிடப்பட்ட அரசாணைகளின்படி தங்களுடைய மனை மற்றும் மனைப்பிரிவுகளை வரன்முறை செய்யத் தவறியவர்களுக்காகவும் மேலும் ஒரு வாய்ப்பு அளிக்கும் பொருட்டு 20.10.2016 அன்று அல்லது அதற்கு முன்னர் பதிவு செய்யப்பட்டிருப்பின் அந்த மனைப்பிரிவில் அமையும் விற்கப்பட்ட மற்றும் விற்கப்படாத அனைத்து மனை மற்றும் மனைப்பிரிவுகளை வரன்முறைப்படுத்த பார்வை 1 மற்றும் 2–இல் காணும் அரசாணைகளில் குறிப்பிடப்பட்டுள்ள அனைத்து விதிகளுக்கு உட்பட்டு எவ்வித மாற்றமும் இல்லாமல் 28.02.2021 வரை கால நீட்டிப்பு செய்து ஆணை வெளியிடுகிறது. மேலும், இத்திட்டத்தில் இணைய வழி மூலம் மட்டுமே மனை மற்றும் மனைப்பிரிவுகளை வரன்முறைப்படுத்த விண்ணப்பிக்க இயலும்.

6. தமிழ்நாடு அங்கீகரிக்கப்படாத மனைபிரிவுகள் மற்றும் மனைகளை வரன்முறைப்படுத்தும் விதி 2017–இல் இத்திட்டம் தொடர்பான உரிய திருத்தம் பின்னர் வெளியிடப்படும்.

(ஆளுநரின் ஆணைப்படி)

தா. கார்த்திகேயன்,
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26.01.2021 அன்று தென்னக மய்ய வளாகத்தில் நடைபெற்ற 72வது குடியரசு தினவிழா கொண்டாடப்பட்டது

29.01.2021 அன்று நடைபெற்ற பொதுக்குழு கூட்டத்தில் 2021-22ம் ஆண்டிற்கான தேர்தல் முடிவுகள் அறிவிக்கப்பட்டன

மக்கள் மருத்துவர்
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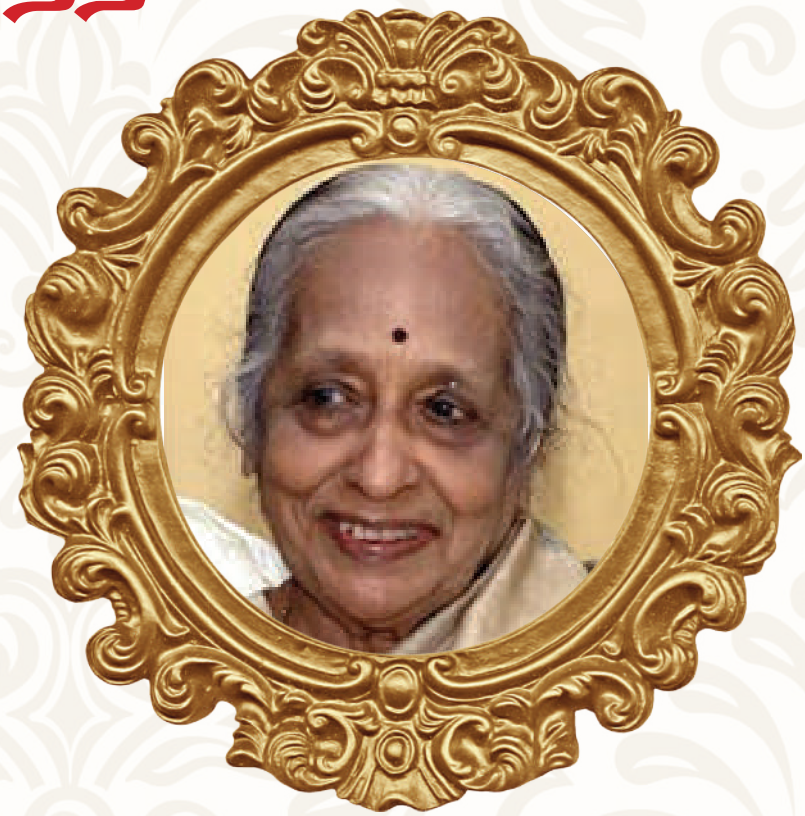
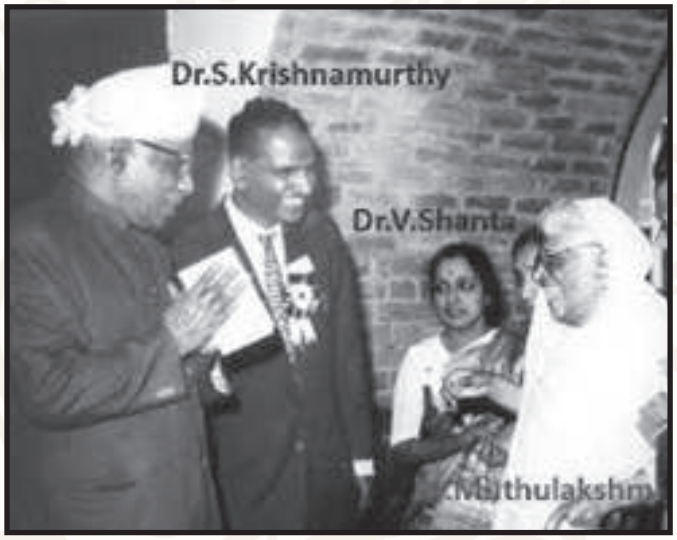


1927ம் ஆண்டு மார்ச் மாதம் 11ம் தேதி சென்னை மயிலாப்பூரில் ஒரு நடுத்தர குடும்பத்தில் பிறந்த தலைமகள் சாந்தா. நோபல் பரிசு பெற்ற விஞ்ஞானி சர்.சி.வி. ராமன், இவரின் தாத்தாவின் சகோதரர். நோபல் பரிசு பெற்ற டாக்டர் எஸ் சந்திரசேகர் இவரின் தாய் மாமா. இவருக்கு நான்கு தங்கைகள், இரண்டு தம்பிகள். இவருடைய அப்பா ரயில்வே அதிகாரி.

மயிலாப்பூரில் உள்ள பி எஸ் சிவசாமி பெண்கள் உயர் பள்ளியில் கல்வி கற்றார். சென்னை மருத்துவக்கல்லூரியில் 1949ல் டாக்டர் பட்டமும் 1955ம் ஆண்டில் எம்.டி. பட்டமும் பெற்றார். பொதுசேவை ஆணையத் தேர்வில் தேர்ச்சி பெற்று மகளிர் மற்றும் குழந்தைகள் மருத்துவமனைக்கு அனுப்பப்பட்டார். 1950ல் மருத்துவத் தொழிலில் நுழைந்த இந்திய பெண்கள் பொதுவாக மகப்பேரியல் மற்றும் மகளிர் மருத்துவத் துறையிலேயே நுழைந்தனர். ஆனால் சாந்தா அதற்கு பதிலாக அடையாறு புற்றுநோய் நிறுவனத்தில் சேர்ந்தார்.

1954ல் டாக்டர் முத்துலட்சுமி ரெட்டி அவர்களால் துவங்கப்பட்ட புற்றுநோய் நிறுவனத்தை அமைத்த போது மக்கள் மருத்துவ சேவைக்காக அரசுப் பணியை விட்டுவிட்டு அந்த குடிசைக்கு வந்தார். இந்த குடிசை இரண்டு படுக்கைகள் இரண்டு மருத்துவர்கள் மற்றும் நான்கு ஊழியர்களுடன் துவங்கப்பட்டது. இதில் மாதத்திற்கு ரூ. 200 கவுரவ ஊதியம் பெற்றுக் கொண்டு வளாகத்திற்குள் குடிபுகுந்தார். தன் இறுதிக்காலம் வரை அங்கேயே தங்கி நிறுவனத்தின் கவுரவ ஊழியராகப்பணியாற்றினார். அந்த குட்டி நிறுவனத்தை உலகத் தரம் வாய்ந்த



நிறுவனமாக மாற்றிய பிறகும் அவர் ஓயவில்லை. தனக்கென திருமணம் குழந்தைகள் என குடும்ப அமைப்பை உருவாக்காமல் தன் இறுதி மூச்சு வரை மருத்துவமனையின் வளர்ச்சிக்காகவே பாடுபட்டார். இன்று ஆண்டுக்கு ஒன்றரை லட்சம் புற்றுநோயாளிகளுக்கு சிகிச்சை அளிக்கும் அளவுக்கு பிரமாண்டமாக அடையாயறின் இன்னொரு ஆலமரமாக வளர்ந்திருக்கிறது கேன்ஸர் இன்ஸ்ட்டிடியூட். இதில் 60%க்கும் மேலானோருக்கு இலவசமாக மருத்துவம் செய்யப்படுகிறது.

1950 களில் புற்றுநோய்க்கான காரணங்களும், சிகிச்சை முறைகளும் மருத்துவர்களுக்கே புதிராக இருந்தன. இந்த நோய் காரணமாக குழந்தைகள் உட்பட பலரும் உயிரிழப்பது அதிகமாக இருந்தது. இதைத்தவிர்க்கம்முனைப்புடன் செயல்பட்ட சாந்தா அவர்கள் நோயைப் பற்றிய ஆய்வு, அதன் தடுப்பு மற்றும் குணப்படுத்துதல் பற்றி ஆராய்ச்சி, நோயைப் பற்றிய விழிப்புணர்வைப் பரப்புதல், மற்றும் புற்றுநோய்க்கான பல்வேறு துணை துறைகளில் நிபுணர்கள் மற்றும் விஞ்ஞானிகளை வளர்ப்பது போன்ற பணிகளுக்கு அவர் தன்னை அர்ப்பணித்தார்.

டாக்டர் சாந்தா அவர்கள் 1955 முதல் அடையாறு புற்றுநோய் நிறுவனத்துடன் தொடர்புடையவர். 1980 மற்றும் 1997க்கு இடையில் நிறுவனத்தின் இயக்குநர் உட்பட பல பதவிகளை வகித்தார். உலக சுகாதார அமைப்பு உட்பட சுகாதாரம் மற்றும் மருத்துவம் தொடர்பான பல தேசிய மற்றும் சர்வதேச குழுக்களில் உறுப்பினராக பணியாற்றினார்.

எளிமையே இவரது அழகு. அசாத்திய சாதனைகள் பலவற்றை நிகழ்த்தியிருந்தாலும் எளிமையும் மென்மையுமே சாந்தாவின் பலம். பழுப்பு நிற காட்டன் புடவைகளை மட்டுமே உடுத்துவார். ஒற்றைச் சங்கிலி தவிர வேறெந்த ஆபரணமும் அணிவதில்லை. அதிகாலை 4.30 மணிக்கு எழுந்தால், இரவு 10 மணி வரை அர்ப்பணிப்பு உணர்வுடன் பணிபுரிவார். வயோதிகம் ஒரு பொருட்டே அல்ல என்பதற்கு சிறந்த உதாரண பெண் இவரே. 90 வயது தாண்டிய பிறகும் திங்கள் மற்றும் வியாழக்கிழமைகளில் நோயாளிகளுக்கு ஆலோசனை வழங்கி வந்தார்.

மகசேசே விருது, பத்மஶ்ரீ விருது, பத்மபூஷன் விருது, பத்மவிபூஷன் விருது, நாயுடம்மா விருது, அவ்வையார் விருது, அன்னை தெரசா விருது, தமிழண்ணை விருது போன்றவை இவர் பெற்ற முக்கியமான விருதுகள். விருதுகள் மூலம் கிடைக்கும் பணம் முழுவதையும் அடையாறு புற்றுநோய் மருத்துவமனையின் வளர்ச்சிக்கே செலவு செய்தார். ஒரு கட்டத்தில் இந்தியாவின் உயரிய விருதான பாரதரத்னா விருதை இவருக்கு வழங்குவதற்கு மத்திய அரசு முயன்றதாகவும், சாந்தா அவர்கள் மறுத்துவிட்டதாகவும் கூறப்படுகிறது.

புற்றுநோய் தொடர்பாக டாக்டர் சாந்தா எழுதிய பல கட்டுரைகள் சர்வதேச அளவில் கவனம் ஈர்த்தவை. புற்றுநோய் சிகிச்சையில் உலகில் எந்தவொரு முன்னேற்றம் ஏற்பட்டாலும் அந்த வாய்ப்பை அடையாறு மருத்துவமனைக்கு வழக்குவதில் பெருமுயற்சிகள் எடுத்தவர். இவரது அசுர முயற்சியில்தான் புகையிலையை படிப்படியாக ஒழிக்க அரசுகள் ஓரடி எடுத்து வைத்திருக்கின்றன.

ஜனவரி 18ந் தேதி இரவு அவர் மார்பு வலி இருப்பதாக கூறியபோது ஒரு தனியார் மருத்துவமனைக்கு கொண்டு செல்லப்பட்டார். அப்போது சரி செய்ய முடியாத ஒரு பெரிய இதய அடைப்பு அவருக்கு இருப்பது கண்டறியப்பட்டது. அப்போது அவர் கூறியவை நான் நாளை விடைபெறக் கூடும். யாரும் அழுது புலம்பி, இங்கே பணிகள் தடைபடக் கூடாது நாளை எப்போதும் போல பணிகள் நடக்க வேண்டும். நிறைய பேர் மாலை போட வரிசையில் வரக்கூடாது.

வேண்டுமானால், மாலைக்கான காசை நம் அறக்கட்டளையில் செலுத்தச் சொல்லுங்கள். அதைப் புற்றுநோயாளிகளின் மருத்துவத்திற்கு பயன்படுத்தலாம். எனக்கு நினைவகம் கட்டுகிறேன் என்று இந்த இடத்தையோ பணத்தையோ வீணாக்கக் கூடாது. என் சாம்பலை இந்த மையத்தின் எல்லா பக்கமும் தூவினாலே போதும் என்று கூறினார்.

அன்னை சாந்தா அவர்கள் ஜனவரி 19, 2021 அன்று இறைவனடி சேர்ந்தார். நாம் இந்த அர்ப்பணிப்பாளரின் சம காலத்தில் வாழ்ந்ததே நமக்குப் பெருமைதான்.

கல்கத்தாவிற்கு ஒரு அன்னை தெரஸா
சென்னைக்கு ஒரு அன்னை சாந்தா

நயனொடு நன்றிபுரிந்த பயன் உடையார்
பண்புபாராட்டும் உலகு

- திருக்குறள்

PYRAMIDS IN EGYPT AND THEIR CONSTRUCTION METHODS

DR. Colonel. P Nallathambi.
Ph.D (Structural Engg), ME, MBA, FIE, FIV)

The pyramids of Egypt bring out wonder for their size, their construction and the mystery of their purpose. People have been visiting the pyramids since ancient times, and it is not surprising that the Great Pyramid of Giza was deemed one of the Seven Wonders of the World. **The word 'Pyramid' actually comes from the Greek word 'Pyramis' which means 'wheat cake'.** The ancient Egyptian buildings reminded the Greeks of pointy-topped wheat cakes. Pyramids originated from simple rectangular **"Mastaba"** tombs that were being constructed in Egypt over 5,000 years ago, according to the discovery made by archaeologist Sir Flinders Petrie. A major advance occurred during the reign of the Pharaoh Djoser (reign started around 2630 BC). The pyramids continue to reveal their secrets to visitors today, and researchers continue to ascertain special things about the pyramids.

Kingly Tombs. The ancient Egyptians built pyramids as tombs for the pharaohs and their queens. The pharaohs were buried in pyramids of many different shapes and sizes from before the beginning of the Old Kingdom to the end of the Middle Kingdom. **Pharaoh meant 'great house'**, When this word was first used, it referred to the palace and its greatness, not just to the ruler himself. However, later in Egyptian history the title 'Pharaoh' use to describe the rulers of ancient Egypt. Egyptian beliefs held that when the pharaoh died, his spirit remained vital in the afterlife. Part of his spirit, known as ka, needed an earthly home. Preserving the Pharoah's body in the pyramid ensured the survival of his ka, which would allow him a happy existence in the afterlife, and his people protection from disaster. In addition to the Pharoah's body, the pyramids contained to offer food, furniture and other items, which the pharaoh would need in the afterlife.

The **first royal tombs, called Mastabas**, were built at Abydos during the first and second dynasties. They were marked with a stele inscribed with the kings' names. The burial chambers were cut into the rock, lined with sun-baked bricks and faced with wooden boards that have long since disappeared. Beside the chambers were having rooms containing jars, small objects, and offerings of food and drink. The tombs were surrounded by a large number of graves of women and dwarves (short person). These people may have been servants of the kings who were sacrificed to serve them in their afterlife.

Gaza Pyramids, Egypt

Tombs Chamber

Mastabas

Pyramids were built as royal burials until 1640 BC. The most famous is the Great Pyramid at Giza. To prevent robbery, the kings, queens and nobles of the New Kingdom built their tombs in a remote valley west of the Theban capital known as the **Valley of the Kings**. The tombs of Egypt are one of the greatest tourist attractions in the world. They are indeed a world treasure!, the spectacular pyramids that have made Egypt so famous are truly one of the world's greatest architectural wonders. One of the oldest mysteries surrounding ancient Egypt concerns the building of the pyramids.

Passages to the Sun. The Pharoah (ruler's royal palace) reached heaven via sunbeams, so the pyramids contain shafts leading up from the burial chambers that may have been designed to help the king's spirit reach the heavens. The shape of the pyramids themselves may have been designed to evoke the rays of the sun streaming between heaven and earth. The great pyramids at Giza have another connection to the heavens that they are large enough to be viewed from outer space and are clearly identifiable on satellite photos.

Cities of the Dead. The Pharaohs' tombs didn't stand alone. Instead, they were part of a complex of structures that included mortuaries, temples, smaller pyramids and tombs of officials in the Pharoah's government. The funerary complex includes a processional causeway that links a funerary temple to the pyramid, solar barques buried on the four sides of the pyramid, and Mastabas and smaller pyramids where the family of the king and nobles were buried.

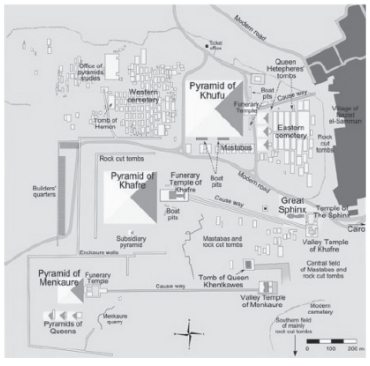
Workers often lived in villages near the pyramids and constructed. Excavations have revealed that these workers were not slaves, but skilled craftsmen who specialized in stone carving and other techniques employed in building the pyramids. Archaeologists have identified about 80 pyramids in Egypt, some little more than foundations. The Great Pyramid at Giza is the largest, rising 481 feet above the desert. Builders used 2.3 million stone blocks to construct this pyramid; each block weighs between 2.5 and 15 tons. The first pyramids were constructed of stair-stepped stone. Over time, builders moved to the classic pyramid shape. Scientists don't know why Egyptians stopped building pyramids, although it may have been that the cost of construction became prohibitive.

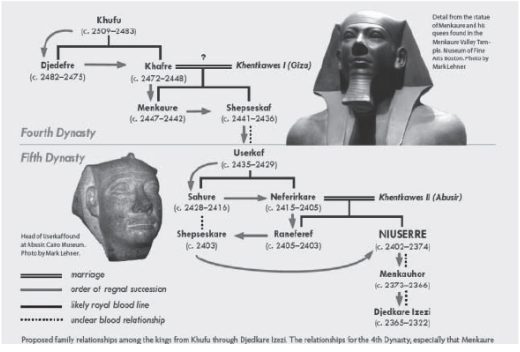
One of the Seven Wonders of the Ancient World. The last remaining of the Seven Wonders of the ancient world, the great pyramids of Giza are perhaps the most famous and talked structures in history. These massive monuments were unsurpassed in height for thousands of years after their construction and continue to amaze and mesmerize us with their overwhelming mass and seemingly impossible perfection. Their exacting orientation and mind-boggling construction have elicited many theories about their origins, including unsupported suggestions that they had extra-terrestrial impetus. However, by examining the several hundred years before their emergence on the Giza plateau, it becomes clear that these incredible structures were the result of many experiments, some more successful than others, and represent an apogee in the development of the royal mortuary complex.

Ancient Egyptians Use the Pyramid Shape. Egyptologists have developed many theories about why the tombs of the early pharaohs were built in the pyramid shape. Here are three different ideas: The pyramid represented the first land to appear at the beginning of time- a hill called 'Ben-Ben'. The pyramid had sloping sides so that the dead pharaoh could symbolically climb to the sky and live forever. The pyramid represented the rays of the sun.

Three Pyramids and Three Rulers. The three primary pyramids on the Giza plateau were built over the span of three generations by the rulers Khufu, Khafre, and Menkaure. Each pyramid was part of a royal mortuary complex that also included a temple at its base and a long stone causeway (some nearly 1 Kilometer in length) leading east from the plateau to a valley temple on the edge of the floodplain.

Other (Smaller) Pyramids, and Small Tombs. In addition to these major structures, several smaller pyramids belonging to queens are arranged as satellites. A major cemetery of smaller tombs, known as Mastabas (Arabic for 'bench' in reference to their shape—flat-roofed, rectangular, with sloping sides), fills the area to the east and west of the pyramid of Khufu and were constructed in a grid-like pattern for prominent members of the court. Being buried near the pharaoh was a great honour and helped ensure a prized place in the afterlife.





Giza Pyramid Complex **Ben-ben stone Connection** **Family Relationship of Kings**

Most Famous Egyptian Pyramids.

There are about eighty pyramids known today from ancient Egypt. The three largest and best-preserved of these were built at Giza at the beginning of the Old Kingdom. The most well-known of these pyramids was built for the pharaoh Khufu. It is known as the 'Great Pyramid'. Giza is a town located near Cairo in northern Egypt where three large stone pyramids were built during the fourth dynasty.

The Pyramid of Djoser (2630 BC) (Saqqara). Constructed in the Saqqara necropolis, northwest of the city of Memphis, it is the central feature of a huge mortuary complex, bordered on all sides by a 33 feet wall made of light Tura limestone. As it was being the first monumental structure made of stone, and the most

famous "step-sided" Egyptian pyramid, its original height was roughly 203 feet (62 metres), and it was faced with polished white limestone.

The Bent Pyramid (2600 BC) (Dahshur). This peculiar-shaped structure, called the Bent, Blunted, or Rhomboidal Pyramid, and known previously also as the Southern-Shining-Pyramid, is situated at the royal necropolis of Dahshur, south of Cairo. It is roughly 320 feet (98 metres) tall and was the second pyramid erected by King Snefru. A sort of hybrid between the step-sided and smooth-sided pyramids, it is the only one whose original polished limestone cladding remains intact.

The Red Pyramid (2600 BC) (Dahshur). Named after its reddish-coloured stones, at 341 feet high, this is the biggest of the three important pyramids at the Dahshur necropolis and the third-largest after those of Khufu and Khafre at Giza. It is also considered by experts to be the world's first "true" smooth-sided pyramid. Ironically, it was not always red in colour, since - like nearly all the pyramids, it was originally faced with white Tura limestone. It was the third pyramid built by King Snefru and took between 10 and 17 years to build.

The Pyramid of Khufu/Cheops (2565 BC) (Giza). Built by King Khufu, son of King Snefru, the Pyramid of Khufu is known as the Great Pyramid of Giza. It is the oldest and largest of the three tombs in the Giza Necropolis. Approximately 480feet (146 metres) tall, it was the world's tallest man-made structure for nearly four millennia. According to the eminent Egyptologist, Sir Flinders Petrie, it was constructed from about 24,00,000 limestone blocks, each weighing 2.5 tons, it took roughly 20 years to build. Most of the rough interior blocks were quarried locally, but the granite for the royal chambers came from quarries at Aswan, some 500 miles away. In addition to roughly 6 million tons of limestone, Khufu's pyramid used up 8,000 tons of granite and about 5,00,000 tons of mortar.

The Pyramid of Djedefre (2555 BC) (Abu Rawash). Now in ruins, largely (it is thought) because it was dismantled by Roman builders who wanted the stone for their own building projects elsewhere in Egypt, this pyramid at Abu Rawash was built by Djedefre, son of King Khufu. It is Egypt's northernmost pyramid and is believed to have been similar in size to the Pyramid of Menkaure at Giza, although some evidence suggests it might have been the tallest of all the pyramids. Originally known as "Djedefre's Starry Sky", according to Egyptologists its exterior layer of polished granite plus limestone, along with its large pyramidion, made it one of the most beautiful pyramids.

The Pyramid of Khafre (2545 BC) (Giza). At 448 feet tall, this pyramid, also called the Pyramid of Chefren is the second biggest structure at the Giza Necropolis. It sits on a slightly elevated rock base, it looks as if it is taller than Khufu's pyramid. Also made from Tura limestone blocks, the largest weighing an estimated 400 tons, its exterior casing was dismantled during the era of Egyptian New Kingdom architecture, by Rameses II, in order to provide stone for a temple at Heliopolis. East of the pyramid, stands the customary mortuary temple, with the regulation entrance hall, columned court, five spaces in which to fit a statue of the Pharaoh, five storage chambers, and an inner sanctuary. Khafre's Pyramid. Khufu's son, Khafre, built the second pyramid in Giza From a distance, the second pyramid appears to be taller than the Great Pyramid, but it was built on a rise that is 33 feet higher than his father's pyramid. Khafre also built the Sphinx, carved from the bedrock in front of his pyramid.

The Pyramid of Menkaure (2520 BC) (Giza). This is the third and last of the famous pyramids at Giza, situated to the southwest of Cairo. The smallest of the three, its original height was roughly 215-feet (65.5 metres) and like the others, it is made from limestone and granite. It served as the tomb of King Menkaure who, according to ancient historians like Herodotus, was a kind and enlightened ruler. Inside the pyramid, archaeologists discovered a large amount of stone sculpture depicting the Pharaoh in the traditional style of Egyptian naturalism, as well as a magnificent basalt sarcophagus which may have contained Menkaure's remains. Unfortunately, the ship carrying it to England sank off the island of Malta.

The Great Sphinx (1400 BC) (Giza). Many scholars believe that the Sphinx monument, which lies near Khafre's pyramid, was built by Khafre, and that the face of the Sphinx was modelled after him. It is a large human-headed lion that was carved from a mound of natural rock. It is located in Giza where it guards the front of Khafra's pyramid. Stories tell about the powers and mysteries of this sphinx and some people even believe that there are hidden passageways or rooms underneath the Great Sphinx, but nothing has been found yet. Great Sphinx storey reads that one day, a young prince fell asleep next to the Great Sphinx. He had been hunting all day and was very tired. He dreamt that the Great Sphinx promised that he would become the ruler of Upper and Lower Egypt if he cleared away the sand covering its body. This stele was put up by the pharaoh Thutmosis IV who lived around 1400 BC. This is part of the beard of the Great Sphinx. The beard was added during the New Kingdom, hundreds of years after the Great Sphinx was first carved.




Giza pyramids **Great Sphinx** **Bent pyramid**

The bent pyramid at Dahshur shows us that the ancient Egyptians experimented a lot with the slope of the pyramids. In the middle of construction, the builders must have decided that the slope of the building was too steep to continue. Thus, the top half of the pyramid has a different slope. The slope that was used for the upper section of this pyramid was later used by the builders of the Giza pyramids.

The Giza Pyramids (2551 BC) (Giza). The ancient Egyptians continued to build pyramids for their pharaohs after the Giza pyramids were built. However, they were never as big or well-designed as the Giza pyramids. In the fourth dynasty, three large stone pyramids were built at Giza. The design of these pyramids was based on the pyramids that had been built before. These are the largest and sturdiest pyramids that were ever built in ancient Egypt. The Great Pyramid is the only ancient wonder still standing today. The first, and largest, the pyramid at Giza was built by the pharaoh Khufu His pyramid (also known as Cheops) 455 feet (138 meters) tall is known as the Great Pyramid and was considered one of the Seven Wonders of the Ancient World. The second-largest pyramid was built for Khufu's son, Khafra (also known as Chephren) (reign started around 2520 BC) was only slightly smaller than Khufu's but stood on higher ground. Finally, the third-largest pyramid was built for the pharaoh Menkaure (also known as Mycerinus) (reign started around 2490 BC), who opted for a smaller pyramid that stood 215 feet (65m) high.. The ancient Egyptians continued to build pyramids for their pharaohs after the Giza pyramids were built. However, they were never as big or well-designed as the Giza pyramids. In the fourth dynasty, three large stone pyramids were built at Giza. The design of these pyramids was based on the pyramids that had been built before. These are the largest and sturdiest pyramids that were ever built in ancient Egypt. The Great Pyramid is the only ancient wonder still standing today.

Pyramid Architecture. The ancient Egyptians built their pyramids, tombs, temples and palaces out of stone, the most durable of all building materials. Although earthquakes, wars and the forces of nature have taken their toll, the remains of Egypt's monumental architectural achievements are visible across the land, a tribute to the greatness of this civilization. These building projects took a high degree of architectural and engineering skill and the organization of a large workforce consisting of highly trained craftsmen and labourers.




Architecture and Paintings in Pyramids

Apart from the pyramids, Egyptian buildings were decorated with paintings, carved stone images, hieroglyphs and three-dimensional statues. The art tells the story of the pharaohs, the gods, the common people and the natural world of plants, birds and animals. The beauty and grandeur of these sites are beyond compare. How the ancient Egyptians were able to construct these massive structures using primitive tools is still a mystery.

Developing Pyramid Building Techniques. The techniques used to build the Giza pyramids were developed over a period of centuries, with all of the problems and setbacks that any modern-day scientist or engineer would face. Mastaba tomb at Saqqara started off as a simple rectangular tomb before being developed into a six-layered step pyramid with underground tunnels and chambers. Another leap in pyramid-building techniques came during the reign of the pharaoh Snefru (2575 BC) who built at least three pyramids. Rather than constructing step pyramids, Snefru's architects developed methods to design smooth-faced, true pyramids. It appears that Snefru's architects ran into trouble. One of the pyramids constructed at the site of Dahshur is known today as the "bent pyramid" because the angle of the pyramid changes partway up, giving the structure a bent appearance. Scholars generally regard the bent angle as being the result of a

design flaw, Snefru's architects would correct the flaw. A second pyramid at Dahshur, known today as the "red pyramid" has a constant angle, making it a true pyramid. Snefru's son, Khufu, would use the lessons from his father and earlier predecessors to construct the "Great Pyramid," the largest pyramid in the world. The pyramids of Giza were built using techniques that took centuries to develop.

Engineering in Pyramids. The great temples of ancient Egypt arose from the same technical skill one sees on the small scale of household goods. The central value observed in creating any of these goods or structures was careful attention to detail. The Egyptians are noted in many aspects of their culture as a very conservative society, and this adherence to a certain way of accomplishing tasks can clearly be seen in their construction of the pyramids and other monuments. The quarrying and transport of obelisks are well documented and shows strict adherence to a standard procedure. The technological skill required to build the Great Pyramid still mystifies scholars in the present day. Egyptologists Bob Brier and Hoyt Hobbs made comments, because of their immense size, building pyramids posed special problems of both organization and engineering. Constructing the Great Pyramid of the pharaoh Khufu, for example, required that more than two million blocks weighing from two to more than sixty tons be formed into a structure covering two football fields and rising in a perfect pyramidal shape 480 feet into the sky. Its construction involved vast numbers of workers which, in turn, presented complex logistical problems concerning food, shelter, and organization. Millions of heavy stone blocks needed not only to be quarried and raised to great heights but also set together with precision in order to create the desired shape.

Construction of Pyramids. The Great Pyramid at Giza is the largest in the world, filling 13 acres at its base. At 481 feet tall, it was the tallest structure in the world until the advent of modern skyscrapers. The pyramid builders used 2.3 million stone blocks, each weighing between 2.5 and 15 tons, to construct the Great Pyramid. The pyramid architects have mystery chambers which include four shafts from the burial chamber that seemingly lead nowhere. Scientists have theorized that these shafts were designed to allow the pharaoh's soul a direct route to the afterlife. Early explorers named the first, shallowest chamber inside the Great Pyramid the Queen's chamber, but it was never meant to hold a queen. Now scientists think it was designed to hold a depiction of the Pharaoh. Pyramids were constructed by large work gangs over a period of many years. The Pyramid age spans over a thousand years, starting in the third dynasty and ending in the Second Intermediate Period. The Greek historian Herodotus was told that it took 1,00,000 men 20 years to build the Great Pyramid at Giza. Scholars today, however, think it may have been built by only 20,000 men over 20 years. A pyramid's large square base creates a very stable structure. Several astronomical observations were used to precisely align its corners with the four cardinal points. Approximately 80% of the building materials are found in the lower half. This means that relatively few stone blocks were hauled to the upper levels. Since pyramids are solid, no walls or pillars were required to support the structure. Despite its simple design, a pyramid is an incredible engineering feat. Several theories attempt to explain how pyramids were constructed, but for now, the mystery has yet to be solved.

How Were the Pyramids Built?. Egyptologists remain undecided as to the exact building method used to create the pyramids. Specifically, experts disagree about the method by which the stones were conveyed and laid (rollers, various types of the ramp, or a system of levers), and the type of workforce used (slaves or paid workers, and, if paid, were they given a salary or a tax credit). Whatever the exact method of construction used, the results were extraordinary. The Great Pyramid of Giza, for instance, was built to extremely precise dimensions - a sheet of paper hardly fits between the stones and levelled to within a fraction of an inch over the entire 13-acre base. The latest construction methods and laser levelling techniques can hardly do better. One reason why the Egyptian pyramids are such an astonishing example of megalithic art, and why they rank among the greatest works in the history of art.

Workers Used to Build the Egyptian Pyramids. According to an estimate by consultants, Daniel, Mann, Johnson, & Mendenhall in collaboration with Egyptologists, the Great Pyramid of Giza was built using an average workforce of roughly 14,500 people and rising to an occasional peak workforce of 40,000, for about ten years, without the use of iron tools, pulleys or wheels. They calculated that the workforce could have maintained a work-rate of 180 blocks per hour and ten-hour workdays: calculations based on data taken from modern construction projects completed in the Third World, without modern machinery. An estimated 340 stones could be moved daily from quarry to the construction site, particularly when one considers that many of the blocks were considerably smaller. Scientists estimate that between 20,000 and 30,000 workers spent

80 years building the pyramids at Giza. These were not slaves, but a mixture of local residents and itinerant craftsmen who provided specialized skills. The workers lived in villages near the pyramid site.

Quarrying the Blocks. Many of the stones used in Khufu's pyramid are from a horseshoe-shaped quarry located just south of the pyramid, said Mark Lehner, Construction workers would have used blocks from a quarry located south-southeast of Menkaure's pyramid to build that pyramid, the researchers said. However, it is unclear which quarry was used for Khafre's pyramid. When nearly complete, each of the Giza pyramids was furnished with a smooth outer casing made of limestone. Little of this outer casing remains today, having been reused for other building projects in Egypt over the millennia. The papyri found at Wadi al-Jarf said that the limestone used in the casing is from a quarry located at Turah, near modern-day Cairo, and was shipped to Giza by boat along the Nile River and a series of canals. One boat trip took four days.

Moving the Blocks. How did humans move such massive blocks of stone using only Stone Age tools? Curiously enough, none of them shows how pyramids were built. A pyramid is a tomb, a four-sided stone structure that symbolizes the sacred mountain, humanity's universal striving to reach the heavens. The ancient belief in raising the human spirit towards the gods is the quintessential purpose behind the construction of pyramids. Even today, pyramids are metaphors for humanity's search for higher consciousness. One of the major difficulties faced by the early pyramid builders was how to move huge numbers of heavy stone blocks. To begin with, blocks of stone were lubricated with oil to facilitate movement. Also, based on the excavation of artefacts from certain temples, it seems that builders used a cradle-like machine to help roll the stones. Greek architecture borrowed significantly from Egyptian building techniques. To move the stones overland, the Egyptians would have used large sledges that could be pushed or pulled by gangs of workers. The sand in front of the sledge was likely dampened with water, something that reduced friction, making it easier to move the sledge. Most Egyptologists agree that when the stones arrived at the pyramids, a system of ramps was used to haul the stones up. However, Egyptologists are uncertain how these ramps were designed. Little evidence of the ramps survives, but several hypothetical designs have been proposed over the last few decades.

Theories Adopted in Construction of Giza Pyramid. One theory suggests that causeways were used to haul the stone blocks on wooden sledges up the side of the pyramids. The ramps were lubricated with water to reduce friction when hauling the blocks. As few as 10 men were needed to drag a stone block up a ramp. There may have been several ramps on each side of the pyramid at different levels, and a ramp may have been coiled around the pyramid as it grew in height. Once a stone block reached its desired level, wooden rockers may have been used to manoeuvre it into position. Another theory suggests that a wooden crane with a counterweight on one end may have been used to lift the blocks from one level to the next. This theory has been disputed since the Egyptians did not have access to trees that were strong enough for this type of work. The average weight of the stone blocks used to build the Great Pyramid at Giza has been estimated at 2.5 tonnes. Such an enormous weight would undoubtedly break a wooden crane before the block could be lifted. Another possibility involves the use of pulleys to hoist the blocks up the ramps and fulcrums to manipulate the blocks into place. Pulleys were used on ships at the time.

UNESCO World Heritage. The pyramids were inscribed into the UNESCO World Heritage List in 1979, and since 1990, the organization has sponsored over a dozen missions to evaluate their status. It has supported the restoration of the Sphinx, as well as measures to curb the impact of tourism and manage the growth of the neighbouring village. Still, threats to the site continue: air pollution from waste incineration contributes to the degradation of the stones, and the massive illegal quarrying of sand on the neighbouring plateau has created holes large enough to be seen on Google Earth. UNESCO has continually monitored these issues, but its biggest task with regard to Giza has been to advocate for the rerouting of a highway that was originally slated to cut through the desert between the pyramids and the necropolis of Saqqara to the south. UNESCO and ICOMOS are calling for in-depth studies of the project's potential impact, as well as an overall site management plan for the Giza pyramids that would include ways to halt the continued impact of illegal dumping and quarrying. As massive as they are, the pyramids at Giza are not immutable. With the rapid growth of Cairo, they will need sufficient attention and protection if they are to remain intact as key touchstones of ancient history.

SOUTHERN CENTRE ACTIVITIES

06.01.2021

அன்று நமது மய்ய வளாகத்தில் உள்ள டாக்டர் A. ராமகிருஷ்ணா அரங்கில் தென்னக மய்யத்தின் 70வது வருடாந்திர மகாசபைக்கூட்டம் மாலை 4.00 மணி அளவில் நடைபெற்றது. இதில் அகில இந்திய முன்னாள் தலைவர் திரு. R. இராதாகிருட்டிணன், அகில இந்திய தலைவர் திரு. Mu. மோகன், மய்யத்தலைவர் திரு. L. சாந்தகுமார் மற்றும் மய்ய நீர்வாகிகள் தென் மண்டல செயலாளர் திரு. R. சிவகுமார், மாநிலச் செயலாளர் திரு. K. வெங்கடேசன், மாநிலப் பொருளாளர் திரு. S. இராமப்பிரபு மற்றும் அனைத்து செயற்குழு மற்றும் பொதுக்குழு உறுப்பினர்களும் கலந்து கொண்டு சிறப்பித்தனர்.

12.01.2021

அன்று நமது மய்ய வளாகத்தில் உள்ள டாக்டர் A. ராமகிருஷ்ணா அரங்கில் கட்டுநர் தின விழாவில் ஒரு பகுதியாக கல்லூரி மாணவர்களுக்கான பேச்சுப்போட்டி Safety is not Expensive, it is Priceless என்ற தலைப்பில் நடைபெற்றது. இதில் வேலம்மாள் கல்லுரியும், வெங்கடேஸ்வரா கல்லுரியும் கலந்து கொண்டது. இப்பேச்சுப் போட்டியில் திருமதி. P. ஆஷா பேராசிரியர், செயின்ட் பீட்டர்ஸ் கல்லூரி, அகில இந்திய முன்னாள் காப்பாளர் திரு. J.R. சேதுராமலிங்கம், மய்யச் செயலாளர் திரு. A. N. பாலாஜி, ஆகியோர் நடுவர்களாக இருந்து சிறப்பாக நடத்திக் கொடுத்தனர். இதில் அகில இந்திய முன்னாள் தலைவர் திரு. R. இராதாகிருட்டிணன், மய்யத்தலைவர் திரு. L. சாந்தகுமார் மற்றும் நமது உறுப்பினர்கள் கல்ந்து கொண்டனர்.

20.01.2021

அன்று கட்டுநர் தின விழா Park In Beach Resort ல் மாலை 3.00 மணிக்கு மருத்துவ முகாமுடன் துவங்கியது. கட்டுமான தொழிலாளர்களுக்கான மருத்துவ முகாமினை மருத்துவமுகாம் குழுத்தலைவர் திரு. A. சத்தியநாராயணா, திரு. K. கோபிநாத் ஆகியோர் மிகவும் சிறப்பாக ஏற்பாடு செய்திருந்தனர். Apollo Hospitals, Saveetha Dental University, and Government Eye Hospitalலிருந்து மருத்துவர்கள் மற்றும் செவிலியர்கள் வந்திருந்து மருத்துவ பரிசோதனை செய்தனர். இதில் சுமார் 400 கட்டுநமானத் தொழிலுளர்கள் கலந்து கொண்டு பயனடைந்தனர். பல்வேறு கலை நிகழ்ச்சிகள் நடைபெற்றது. மாலை 7.00 மணி அளவில் தலைமை விருந்தினராக நமது அகில இந்திய தலைவர் திரு. MU. மோகன், கவுரவ

விருந்தினராக அகில இந்திய முன்னாள் தலைவர் திரு. R. இராதாகிருட்டிணன், மாநிலத் தலைவர் திரு. R. பிரகாஷ், தொழிலக பாதுகாப்பு மற்றும் சுகாதார இயக்கத்தின் இயக்குநர் திரு. M.V. செந்தில் குமார் மற்றும் திருமதி. டாக்டர். பர்வின் சுல்தானா அவர்கள் கலந்து கொண்டு சொற்பொழிவாற்றினார். விழாவில் அகில இந்திய தலைவர் திரு. Mu. மோகன் அவர்களின் நீண்ட கால சேவையை பாராட்டி சபையில் அவருக்கு பொன்னாடை மற்றும் வாழ்த்து மடல் அளிக்கப்பட்டு கவுரவிக்கப்பட்டார்.

22.01.2021

அன்று ஒன்பதாவது செயற்குழு மற்றும் பொதுக்குழு கூட்டம் பிlotel Accord –ல் திரு. T.V. சந்திரசேகரன், திரு.V.S.B. சுந்தர், திரு.R.ராஜேந்திரன், திரு.M.செந்தில்குமார், திரு. K.அண்ணாமலை, திரு. A.ஜெயசீலன், திரு. A.ராஜசேகர், திரு. Y.சீனிவாசன், திரு. A.உதயசங்கர், திரு. M. பசுபதி ஆகியோரின் உபசரிப்பில் நடைபெற்றது.

26.01.2021

Republic day 72வது குடியரசு தின விழா நமது தென்னக மய்யத்தின் சார்பில் அறக்கட்டளையின் வளாகத்தில் காலை 8.20க்கு பீஷ்மா திரு.R.இராதாகிருட்டிணன் அவர்களின் கொடியேற்றத்துடன் நடைபெற்றது. இதில் நமது அகில இந்திய தலைவர் திரு.Mu.மோகன், திரு. L. சாந்தகுமார், மய்யத்தலைவர், திரு.R.சிவக்குமார், தென்மண்டல செயலாளர், திரு.K.வெங்கடேசன், மாநிலச் செயலாளர், திரு. R.இராமப்பிரபு, மாநிலப் பொருளாளர் மற்றும் முன்னோடிகள், செயற்குழு மற்றும் பொதுக்குழு உறுப்பினர்கள் கலந்துகொண்டு சிறப்பித்தனர். அனைவருக்கும் காலை சிற்றுண்டி தென்னக மய்யத்தின் உபசரிப்பில் வழங்கப்பட்டது.

29.01.2021 General Body Meeting

2021-22ம் ஆண்டிற்கான புதிய மய்ய நிர்வாகிகள், செயற்குழு, பொதுக்குழு உறுப்பினர்கள் போட்டியின்றி ஒருமனதாக தேர்ந்தெடுக்கப்பட்டதை திரு. S. ஜெயராமன், Scrutinzing officer, அறிவித்தார். இக்கூட்டம் நமது மய்யத்தில் உள்ள A. டாக்டர். ராமகிருஷ்ணா அரங்கத்தில் நடைபெற்றது. இதில் அகில இந்திய முன்னாள் தலைவர் பீஷ்மா திரு. R. இராதாகிருட்டிணன் அவர்கள், அகில இந்திய தலைவர் திரு. Mu. மோகன், திரு. L. சாந்தகுமார், மய்யத்தலைவர், திரு. R. சிவக்குமார், தென்மண்டல செயலாளர், திரு. K. வெங்கடேசன், மாநிலச் செயலாளர், திரு. R. இராமப்பிரபு, மாநிலப் பொருளாளர் மற்றும் முன்னோடிகள், செயற்குழு மற்றும் பொதுக்குழு உறுப்பினர்கள் கலந்துகொண்டு சிறப்பித்தனர்.

▶▶ *21.01.2021 அன்று தமிழ்நாடு மின்சார ஆணைய இயக்குநர் திரு. R.V. சுந்தரராமன் அவர்களை தென்னக மய்யத்தலைவர் மற்றும் மய்ய நிர்வாகிகள் சந்தித்து கோரிக்கை மனு அளித்தனர்*

▼▼ *22.01.2021 அன்று ஒன்பதாவது செயற்குழு மற்றும் பொதுக்குழு கூட்டம் Hotel Accord –ல் திரு.T.V.சந்திரசேகரன், திரு.V.S.B.சுந்தர், திரு.R.ராஜேந்திரன், திரு.M.செந்தில்குமார், திரு.K.அண்ணாமலை, திரு.A.ஜெயசீலன், திரு.A.ராஜசேகர், திரு.Y.சீனிவாசன், திரு.A.உதயசங்கர், திரு.M.பசுபதி ஆகியோரின் உபசரிப்பில் நடைபெற்றது*

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