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மாண்புமிகு தமிழக முதல்வர் திரு. மு.க. ஸ்டாலின் அவர்களை
மய்யத்தலைவர் திரு. L. சாந்தகுமார் அவர்கள் நேரில்
சந்தித்து கட்டுநர் சங்க கோரிக்கைகளை எடுத்துரைத்தார்

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ஆசிரியர் மடல்

அன்புடையீர் வணக்கம்,

மனிதர்கள் ஒவ்வொரு நாளும் விரைவாக முன்னேற்றப்பாதையை நோக்கி அதிவேகமாக ஓடிக்கொண்டிருக்கிறார்கள். கல்வியில் பல துறைகளில் தேர்ச்சி, தொழில்நுட்பத்தில் வளர்ச்சி, கலாச்சாரத்தில் நெகிழ்ச்சி, உணவு வகைகளில் புத்தாக்க முயற்சி, புதிய சிந்தனைப் புரட்சி என்று எண்ணிலடங்கா மாற்றங்களையும், சாதனைகளையும் படைத்துக்கொண்டு. ஓடிக்கொண்டிருக்கும் நெடிய சாலையில் சட்டென்று எதிர்பாராத விதமாக சந்திக்கும் ஒரு வேகத்தடை உடல்நலக்குறைவு.



மனிதனின் உடல் என்பது இயற்கையின் ஓர் அற்புத படைப்பு. ஒவ்வொரு பருவத்திற்கும் உரிய நேரத்திற்கும் ஏற்றாற்போல் வலிமை, மாறுதல், வளர்ச்சி, முதிர்ச்சி என தன்னைத்தானே செம்மைப்படுத்திக் கொள்ளும் திறன் வாய்ந்தது. அப்படிப்பட்ட உடலை ஆரோக்கியமாக பேணிக்காப்பது நம் கடமை. அதை உணராமல் நாம் ஓடும் ஓட்டத்திற்கும் காணும் மாற்றத்திற்கும் உடலை பணியச் செய்து உடல் நலம் குன்றும் நேரத்தில், அதன் அருமையை உணருகிறோம்.

இக்காலத்தில் தொழில்நுட்ப சாதனங்களுக்கு தூக்கத்தை விலைபேசி விற்று, உட்காந்த இடத்திலேயே உடம்பு நலுங்காமல் வேலை செய்து, கொண்டிருக்கிறோம். கல்லை தின்றால் கூட கரைந்துவிடும். என்கின்ற உடல்வாகு கொண்டவர்கள் நம் முன்னோர்கள். ஆனால் நெகிழிப்பையைப் போன்ற பீட்சா, பாகர் முதலிய துரித உணவுகளுக்கு நாக்கை அடிமையாக்கி, தீயபழக்கங்களுக்கு வித்திட்டு, எதிர்மறையான எண்ணங்களை முளைக்கச் செய்து, ஆசைக்கும் போராசைக்கும் வேறுபாடு தெரியாமல் அலையும் மனம், எந்நேரமும் கடுகடுத்த முகம் இவையே நமது ஆரோக்கிய உடல் நலத்திற்கு எதிரிகளாக உருவெடுத்துள்ளன என்ற உண்மையைத் தெரிந்தும் அலட்சியம் படுத்தி விடுகிறோம்.

குறைந்தது எட்டு மணி நேர ஆழ்ந்த தூக்கம், உரிய நேரத்தில் குறைந்தது ஒரு மணி நேர உடற்பயிற்சி, சத்து நிறைந்த சமச்சீரான உணவு, தூய்மையான பழக்க வழக்கங்கள், நோய்மறை எண்ணங்கள், நிம்மதியான நிறைவான மனம், எந்நேரமும் பொன் நகையாய் மின்னும் புன்னகை. இவையே நம் ஆரோக்கியமான உடலுக்கும் நீண்ட ஆயுளுக்குமான மிக முக்கியமான காரணங்கள் ஆகும். இன்றைய காலக்கட்டத்தில் உலகில் ஒவ்வொரு முலைமுடுக்கையும் கூட விட்டு விடாமல் கொரோனாவின் கோரதாண்டவம் தலைவிரித்தாடுகிறது. ஆரோக்கியமானவர்களையும் விட்டுவைக்கவில்லை என்கின்ற நிலை அச்சுருத்துக்கூடியதாய் இருக்கிறது.

விஞ்ஞானிகளுக்கும் ஆராய்ச்சியாளர்களுக்கும் சவால் விட்டு நாளுக்கு நாள் ஒமேக்ரான் என்ற பெயரில் உருமாறி விளையாடிக் கொண்டிருக்கிறது. இதன் ராட்சச பிடியிலிருந்து தப்பித்து உலகம் புத்தம் புதிய பூமியாய் மாற நாம் எடுக்கக்கூடிய ஆயுதம் முகக்கவசம் அணிந்து, கைகளை அடிக்கடி சுத்தம் செய்து சமூக இடைவெளியைக் கடைபிடித்து முடிந்த வரை அநாவசியமாக வெளியே செல்லாமல் இருந்து நோய் பரவலை முறியடிக்க வேண்டும். நாம் சேர்க்கும் உண்மையான சொத்து, நோய்பிணி அண்டாத ஆரோக்கியமான உடல்நலமே என்பதை உணர வேண்டும்.

சுவரை வைத்துதான் சித்திரம் வரைய முடியும் என்கிற கூற்றிற்கு ஏற்ப இந்த பேரிடர் காலத்தில் மக்களின் நல்வாழ்வினை கருத்தில் கொண்டு அரசு எடுக்கும் நடவடிக்கை மற்றும் கட்டுப்பாடு விதி முறைகளை நாம் அனைவரும் தவறாமல் கடைபிடித்து இந்த நாட்டிற்கும் நம் வருங்கால சந்ததியினருக்கும் நன்மை பயக்கும் விதமாக செயல்படுவோம்.

அஞ்சுவது அஞ்சாமை பேதைமை அஞ்சுவது
அஞ்சல் அறிவார் தொழில்

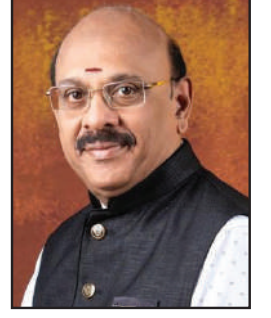
என்றும் அன்புடன்

S. அய்யநாதன்



அன்பார்ந்த நண்பர்களே வணக்கம்,

நமது தலைமையக வருடாந்திர மகாசபைக் கூட்டமும் அகில இந்திய மேலாண்மை மற்றும் பொதுக்குழு கூட்டமும் டிசம்பர் 2 மற்றும் 3 தேதிகளில் ஜெய்பூரில் மிகச் சிறப்பாக நடைபெற்றது. நமது மய்யத்திலிருந்து 24 பொதுக்குழு மற்றும் மேலாண்மைக்குழு உறுப்பினர்கள் கலந்து கொண்டோம். அந்த மகாசபைக்கூட்டத்தில் 2020-21ம் ஆண்டிற்கான "BEST PUBLICATION AWARD" நமது சதான் பில்டர் மாத இதழுக்கும், "OVERALL BEST CENTRE AWARD" நமது தென்னக மய்யத்திற்கும் அறிவிக்கப்பட்டது. "OVERALL BEST CENTRE" விருதை நமது மய்யம் 12வது முறையாகவும், "BEST PUBLICATION" விருதை நமது மய்யத்தால் வெளியிடப்படும் சதான் பில்டர் மாத இதழ் தொடர்ந்து 7வது முறையாகவும் பெறுகிறது என்பதை பெருமையோடும் மிகுந்த மகிழ்ச்சியோடும் தெரிவித்துக்கொள்கிறேன்.



14.12.2021 அன்று கட்டுமானத் தொழிலாளர் நலவாரியக் கூட்டத்தில் நமது மாநிலத்தலைவர் திரு. R. சிவக்குமார் அவர்களோடு நானும் கலந்து கொண்டு நமது கருத்துக்களை பதிவு செய்தோம்.

வரும் பிப்ரவரி திங்களில் நடைபெறவுள்ள அகில இந்திய கட்டுநர் மாநாட்டின் ஏற்பாடுகள் குறித்த ஆய்வுக்கூட்டம் நமது மய்ய அலுவலகத்தில் 15.12.2021 அன்று மாநாட்டுத்தலைவர் திரு. R. இராதாகிருட்டிணன் அவர்கள் தலைமையில் நடைபெற்றது. இந்த ஆலோசனைக்கூட்டத்தில் மாநாட்டு ஆலோசகரும் அகில இந்திய முன்னாள் தலைவருமாகிய திரு. B. சீனய்யா அவர்களும் முன்னாள் அகில இந்திய துணைத்தலைவர் திரு. ஸ்ரீராம் அவர்களும் கலந்து கொண்டு ஆலோசனை வழங்கினார்கள். அன்று மாலை நடைபெற்ற செயற்குழு மற்றும் பொதுக்குழு கூட்டத்தில் தென்னக மய்யத்தின் 2022ம் ஆண்டிற்கான நாட்குறிப்பினை அகில இந்திய துணைத்தலைவர் திரு. S. அய்யநாதன் அவர்கள் வெளியிட பீஷ்மா திரு. R. இராதாகிருட்டிணன் அவர்கள் பெற்றுக்கொண்டார்.

16.12.2021 அன்று மாண்புமிகு தமிழக முதல்வர் திரு. M.K. ஸ்டாலின் அவர்களை நேரில் சந்தித்து கட்டிட வரைவு பட அனுமதி காலத்தினை 5 ஆண்டிலிருந்து 8 ஆண்டுகளாக உயர்த்தியமைக்காவும், மனைப்பிரிவு மற்றும் மனைகளுக்கு 60 நாட்களுக்குள் அனுமதி வழங்கத்தக்க வகையில் ஒற்றை சாளர முறை விரைவாக அறிமுகப்படுத்தப்படும் என்று அறிவித்தமைக்காவும் நன்றி தெரிவிக்கப்பட்டது.

நமது மய்ய அலுவலகத்தில் உள்ள பத்மபூஷன் A. ராமகிருஷ்ணா கூட்ட அரங்கில் மாநில அளவிலான மய்யத்தலைவர்கள் மற்றும் குழுத்தலைவர்கள் கூட்டம் 21.12.2021 அன்று நமது மய்யத்தின் உபசரிப்பில் வெகு விமரிசையாக நடைபெற்றது. இக்கூட்டத்தில் 2022 ஆண்டிற்கான மாநில நாட்குறிப்பினை அகில இந்திய துணைத்தலைவர் திரு. S. அய்யநாதன் அவர்கள் வெளியிட பீஷ்மா திரு. R. இராதாகிருட்டிணன் அவர்கள் பெற்றுக்கொண்டார்.

நடைபெறவுள்ள அகில இந்திய கட்டுநர் மாநாட்டினை வெகு சிறப்பாக நடத்த அனைவரின் ஒத்துழைப்பையும் மீண்டும் வேண்டிக் கேட்டுக் கொள்கிறேன்.

என்றும் அன்புடன்
L. சாந்தகுமார்

STEEL CONCRETE COMPOSITE SYSTEMS



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Introduction

- The most frequently adopted combination of construction materials are steel and concrete, with applications in multi-storey commercial buildings and factories, as well as in bridges. The two building systems, concrete and steel, evolved independently of each other until 1960s were architects and engineers constructed tall buildings either in steel or concrete. But it was in 1969 when Dr. Fazlur Khan of Skidmore, Owings and Merrill broke this trend by blending steel and concrete into a composite system for constructing a 20-storey building, in which the exterior columns and spandrels were encased in concrete so as to provide the required lateral resistance. The system was a steel frame stabilized by reinforced concrete.
- These materials can be used in mixed structural systems, for example concrete cores encircled by steel tubes, as well as in composite structures where members consisting of steel and concrete act together compositely.
- They have an ideal combination of strengths with the concrete strong in compression and steel in tension; concrete also renders corrosion protection and thermal insulation to steel at higher temperatures.
- In multi-storey buildings, structural steelwork is been used together with concrete; for example steel beams with concrete floor slabs.
- A technique that provides the required monolithic action between the prefabricated units such as steel beams, precast reinforced or prestressed concrete beams & cast-in-situ concrete which increases the structural efficiency of the whole section.
- The term “steel and concrete composite systems” is used to encompass both gravity and lateral load resisting elements.
- Composite structural forms were often employed to maximize the individual benefits of using different materials of construction, in combination.
- It is always possible to ensure that the slab and the beam remain intact at a relatively extra cost of providing connectors between them.
- If the slab and the beam are connected and the slip between them is prevented the bending strength of the combined unit is found to be augmenting. Thereby making the size of steel beam appreciably smaller for a composite section than for a non-composite one for resisting the same load.
- Prefabricated and cast-in-situ construction possesses their own advantages and disadvantages; and composite construction tends to combine the advantages and minimize the disadvantages of these methods of construction.
- There is an effective reduction in cost when compared

to that of reinforced concrete construction and there is an effective reduction in weight. That is there is a direct economy in the tonnage of steel and indirect economies due to a decrease in construction depth of the floor and also there is reduction in the foundation cost.

- A composite floor construction consisting of profiled steel sheeting with a concrete topping is found to possess the following advantages:

Speed
Safety
Efficiency of construction

The structural behaviors were found to be same as that of a reinforced concrete slab, with the steel sheeting acting as the tension reinforcement.

- Today with the advent of high strength concrete a new era of super columns and mega frames emerged where the economy, stiffness and damping characteristics of large concrete elements are combined with the lightness and constructability of steel frame. Nowadays engineers are increasingly adopting composite building systems of structural steel and reinforced concrete in order to produce structures that are more efficient when compared to designs using either material alone.

Composite elements

Composite elements

To get in depth into different composite building schemes, it is necessary to study the various techniques of composting both the horizontal and vertical elements. They are:

- Composite slabs.
- Composite girders.
- Composite columns.
- Composite diagonals.
- Composite shear walls.

Composite slabs:

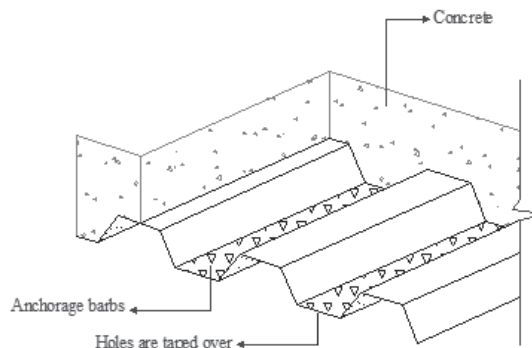


Figure 9.1 Typical Composite Slab

- A composite slab (Figure 9.1) is one in which profiled steel sheets are used as permanent shuttering capable of supporting the wet concrete, reinforcement and

construction loads. Subsequently, the profiled steel sheets combine structurally with the hardened concrete and act as part or all of the tensile reinforcement in the finished floor.

- In high-rise steel buildings, the use of high-strength light-gauge metal deck with concrete topping has become the standard floor-framing method nowadays. The metal deck (Figure 9.2) usually has embossments impressed into the sheet metal in order to achieve composite action with the concrete topping. As the concrete hardens, the metal deck acts as the bottom tension reinforcement whereas the concrete acts as the compression component. Thereby the resulting composite slab acts as a horizontal diaphragm interconnecting all vertical elements at each level enabling the horizontal transfer of shear forces to bracing elements.



Figure 9.2 Profiled sheeting concrete

- Composite slabs are often used in combination with multi-storey steel-framed buildings. Composite slabs are best suited to indoor application and under normal environmental conditions. Composite slabs are most often used in the following types of buildings: Industrial buildings, Office buildings, Commercial buildings, Hospitals, Housing, Renovation of existing buildings, etc.
- Below figure 9.3 shows an innovative composite slab floor system design which was not only light in weight but also able to span up to 30 ft. without any intermediate beams.

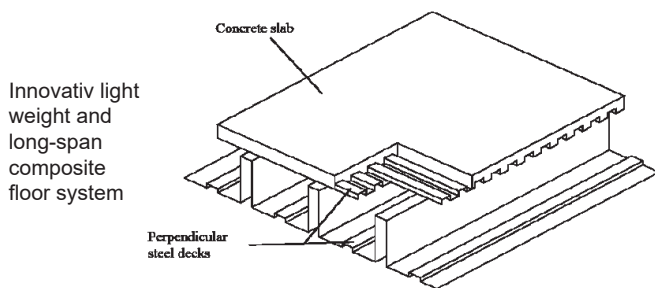


Figure 9.3 Innovative composite slab

Steel decking plays number of roles that are listed below:

- It supports the loads during construction and thus acting as a working platform.
- It stabilizes the beam against lateral buckling, until the concrete hardens.
- It acts as transverse reinforcement to composite beams.
- It develops adequate composite action with concrete to support construction loads.
- It reduces the volume of concrete in tension zone (in sagging moment regions).
- It distributes the shrinkage strains, thus preventing serious cracking compared to precast or in-situ concrete.

Composite girders:

- Different types of Composite girders are effectively used in the bridge design. (Figure 9.4)

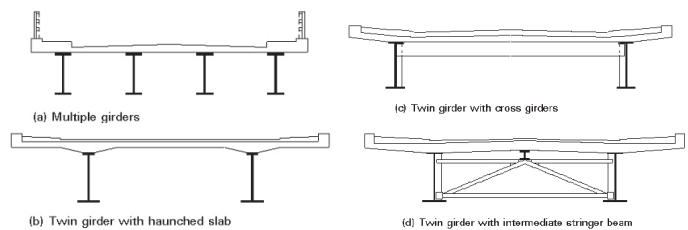


Figure 9.4 Types of usage of composite girders in bridges

- Consider a typical steel moment frame consisting of steel beams rigidly connected to the columns. The stiffness of the frame normally depends upon the stiffness of the girder. This is because in a frame with its typical column to column spacing (7.6m to 10.6m) and floor to floor height (3.8m to 4.1m), the columns are much stiffer than beams.
- In order to limit the sway of structure under lateral loads it is more efficient to increase the girder stiffness rather than the column stiffness. This is shown in Figure 9.5

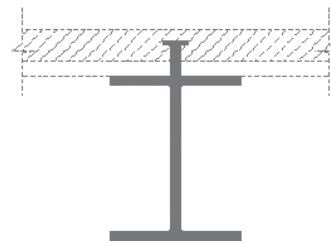


Figure 9.5 Steel-beam composite slab or RC-slab

Composite box girder bridges

Composite steel and concrete box girder bridges have now been widely used for medium span (span - 45m to 100m) bridge structures. These bridges are aesthetically pleasing and offer an attractive form of construction. They possess many economic advantages over the familiar I-beam and plate girder structures. A composite box girder section has high torsional stiffness, which results in a greater lateral distribution of the live load. The following are the advantages achieved by using composite box girders:

- Girder section can be erected by means of mobile crane.
- Because of the torsional stiff section the intermediate bracing can be eliminated.
- Can achieve improved resistance to aerodynamics excitation.
- Torsional performance reduces bearing requirement.
- Ensures very clean surfaces (of boxes) leading to fewer corrosion traps.
- Enables the use of sections curved in plan.
- Painting surface is found to be very less.

A composite box girder highway bridges consist of reinforced concrete deck slab on top of one or more fabricated steel open box girders. Normally two boxes are used for carrying minor roads and for wider roads,

multiple boxes, four or more, may be employed. In practice, there are two different classes of composite box girders:

- i. Steel boxes which have completely closed.
- ii. The other is the form of an open 'U' section.

For both the classes, the box section could be either rectangular or trapezoidal. The bottom flange width is found to be narrower when compared to the top flange. In elevation the box section may have a constant depth or they may be haunched. The soffit portion is normally curved for better appearance. (Figure 9.6)

The flanges and the webs are fitted with stiffeners before they are assembled. Cross-frames or diaphragm are required during this stage in order to ensure that the cross-section is held in position during welding. Closed trapezoidal boxes are usually assembled in inverted position and then the bottom flanges are added. Internal welding after closure is usually necessary – support diaphragm at least must be welded all round. The main advantage of composite box girder over the prestressed concrete box girder is the speed and ease of construction.

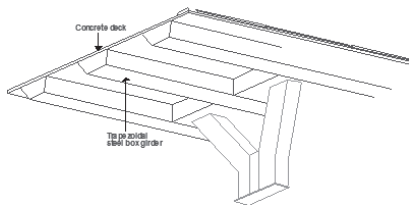


Figure 9.6 Steel box Girder Bridge

Composite beams:

- In conventional composite construction, concrete slabs rest over steel beams and they are supported by them. Under load these two components act independently and a relative slip occurs at the interface if there is no connection between them. However, if appropriate connection is provided between the beam and the concrete slab, the slip between them can be eliminated. Thus the steel beam and the slab act as the 'composite beam' and their action is similar to that of a monolithic tie beam.

- As concrete is stronger in compression and steel is susceptible to buckling in compression, by the composite action between these two materials, one can obtain their respective advantages to the fullest extent.

- Usually in steel concrete composite beams, the steel beams are integrally connected to prefabricated or cast in situ reinforced concrete

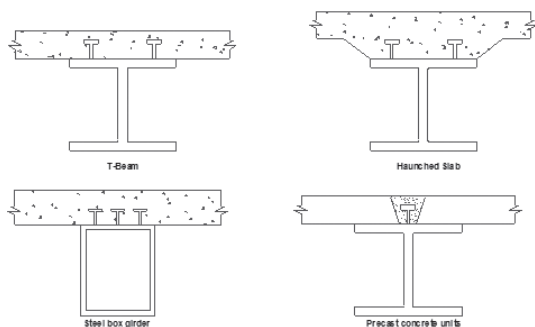


Figure 9.7 Typical beam cross-section

The above figure 9.7 shows the use of various shapes and types of steel beams (rolled or welded sections) together with in situ concrete. Instead of in situ concrete slab, precast concrete floor or deck units can also be employed as shown in figure 9.8 explains a system using large prefabricated deck elements with longitudinal joints. The gap between the units shall be filled with mortar in the final structure, thereby giving composite action with the beams.

In case of commercial and industrial buildings, the usual practice is to construct the floors using metal decking that incorporates additional embossments to provide composite action.

Composite action in beams:

Composite beams, mainly subjected to bending, possess steel section acting compositely with one (or two) flanges of reinforced concrete. The two materials are interconnected by means of mechanical shear connectors. For single span beams, sagging bending moments which occurs due to applied vertical loads, cause tensile forces in the steel section and compression in the concrete deck thereby making optimum use of each material. Hence it is clear that composite beams even with small steel sections have high stiffness and can carry heavy loads on long spans.

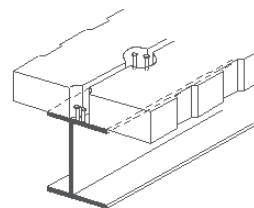


Figure 9.8 Use of precast concrete floor units

Some of the advantages associated with steel composite beam construction are listed below:

- Because of its larger stiffness and strength, composite beams have less deflection than steel beams.
- The most effective utilization of steel and concrete is achieved.
- As the depth of the beam reduces, the construction depth reduces, thereby resulting in enhanced headroom.
- This method provides an effective and efficient way of arrangement to cover large column free space.
- Encased steel beam sections have improved fire resistance and corrosion.
- Composite construction is amenable to fast track construction because of employing rolled steel and pre-fabricated components, rather than cast in situ concrete.

Shear connection

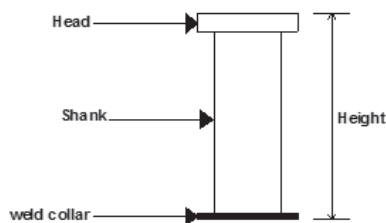
It is very important to note the bond between the steel and concrete elements in composite members which is a crucial issue. At their interface where these two elements meet, they have to be tied together mechanically using what is termed as "Shear connector". Basically these shear connectors are designed to resist:

- i. Longitudinal shear force at the steel/concrete interface.
- ii. A tension which is caused by the tendency of separation of the steel/concrete elements at the interface.

The shear connectors are basically steel dowels embedded in concrete medium, they possess a component which is designed to resist the longitudinal shear forces and another component designed to resist the normal tensile forces, thus preventing the separation of the steel and the concrete at the interface. They all impart highly concentrated loads to the concrete elements.

Types of shear connectors

Stud shear connector (Figure 9.9) is probably the most common type of mechanical shear connector used in practice. This connector consists of a bolt that is electrically welded to the steel member by adopting an automatic welding procedure. The shank and the weld collar adjacent to the steel element are designed to resist the longitudinal shear load, while the head is designed to resist the tensile loads which are normal to the steel/ concrete interface.



Bolt connectors (Figure 9.10) can be bolted to the flange, but this method requires holes to be made in the flange.

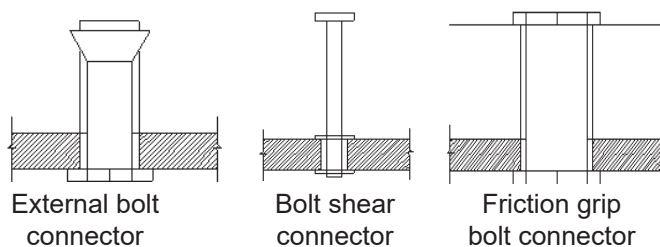


Figure 9.10 Bolt Connectors

In the Channel connector (Figure 9.11) the longitudinal shear is resisted by the bottom flange of the channel while the top flange resists the tensile loads normal to the steel/concrete interface.

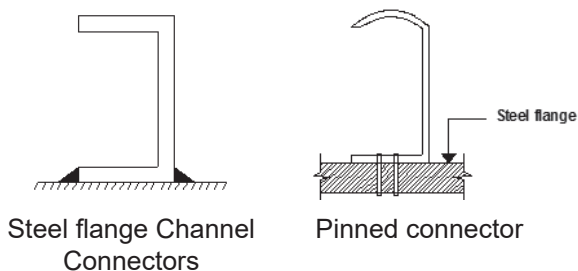


Figure 9.11 Channel Connectors

a. Block connectors: these (Figure 9.12) are very stiff and strong in shear connection and the spiraled or hoped bars resist the normal tensile loads.

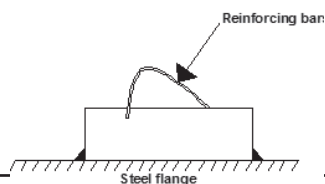


Figure 9.12 Block connector

Angle connectors(Figure 9.13) acts as more or less channel connection, but has a reinforcing bar welded to it in order to resist the tensile forces.

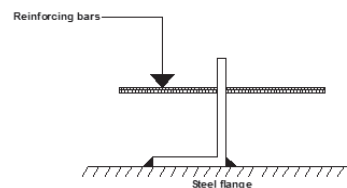


Figure 9.13 Angle connector

♦Mechanical connectors are used to develop the required composite action between steel beams and concrete. This connection is provided mainly to resist longitudinal shear, and is termed as the “Shear connection”.

- ♦ The fulfill the following requirements:
 - a. They must transfer direct shear at their base.
 - b. They must create a tensile link into the concrete.
 - c. They must be economic to manufacture and fix.

Composite columns

A steel-concrete composite column is a compression member. There are three different types of composite columns that are mainly in use:

- ♦ Concrete encased steel columns.
- ♦ Concrete filled steel tubes.
- ♦ Rolled section columns partly encased in concrete.

Both steel and concrete sections would resist the external loading by interacting together by bond and friction.

In other word, the cross-section of composite columns can be classified into two groups:

- Concrete filled sections in which the concrete is hidden.

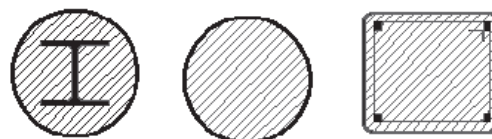


Figure 9.14 Concrete filled steel sections

With the concrete filled (figure 9.14) profiles, the steel sections serves as formwork during the process of casting. Hence, these sections provide an opportunity to erect the steel frame of a building and then pump in the concrete in order to fill the cross-sections, thereby, reducing the time of erection. The protective steel casing also allows the concrete infill to achieve greater strength; for example, in the case of concrete filled circular hollow profiles, the effect of confinement by the steel leads to an increase in the overall resistances. There is no need to provide additional steel reinforcing in this type of composite column, except for fire resistance requirements.

- Totally or partly encased sections.(Figure 9.15



Figure 9.15 Totally and partially encased sections

The complete encasement of the steel section by concrete normally fulfills the technical requirements for fire protection without any need for additional measures. For partly encased sections as well as for the concrete filled sections, the fire requirements can be achieved by using additional reinforcement. The partly encased sections has the advantage of being produced quite simply by casting the concrete whilst the steel section lies horizontally; 24 hours later the column can be turned around and further concrete can be added, the formwork for the wet concrete is provided by the steel profile.

All cross-sections are symmetrical about both the axes. In all these cases the complete interaction must be ensured between the column and the beam by means of mechanical connectors. These connections have to be provided at least at the column ends and where the loads or forces are acting. They should be distributed over the whole cross-section. Such connectors can be headed studs, top or bottom plates, suitable brackets, vertical gusset plates, shear heads or the other structural means.

■ Concrete encased steel columns: this column has the advantage of meeting the fire resistance requirements without the need for any other protection. And also, they can be easily strengthened by reinforcing bars in the concrete cover. Concrete encased steel composite columns have become the most preferred structural form for many earthquake resistant structures in many countries like Japan, etc. However, the main drawback is that they do not provide any accessible structural steel surface for future fastening and also attractive surface treatment.

■ Concrete filled steel tubes: this column is famous for its use as individual column elements. In this type of column the tube is filled with high strength concrete. In order to achieve the required fire resistance rating, the concrete core must be longitudinally reinforced. The confined concrete fill increases the axial load resistance but has little effect on the flexural resistance. Hence, it is unlikely that these columns would be a good choice for a moment resisting frame.

The beam-to-column connections play an important role in the overall stability of any frame. For economic reasons these connections are usually made with bolts. They should be simple, with as much work as possible carried out in the work shop, thereby minimizing site work. The main hindrance in designing a composite beam to steel column connection is in assessing the behaviour and the contribution of the slab to a joint which is mainly under horizontal loading. It is already known that when gravity loading alone is applied to a frame, positive bending moment occurs at the midspan and negative moment at the ends of the beams. Hence it is customary to assume that the composite action takes place only in the positive moment region of the beam.

■ Concrete columns can be either partly or totally encased open section, or alternatively, they may be concrete filled steel tubes.

■ Careful attention must be given to connection detailing to ensure direct transfer of bearing loads to both

the steel and concrete elements of the column sections.

■ A composite column possesses increased strength for a given external dimension, increased stiffness and increased buckling resistance.

■ It also possesses very good fire resistance property and corrosion protection as in the case of encased columns.

■ Sections with different load and moment resistance but with similar external dimensions can be easily produced simply by varying the steel thickness, the concrete strength or the reinforcement. This permits the outer dimensions of a column to be held constant over a number of floors in a building, thus simplifying the construction and architectural detailing.

■ With the composite construction, the bare steel sections support the initial construction loads that include the weight of the structure itself during construction. Concrete is then later cast around the steel section or filled inside the tubular sections. Both the materials steel and concrete are combined in such a fashion that their advantages are utilized effectively in composite columns.

■ The lighter weight and higher strength of steel permits the use of smaller and lighter foundations and the subsequent addition of concrete ensures the building frame to easily limit the sway and lateral deflections.

■ Such columns occupy less space (floor area) compared to that of the reinforced concrete columns.

Fire resisting properties of composite column

Because of the thermal mass of concrete, composite columns always possess a higher fire resistance than the corresponding steel columns by themselves. It can also be said that composite columns were basically invented for their inherent high fire resistance. They are usually designed in the 'normal' or 'cool' state and then checked under fire conditions. The composite floor must provide satisfactory performance in terms of stability, integrity and insulation in the event of fire. While insulation is taken care by the thickness of the slab, the integrity is generally ensured by sheeting. The stability of the structure (i.e.) its ability to prevent collapse in the course of fire depends upon the conventional reinforcement in the slab and for this purpose the nominal anti-crack reinforcement is adequate. Additional reinforcement is generally required to attain the targeted fire resistance.

■ In the case of composite columns with fully concrete encased steel sections the fire resistance can be treated in the same way as that for the reinforced concrete columns. Light reinforcement is also required in order to maintain the integrity of the concrete cover. As the steel is insulated by an appropriate concrete cover such cases usually possess two hours of fire resistance with the minimum concrete cover of 40mm.

■ In the case of partially concrete encased steel sections, the structural behavior of the column is very different in the event of fire as the flanges of the steel sections are exposed and less concrete acts as a 'heat sink'. Additional reinforcement is often required to achieve more than one hour fire resistance.

■ In the case concrete filled hollow section subjected

to fire, the steel sections are subjected to direct heating while the concrete core behaves as 'heat sink'. In general, sufficient stress redistribution occurs between the hot steel sections and the relatively cool concrete core, and hence a fire resistance of one hour can usually be achieved.

■ In order to achieve longer duration of fire resistance, additional reinforcements are required, which are generally neglected in normal design. Steel fiber reinforcement is also found to be effective in improving the fire resistance of a concrete filled concrete.

Seismic behavior of composite structures

Structures are normally designed to resist vertical loads (i.e.) the gravity loads, which act in the vertical direction. But during their course of their life they may be subjected to resist significant lateral loads arising from earthquakes. Therefore it is necessary to analyze the seismic behaviour of any type of construction before adopting it extensively. Structures are considered to perform well under a severe earthquake if they possess very good ductility. This property called 'ductility' may be defined as the ability to withstand large deformations without any significant loss in strength. Another property which is responsible for a good seismic performance is the ability to dissipate energy by inelastic action under cyclic loading and it is referred to as 'hysteretic energy'.

1. One way of increasing both the properties in members involving steel section is to use higher thickness and thereby delay local buckling.

2. The total hysteretic energy dissipated by a structure is nothing but the sum of the energies dissipated by various cross-sections, which have entered the inelastic range. Thus ensuring that as many cross-sections enter the inelastic range as possible before collapse can maximize the total energy dissipated. In other words, selecting a good collapse mechanism that involves the formation of large number of plastic hinges and avoiding the concentration of inelastic action in few locations is the key factor to ensure good seismic performance. This methodology is referred to as 'capacity design'. It is also necessary to consider fire protection, as earthquakes are invariably accompanied by fires and hence the survival of a structure during earthquake is also related to its ability to withstand fires.

3. Seismic behaviour of composite columns: concrete filled tubular columns are employed to a greater extent because of several unique advantages. Apart from other factors like speed of construction, easy connections to steel beams as well as economy in formwork, they also provide superior seismic performance.

4. Seismic behaviour of composite slabs: slabs are designed for strength and their ductility is normally not considered. But however to ensure failure by ductile yield line mechanism the suggestions given below may be adopted:

Employing steel with a sufficiently long yield plateau for the profiled sheeting.

Mechanical interlocks may be adopted to prevent shear bond failure.

Sheeting fastened to supporting members to avoid falling off.

Seismic behaviour of composite beams: the main objective of ensuring composite action between a steel beam and the overlaid concrete slab is to achieve increased positive (sagging) bending moment capacity. Continuous beams and moment resisting frames are not only more economical but also possess efficient seismic resistance systems due to their higher redundancies.

Seismic behaviour of composite connections: connections should be able to resist both the positive and negative moments and have a ductile failure, this is because especially when the gravity loads are small is the reversal bending moments during an earthquake. Frames with simple connections will be incapable of resisting the lateral loads and hence appropriate lateral load resisting systems such as bracings must be provided. The semi-rigid connection has many advantages over conventional steel connections. Providing a few reinforcement bars over column lines not only improves the strength, ductility and stiffness of the connection but also eliminates the top angle which is subjected to a combination of bending, axial and shear forces.

Advantages of composite construction:

- Composite construction, especially the system using profiled steel sheeting, permits rapid construction.
- The life cycle costs are low and the steel being employed is a reusable material hence it is eco-friendly.
- There is significant reduction in cost and weight, which results in a substantial reduction of storey heights in multistorey buildings. It was found that, the cost of the six-storey office building using composite construction was found to be 6% less than the cost of the same building if it were built by employing reinforced concrete. Thus, the composite construction is eminently cost effective for tall buildings.
- The weight of steelwork required in composite construction is significantly less than if the materials were used independently.
- They are more significant for medium to long spans than for short spans.
- Servicing requirements of modern buildings can be accommodated without cutting up the structural elements and several alternative design solutions are available.
- There is no need for expensive false work and formwork as the steel beam is capable of resisting the self-weight of steel and concrete, by itself or with the assistance of a few temporary props.
- The main disadvantage of composite construction is the need to provide connectors at the steel-concrete interface. However, it is far overcome by the significant advantages that can be gained.
- Use of composite columns along with composite beams and composite deck slabs will ensure very early completion of structure and thereby generating rapid return of capital.
- Slim floor concept: this is a special type of composite construction where an asymmetric rolled beam

section is used or a steel plate is welded to the bottom flange of a symmetric beam. Which supports the profile deck and concrete topping on both sides and depth of beam is contained within the thickness of the floor slab. This technique is employed to a greater extent due to numerous advantages such as ability to cover large column free area, better seismic resistance, elimination of shuttering and propping in case of slim floor etc.

- In spite of all this it is very necessary to overcome lack of knowledge on steel and composite construction within the architectural and structural engineering profession.

Composite shear wall

- Shear wall systems are one of the most commonly used lateral load resisting systems in most of the high-rise buildings. The composite shear wall is nothing but a steel plate shear wall with a reinforced concrete wall attached to one side of it using bolts. The bolts connecting the reinforced concrete walls to steel plate shear walls ensures composite action by bracing the steel plate shear wall to the reinforced concrete shear wall and thus preventing the overall buckling of steel plates.

- Traditionally the reinforced concrete shear walls have been used as lateral-load resisting system in multistory buildings. It has been found that steel structures with reinforced concrete shear walls perform well during the earthquakes. However, in recent days, steel plate shear walls have been used to resist lateral-loads in seismic retrofits as well as in the design of new mid-rise and tall buildings.

- The main disadvantage of a reinforced concrete shear wall is the development of tension cracks in the tension zone and compressive crushing in the localized compression areas. Such cracks and crushing failures can cause spalling and splitting of walls as the cyclic deformations becomes larger and repeated. Another

important disadvantage of reinforced concrete shear walls is its relatively high weight to strength ratio compared to steel, because of which reinforced concrete shear walls were impractical to use in many tall buildings with large shear forces.

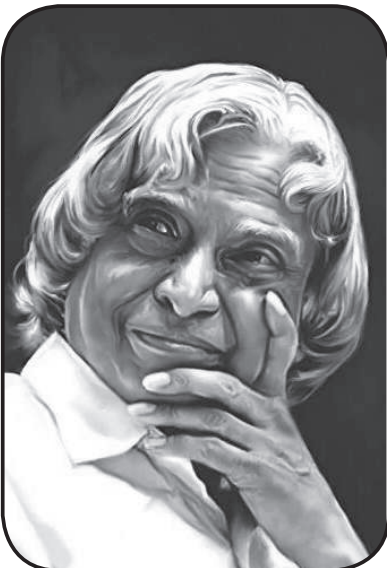
- The main disadvantage of steel shear wall is the buckling of the compression zone of the wall, which results in reduced shear strength, stiffness and energy dissipation capacity but this can be overcome by adding stiffeners to the steel plates. Moreover, this will again result in additional fabrication costs.

Composite shear wall on the other hand, has the ability to eliminate most of the disadvantages of both reinforced concrete, steel shear walls and absorb the advantages of these two construction materials, steel and concrete.

- Composite shear walls can be categorized as 'traditional' and 'innovative' shear wall. In both the cases, primarily a steel plate is welded to the boundary steel beams and columns, then a precast reinforced concrete shear wall is bolted to the steel plate wall thereby forming a composite wall.

- The main difference between the traditional and the innovative wall system is that in the former system the reinforced concrete wall is in direct contact with the boundary steel columns and beams, but in case of the latter system there is a gap in-between. This gap can either be left empty or filled with soft material.

- In traditional composite shear wall both the steel plate and the reinforced concrete walls are active and assure stiffness and strength from the beginning of loading. As a result, not only large forces can be attracted to the structure because of relatively large stiffness of the combined system, but the reinforced concrete wall can also be damaged under relatively small lateral displacements.



I Met money one day.

I said, "You are just a piece of paper"

Money smiled and said,

**"Of course I'm a piece of paper,
but I haven't seen a dustbin yet, in my life"**

That's Attitude

Dr. A. P.J. Abdul Kalam

அன்புள்ள கட்டுநர் சகோதரர்களுக்கு !

இதுவரை 12 சதவீதம் GST செலுத்திக் கொண்டிருந்த சில அரசு ஒப்பந்த வேலைகளுக்கு வரும் 01.01.2022 முதல் 18 சதவிகிதம் GST செலுத்த வேண்டியுள்ளது. அதாவது நேரடி அரசு துறைகளான மாநில பொதுப்பணித்துறை, நெடுஞ்சாலைத்துறை, மத்திய பொதுப்பணித்துறை, ரயில்வே போன்ற ஆளுநர் மற்றும் ஜனாதிபதி சார்பில் ஏற்படுத்தப்படும் ஒப்பந்தங்களுக்கு 12 சதவிகிதமும் அரசாங்க வாரியங்களால் நிர்வகிக்கப்படும் துறைகளுக்கு 18 சதவிகிதமும் செலுத்த வேண்டும். மேலும் ஏதாவது சந்தேகங்கள் இருந்தால் அவரவர் செய்யும் வேலைகளை துறை வாரியாக குறிப்பிட்டு கேட்டு தெளிவுபடுத்திக் கொள்ள வேண்டும்.

திரு. S.D. கண்ணன்
Taxation Committee



GST Rate on works contract services w.e.f 1st January 2022 mentioning Chapter, Section or Heading, Description of Services, GST Rate before 01st January 2022 and GST Rate with effect from 1st January 2022

Sl. No.	Chapter, Section or Heading	Description of Services	Old Rate (percent)	New Rate (Percent) W.e.f 01.01.2022	New Rate (Percent) w.e.f 01.01.2022
				[Employer – Project Authority]- Central Govt, State Govt, Union Territory and Local Authority	[Employer – project Authority]- Government Entity, Govt Authority & Others
1.	Heading 9954 (Construction Services)	“(iii) Composite supply of works contract as defined in clause (119) of section 2 of the Central Goods and Services Tax Act, 2017, supplied to the Government, a local authority or by way of construction, erection, commissioning, installation, completion, fitting out, repair, maintenance, renovation, or alteration of, – (a) a historical monument, archaeological site or remains of national importance, archaeological excavation, or antiquity specified under the Ancient Monuments and Archaeological Sites and Remains Act, 1958 (24 of 1958); (b) canal, dam or other irrigation works; (c) pipeline, conduit or plant for (i) water supply (ii) water treatment, or (iii) sewerage treatment or disposal.	12%	12%	18%
2.	Heading 9954 (Construction Services)	(iv) Composite supply of works contract as defined in clause (119) of section 2 of the Central Goods and Services Tax Act, 2017, supplied by way of construction, erection, commissioning, installation, completion, fitting out, repair, maintenance, renovation, or alteration of, - (a) a road, bridge, tunnel, or terminal for road transportation for use by general public; (b) a civil structure or any other original works pertaining to a scheme under Jawaharlal Nehru National Urban Renewal Mission or Rajiv Awaas Yojana; (c) a civil structure or any other original works pertaining to the “In-situ rehabilitation of existing slum dwellers using land as a resource through private participation” under the Housing for All (Urban) Mission/Pradhan Mantri Awas Yojana, only for existing slum dwellers; (c) „(c) a civil structure or any other original works pertaining to the “In-situ redevelopment of existing slums using land as a resource, under the Housing for All (Urban) Mission/ Pradhan Mantri Awas Yojana (Urban);- N.No.1/2018 dated 25.01.2018 (d) a civil structure or any other original works pertaining to the “Beneficiary led individual house construction / enhancement” under the Housing for All (Urban) Mission/Pradhan Mantri Awas Yojana; (e) a pollution	12%	12%	12%

		control or effluent treatment plant, except located as a part of a factory; or (f) a structure meant for funeral, burial or cremation of deceased „(da) a civil structure or any other original works pertaining to the “Economically Weaker Section (EWS) houses” constructed under the Affordable Housing in partnership by State or Union territory or local authority or urban development authority under the Housing for All (Urban) Mission/ Pradhan Mantri Awas Yojana (Urban); N.No.1/2018 dated 25.01.2018 (db) a civil structure or any other original works pertaining to the “houses constructed or acquired under the Credit Linked Subsidy Scheme for Economically Weaker Section (EWS)/ Lower Income Group (LIG)/ Middle Income Group1 (MIG-1)/ Middle Income Group-2 (MIG-2)” under the Housing for All (Urban) Mission/ Pradhan Mantri Awas Yojana (Urban); N.No.1/2018 dated 25.01.2018 (e) a pollution control or effluent treatment plant, except located as a part of a factory; or (f) a structure meant for funeral, burial or cremation of deceased. a building owned by an entity registered under section 12AA of the Income Tax Act, 1961 (43 of 1961), which is used for carrying out the activities of providing, centralised cooking or distribution, for mid-day meals under the mid-day meal scheme sponsored by the Central Government, State Government, Union territory or local authorities. N.No.1/2018 dated 25.01.2018			
3.	Heading 9954 (Construction Services)	(v) Composite supply of works contract as defined in clause (119) of section 2 of the Central Goods and Services Tax Act, 2017, supplied by way of construction, erection, commissioning, or installation of original works pertaining to,- (a) railways, excluding including N.No.1/2018 dated 25.01.2018 monorail and metro; (b) a single residential unit otherwise than as a part of a residential complex; (c) low-cost houses up to a carpet area of 60 square metres per house in a housing project approved by competent authority empowered under the „Scheme of Affordable Housing in Partnership” framed by the Ministry of Housing and Urban Poverty Alleviation, Government of India; (d) low cost houses up to a carpet area of 60 square metres per house in a housing project approved “(da) low-cost houses up to a carpet area of 60 square metres per house in an affordable housing project which has been given infrastructure status vide notification of Government of India, in Ministry of Finance, Department of Economic Affairs vide F. No. 13/6/2009-INF, dated the 30th March,2017; N.No.1/2018 dated 25.01.2018 (e) post-harvest storage infrastructure for agricultural produce including a cold storage for such purposes; or (f) mechanised food grain handling system, machinery or equipment for units processing agricultural produce as food stuff excluding alcoholic beverages.	12%	12%	12%

4.	Heading 9954 Construction Services	“(vi) Services provided to the Central Government, State Government, Union Territory, a local authority or a governmental authority by way of construction, erection, commissioning, installation, completion, fitting out, repair, maintenance, renovation, or alteration of – (a) a civil structure or any other original works meant predominantly for use other than for commerce, industry, or any other business or profession; (b) a structure meant predominantly for use as (i) an educational, (ii) a clinical, or (iii) an art or cultural establishment; or (c) a residential complex predominantly meant for self-use or the use of their employees or other persons specified in paragraph 3 of the Schedule III of the Central Goods and Services Tax Act, 2017.	12%	12%	18%
5.	Heading 9954 (Construction Services)	“(vii) Composite supply of works contract as defined in clause (119) of section 2 of the Central Goods and Services Tax Act, 2017, involving predominantly earth work (that is, constituting more than 75per cent. of the value of the works contract) provided to the Central Government, State Government, Union territory, local authority, a Governmental Authority or a Government Entity	5%	5%	18%
6.	Heading 9954 (Construction Services)	(Viii) Composite supply of works contract as defined in clause (119) of section 2 of the Central Goods and Services Tax Act, 2017 and associated services, in respect of offshore works contract relating to oil and gas exploration and production (E&P) in the offshore area beyond 12 nautical miles from the nearest point of the appropriate base line.	12%	12%	12%
7.	Heading 9954 (Construction Services)	“(ix) Composite supply of works contract as defined in clause (119) of section 2 of the Central Goods and Services Tax Act, 2017 provided by a sub-contractor to the main contractor providing services specified in item (iii) or item (vi) above to the Central Government, State Government, Union territory, a local authority, a Governmental Authority or a Government Entity.	12%	12%	18%
8.	Heading 9954 (Construction Services)	(X) Composite supply of works contract as defined in clause (119) of section 2 of the Central Goods and Services Tax Act, 2017 provided by a sub-contractor to the main contractor providing services specified in item (vii) above to the Central Government, State Government, Union territory, a local authority, a Governmental Authority or a Government Entity.	5%	5%	18%
9.	Heading 9954 (Construction Services)	Any other works contract services other than those mentioned above	18%	18%	18%

Compiled by Sakthi Services / KSDK and Company LLP



Important GST updates applicable from 1st January 2022

Changes to CGST Act, 2017

Section	Description	Nature of Change
Section 16	NO ITC UNLESS REFLECTED IN GSTR-2A/2B	<ul style="list-style-type: none"> Input Tax Credit shall not be available unless details of invoices uploaded by supplier in Form GSTR-1 are communicated to the recipient (i.e reflected in GSTR-2A/2B) Margin of 5% will no longer be available
Section 75 Sub Section 12	DIFFERENCE BETWEEN GSTR1 & 3B: DIRECT RECOVERY	Tax declared under GSTR-1 but not included in GSTR-3B, will be considered as "Self Assessed Tax" and hence, direct recovery of such tax under Section 79 will be possible even without issuing any Show Cause Notice
Section 107	25% PRE-DEPOSIT FOR E-WAY BILL APPEALS	For filing appeals, before first appellate authority against order for violation of E-way bill and other provisions, it will be mandatory to pay pre-deposit of amount equal to 25% of penalty imposed
Section 129	E-WAY BILL: 200% PENALTY TO RELEASE GOODS	At present, full tax and 100% penalty is required to be paid to release the goods which are seized for violation of E-way Bill related provisions and for non-carrying of other documents under Section 129. Now, it is provided that goods will be released on payment of: <ol style="list-style-type: none"> where owner of goods comes forward to pay penalty: penalty will be equal to 200% of tax and tax will be recovered through separate proceedings where owner of goods does not come forward to pay penalty: penalty will be 50% of value of goods or 200% of tax whichever is higher
Section 83	PROVISIONAL ATTACHMENT OF ASSETS OF BOGUS BILLING BENEFICIARIES ALSO	Not only supplier and recipients but assets of the beneficiaries of bogus billing can also be provisionally attached
Section 83 Sub Section 1	SCOPE OF PROVISIONAL ATTACHMENT WIDENED	Provisional attachment is made applicable in all cases of proceedings of Assessment, Inspection, Search, Seizure and Arrest or Demands and recovery. Now, provisional attachment of property, like bank accounts, can be done not only in the case of Show Cause Notices and investigation but also for other proceedings like Scrutiny of Returns and tax collected but not paid
Section 74	E-WAY BILL CO-NOTICEE MAY NOT GET FREE BY PAYMENT OF 200% PENALTY BY MAIN NOTICEE	Earlier where proceedings against main person liable to pay tax have been concluded under Section 74, proceedings against co-noticee are also deemed to be concluded as provided under Explanation 1(ii) to Section 74. However, now, such benefit will not be available to co-noticee for proceedings initiated to impose penalties for violation of E-way bill
Rule 59	NON FILING OF GSTR-1	A registered person shall not be allowed to furnish the details of outward supplies of goods or services or both under section 37 in FORM GSTR-1, if he has not furnished the return in FORM GSTR-3B for the preceding month (earlier it was preceding two months)
Rule 10B, 23(1), 89(1), 96(1)(c)	REFUND CLAIM	Aadhaar authentication compulsory for filing refund claim

புதிய கோணத்தில் வாஸ்து (New Dimension of Vasthu)



Er. A.G. மாரிமுத்துராஜ்

1. வாஸ்து என்பதற்கு வாழிடம் என்ற பொருள் உண்டு.
2. வாஸ்து சாஸ்திரம் என்றால் தொன்மையான இந்திய கட்டடக் கலையின் அறிவியல் அல்லது விஞ்ஞானம் என்றும் கூறலாம்.
3. ஒரு மனைக்கே உண்டான இலக்கணமும், நுட்பமும் நிறைந்த ஒரு குறிப்பேடு என்றும் சொல்லலாம்.
4. காலத்தையும், இடத்தையும், ஆய்ந்தறிந்து அவற்றில் உள்ள நேர்மறை சக்திகளை, மனித ஆரோக்கியத்திற்கு தேவையான வகையில், தொகுத்து வைக்கப்பட்ட நூல் என்றும் சொல்லலாம்.
5. சூழ்நிலையினால் உந்தப்பட்ட ஒரு உயிர் செய்யும் செய்கையே அதன் நடத்தைகளாகின்றன என்றால் அத்தகைய சூழ்நிலை மூன்று காரணிகளால் உருவாகின்றது.
 - 1) பொளதிக பொருட்களின் அமைவு (Physical surrounding)
 - 2) உயிர்வாழ் அமைவு (Living Organisms)
 - 3) காலநிலை காரணி (Climatic Factor)

இம் மூன்றையும் சரியானபடி அமைத்துவிட்டால் அவ்விடத்தில் இருக்கும் உயிர் நலமுடன் இருக்கும். நாளும் மனிதன் விண்ணையும், மண்ணையும் ஒருசேர ஆராய்ந்து அவற்றின் இயக்கத்தின் மூலத்தை சீர்தூக்கிப்

பார்த்து, அவற்றை நெறிப்படுத்தி ஒரு வாழிடம் இப்படித்தான் இருக்க வேண்டும் என உறுதிப்படுத்தி அதை சாஸ்திரமாக எழுதி வைத்துள்ளனர்.

வாஸ்து என்னும் விஞ்ஞானம்

பொதுவாக, கணக்கை அடிப்படையாகக் கொண்டதற்கு பெயர் தான் விஞ்ஞானம் என்றால், அந்த விஞ்ஞானத்தை அடிப்படையாக கொண்டதற்கு பெயர் தொழில்நுட்பமாகும். தொழில்நுட்பம் என்பது, ஒரு கலையில் கையாளப்பட வேண்டிய விதிமுறைகளாகும். அதாவது

கலை என்பது அந்த காலத்தில்

1. சங்கீதம் (இசை)
2. ஜோதிடம் (Astrology)
3. ஆயுர்வேதம் (மருத்துவம்)
4. யோக (சாஸ்திரம்)
5. வாஸ்து (சாஸ்திரம்)

மேற்கண்டதில் பயன்கலை என்பது கட்டடக் கலையாகும். நுண்கலைகளின் வரிசையிலே இசை, ஓவியம், சிற்பம் முதலானவை வருகின்றது.

மேற்கண்ட ஐந்து கலைகளுக்கும் தனித்தனியாக அவற்றிற்கே உரித்தான விதிமுறைகளை, உள்ளடக்கிய

சாஸ்திர நூல்கள் உள்ளன. அதில் குறிப்பிட்டுள்ள இலக்கணத்தின் படியே அக்கலைகளை கையாள்வதில் தான் அதன் சிறப்பு வெளிப்படும். குறிப்பாக நம் கட்டடக்கலைக்கு உரிய சாஸ்திர நூலாக வாஸ்து மற்றும் மனையடி சாஸ்திரம் உள்ளது.

கட்டுமானமும், கணிதமும்

கட்டடக்கலைக்கு

- 1) அடிப்படைக் கணிதம் (Arithmetic)
- 2) வடிவக் கணிதம் (Geometry) இன்றியமையாததாகும். அடிப்படைக் கணிதம் என்பது, எண்களின் அறிவியலாகும். வடிவங்களுக்கும் புள்ளிகளுக்கும் இடையிலான உறவுகளின் அறிவியலானது வடிவக் கணிதமாகும்.

வீடு முதலான அனைத்து கட்டிட வரைபடங்களுக்கும் பகுமுறை வடிவக் கணிதம் (Analytic Geometry) மிக முக்கிய தேவையாகும். கி.பி. 640ல் பிறந்த தாலஸ்ஸம் அவருடன் கல்வி கற்ற தோழர் கிரேக்கரான பிதாகரஸ்ஸம் வடிவியல் குறித்த நிறைய கண்டுபிடிப்புகளை வெளியிட்டனர். இன்றும் பிதாகரஸ் தேற்றம் இல்லாமல் எந்த கட்டுமானமும் தோற்றுவிக்க முடியாது இல்லையா, கிமு 287ல் வாழ்ந்த ஆர்சிமெடிஸின், இரண்டு தத்துவங்கள்

1. நெம்புகோல் தத்துவம், மற்றும் திருகு
2. ராட்டின பளுதாக்கி இயந்திரம்

இந்த இரண்டு தத்துவமும், கட்டடக் கலையில் பெரும் புரட்சியை ஏற்படுத்தியது என்றால் அது மிகையாகாது. கி.பி. (1642 - 1727) காலத்தில் வாழ்ந்த சர் ஐஸக் நியூட்டனின் புவியீர்ப்பு தத்துவம், இன்றும் கட்டுமானக் கலையில் உயிர்ப்புடன் உள்ளது.

இப்படி எண்ணற்ற கணிதவியலாளர்களின் கண்டுபிடிப்பால் கட்டடக் கலை இன்றும் முதன்மை இடத்தில் இருக்கிறது.

இன்றைக்கு அறிவியல் அறிஞர்களுக்கு இருக்கும் சமூக மரியாதையும், மதிப்பும் அன்றைக்கு இருந்ததில்லை. பாவம் அவர்கள் எத்தனை சிரமங்களுக்கு இடையில் தான் கொண்ட கொள்கையில் உறுதியாக இருந்தற்கு காரணம் அறிவியல் உண்மையை இந்த உலகம், உணர்ந்து கொள்ள வேண்டும் என்பதற்கே.

கணிதத்தைத் தாண்டி கட்டுமான வடிவமைப்பில் இருக்க வேண்டிய முக்கிய அம்சம்

மயனின், ஐந்திரம் என்கிற ஆதிமெய்யியல் நூல், இசை, சிற்பம், கட்டுமானம்... போன்ற பல நுட்பமான கலைகளுக்கு, இலக்கணம் வகுத்துள்ளது. கட்டடக் கலைக்கு “ஒரு கட்டுமானம் எத்தகைய கொள்கையின் அடிப்படையில் அது கட்டமைக்கப்பட உள்ளது என்பதை முதலில் தெள்ளத் தெளிவாக தெரிந்து கொண்டால், அக் கட்டுமானத்தை வடிவமைப்பது, கட்டமைப்பது எளிதாகும், மேலும்



கட்டிடத்தின் குணக் கொள்கை” முடிவு செய்த பின்பு, அதற்கு வழுசேர்க்கக் கூடிய கட்டுமானம் பொருள்களை தேர்ந்து எடுத்து முதல், கட்டுமான வடிவமைப்பு முறையை உருவாக்குவது வரை அனைத்தும் கவனத்தில் கொள்ள வேண்டியது அவசியமான ஒன்றாகும். அப்போதுதான் எதற்காக ஒரு கட்டுமானம் தோற்றுவிக்கப்பட்டதோ, அதன் சிறப்பை நெடுநாள் பறைசாற்றி நிலைத்து நின்ற நிலைவாட்டிக் கொண்டிருக்கும் என்கின்றது.

ஒரு கட்டிடத்தின் உயிரோட்டம் என்பது

1. உணர்தல்
2. உள்வாங்குதல்
3. நிலைத்தல், என்பதைப் பொருத்ததாகும்

உணர்தல் என்பது. ஒரு கட்டிடத்தினுள் நுழைந்ததும் அது எந்த குணக் கொள்கையில் கட்டப்பட்டதோ, அதை உணரும் வகையாகும். உள்வாங்குதல் என்பது ஒரு கட்டிடம், தனக்குள்ளும் தன்னை சுற்றியும் வருவனவற்றை உள்ளிழுத்தலாகும் நிலைத்தல் என்பது, மேற்கண்ட இரு கூறுகளுடன் ஒரு கட்டிடம் இயங்கிக் கொண்டு இருக்குமானால் அது நீண்ட நாள் நிலைத்து நிற்கும் என்பதாகும். மொத்தத்தில், இயற்கையின் இயல்பு மாறாது. மனிதரின் மாண்பும் கெடாதவாறு ஒரு ஒழுங்கு முறையுடன் (System) துல்லியமான விதிமுறைகளை கடைபிடித்து கட்டமைக்கப்பட்ட கட்டிடத்தின் உள்ளே இயக்கம் என்பதும் மிகத்துல்லியமாக இருக்கும் என்றார்கள். எதை மையப்படுத்தி வாஸ்து சாஸ்திரம் உருவாக்கப்பட்டுள்ளது.

வானியல் (Astronomy)

வானியல் அறிவு பெற்றவர்களே அந்த காலத்தில் இட வடிவமைப்பு கலையின் முன்னோடிகளாக திகழ்ந்துள்ளனர். நம்முடைய வானியல் அறிவுக் ‘காகோலசத்திரம்’ என்ற பெயரிலே அழைக்கப்படுகின்றது.

கிமு. 384 - 323 காலகட்டத்தில் வாழ்ந்த அறிஞர் அரிஸ்தோட்டஸ் (Aristotal) தான் முதன்முதலில் பருவங்கள் பற்றிய புத்தகத்தை Metrological என்ற தலைப்பில் வெளியிட்டார். அவரை இயற்கை அறிவியலின் தந்தை (Father of Natural Science) என்று அழைத்தனர். அவர்தான் யார் வானியலைப் பற்றி நன்கு அறிந்து கொள்கிறார்களோ அவர்தான் உண்மையான அறிவாளி என்றார். அதனால் தான் என்னமோ நம் திருவள்ளுவர்

சுவை, ஒளி, ஊறு ஓசை நாற்றம் இவ்வவைந்தின் வகை தெரிவான் கட்டே உலகு என்றார்

அதே கருத்தைத்தான் தொல்காப்பியரும் முன்வைக்கின்றார் நிலம், தீ, நீர்வளி விசும்போடு ஐந்தும் கலந்த மயக்கம் உலகம் என்று.

திருமூலர் ஒருபடி முன்னே போய் இப்படி கூறுகின்றார். “அண்டத்தில் உள்ளதே பிண்டத்திலும்” உள்ளது என்று மேற்கண்டவையில் இருந்து நாம் அறிந்து கொள்வது என்னவென்றால், பிரபஞ்சத்தை ஆட்கொண்டுள்ள பஞ்ச சக்தியும், மனிதனில் உள்ள பஞ்ச சக்தியும் ஒன்றே, அவற்றை சரியான படி எப்படி ஒரு வாழ்விடத்தில் ஒருங்கிணைப்பது என்ற விதிமுறைகளை உள்ளடக்கியதே, மையக் கருத்தாக கொண்ட புத்தகத்திற்கு பெயர்தான் “வாஸ்து” அல்லது “மனையடி சாஸ்திரம்” என்பதாகும்.

திகைக்குறிய அறிவியல் காரணங்கள்

ஒரு வீட்டின் வடகிழக்கு பகுதி ஆற்றலின் நுழைவு வாயிலாக கருதப்படுகிறது. சூரிய ஒளிக் கதிர்வீச்சின் அடிப்படையை மையமாகக் கொண்டே ஒரு வீட்டின் அமைப்பு பெரும்பாலும் நிர்மானிக்கப்படுகின்றது.

காலைச் சூரிய ஒளியில் பல்வேறு நன்மை பயக்கும் அம்சங்கள் நிறைந்து இருப்பதால் அதைத் தடுக்கும் எந்தவிதமான அமைப்பும் அவ்விடத்திலே இருக்கக்கூடாது என்றும் வடகிழக்கு பகுதியில் இருந்து வரும் சூரிய ஒளிக்கதிர் அங்குள்ள நீர் தொட்டியில் விழுந்து வீட்டினுள் செல்லும் போது அறையில் உள்ள வேண்டாத கிருமிகள் அழிக்கப்பட்டு, நல்லதொரு சூழலை ஏற்படுத்துமா.

ஒரு மனையானது, கோடையில் அதிக வெப்பமும் குளிர் காலத்தில் அதிக ஈரமும் இல்லாதபடி அமைக்க வேண்டும். ஓரிடத்தில் உயர்வு தாழ்வு, அவ்விடத்தில் காற்றின் போக்கை நிர்ணயிக்கின்றது. அது போல் ஒரு இடம் உயர்ந்து இருந்தால் அந்த இடத்தில் நீர்மை குறைந்து வறட்சி அதிகம் நிலவும் மற்றும் மின்கட்டத் தன்மை, காந்தத் தன்மை மற்றும் பாரம் சுமக்கும் தன்மை அதிகமாக இருக்கும் என்றனர்.

காலையில் சீரான வெப்பத்தைப் பெறுவதற்கும் மாலை இரவு வேளையில் குளிர்ந்தும் இருப்பதால், தென்கிழக்கு மூளையானது இயற்கையாகவே இங்கு



வைக்கப்படும் ஒரு பொருள் அங்கு நிலவும் இயல்பு தன்மையினால் எந்தவித மாற்றத்திற்கும் உட்படாது என்பதால் சமையல் அறை அவ்விடத்தில் வைத்தனர்.

தென்மேற்கு மூலையை ஏன் 90° சரியாக வைக்க வேண்டும் என்றால், அவ்விடத்தில் உள்ளும் புறமும், சீரான வெப்பம் இருக்கவும் அப்பகுதியை வந்து தாக்கும் காற்று வெப்பம் வெளிச்சம் முதலானவையை நேரடியாக கிரகிக்காமல் அதன் வீரியத்தை குறைத்து பயன்படுத்தவும், தென்மேற்கு மூலையை 90° சரியாக வைத்தனர். தென்மேற்கு மூலை வறண்டு இருப்பதால் நுண்ணுயிரிகளான பாக்டீரியா வைரஸ், புஞ்சைகள் வளரும் விகிதம் குறைகிறது. இதனால் நோய்களுக்குக் காரணமான நுண்ணுயிரிகள் இல்லாததால் அவ்விடத்தில் படுத்தால் இருக்கும் நோய் குணமாவதாக நம்பினர். மேலும் தென்மேற்கு மூலையில் உள்ள உலோகத் தன்மையால் காந்தப்புலம் வலுபெற்று இருப்பது மனித உடலில் உள்ள இரத்தத்தை தூண்டி உடலில் உள்ள கழிவுகளையும் எளிதாக வெளியேற்ற உதவுகிறது.

இது போன்ற எல்லா திசையிலும் அமையும் அறைகளுக்கு என்றே அறிவியல் விளக்கங்கள் உண்டு என்றால் அது மிகையாகாது. வாஸ்து சாஸ்திரம் என்பது பெரும்பாலும் இயற்கையில் உள்ள பஞ்ச சக்திகளின் நேர்மறை ஆற்றலை நேரடியாக பயன்படுத்தும், வகையிலும், எதிர்மறை ஆற்றலை அதன் வீரியத்தை குறைத்து பயன்படுத்தும் வகையிலும் விதிமுறையை உருவாக்கி, அதன்படி கட்டப்பட்ட கட்டத்தில் இருப்பதாக நம்பினார்கள்.

முதலில் மனிதனின் பாதுகாப்பை மையமாகக் கொண்டு உருவான வாஸ்து சாஸ்திரம் நாள் அடைவில் அவனது ஆரோக்கியத்தையும் உள்வாங்கி உருவாக்கப்பட்டதாகும். மொத்தத்தில் இது மனித குலத்திற்குத் தேவையான சூழலியலில் உள்ளிருக்கும் சிறப்பு கூறுகள் குறித்த தொடர் கண்காணிப்பின் மூலம் விளைந்த துல்லிய முடிவுகளைக் கொண்டதொரு அதிசயக் கட்டிடக் கலையே வாஸ்து சாஸ்திரமாகும்.

அகில இந்திய கட்டுநர் மாநாட்டின் ஏற்பாடுகள் குறித்த ஆய்வுக்கூட்டம்
15.12.2021 அன்று மாநாட்டு ஆலோசகரான திரு. B. சீனய்யா அவர்களும்,
முன்னாள் அகில இந்திய துணைத்தலைவத் திரு. ஸ்ரீராம் அவர்களும் கலந்து
கொண்டு ஆலோசனை வழங்கினர்.



15.12.2021 அன்று நடைபெற்ற 9வது செயற்குழு மற்றும் பொதுக்குழு கூட்ட
உபசரிப்பாளர்களுடன் மய்ய நிர்வாகிகள்.



21.12.2021 அன்று நமது மய்ய அரங்கில் நடைபெற்ற மாநில அளவிலான மய்யத்தலைவர் மற்றும் குழுத்தலைவர்கள் கூட்டமும் மாநில அளவிலான 2022ம் ஆண்டிற்கான நாள்காட்டி வெளியீடும் நடைபெற்றது.



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தென்னக மய்யத்தின் 2022ம் ஆண்டிற்கான நாள்காட்டி வெளியீடு



நாமக்கல் மய்யத்தின் 2022ம் ஆண்டிற்கான நாள்காட்டி வெளியீடு



திருச்சிராப்பள்ளி மய்யத்தின் 2022ம் ஆண்டிற்கான நாள்காட்டி வெளியீடு





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Introduction.

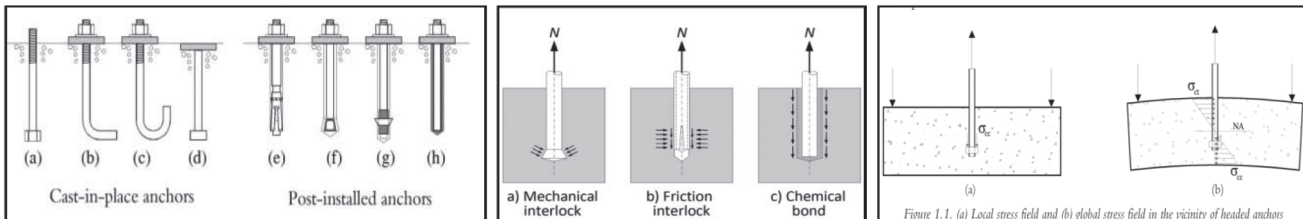
Anchorage in concrete construction, maintenance, repair and rehabilitation, seismic retrofitting and anchoring techniques can be used in all such works. Anchoring is required in concrete structures to join component or member to an existing member. Normally, it is done by breaking the substrate or existing surface, putting some concrete and steel members. In case, such an arrangement has been forgotten, it is broken and redone. In such a case, the anchoring technique can be used, and anchors are fixed.

Anchorage or fastenings in concrete construction is to connect a structural or non-structural component to a concrete structure. A fastener is an element typically made of steel or malleable iron that is installed in concrete by either casting it inside the concrete during construction or post-installed into a hardened concrete member and transmit the loads applied on a structural or non-structural component to the concrete member.

Anchoring can be done in hard concrete, loose concrete, stone masonry and brick masonry. Anchors are available having high and low strength as per requirements. Base or substrate should have sufficient strength to take loads. Anchoring may require base plates, adhesives as per site requirements. If anything is to be hung on any surface weak or strong, provided the surface can take the structural load, use anchoring techniques. One can switch over to finished work and then use the anchoring technique for fixing arrangements. Currently, many companies provide anchors and technical guidance.

Anchor Types and Load-Transfer Mechanisms.

There are many types of anchorage systems used for anchoring external loads to plain and reinforced concrete structures. Most of these systems can be classified as either cast-in-place anchors or post-installed anchors. Cast-in-place anchors are secured in the formwork before casting the concrete, whereas post-installed (drilled-in) anchors are installed in holes drilled into the hardened concrete. The figure shows some common cast-in-place and post-installed anchors, including headed anchors, (a) L-bolts. (b) J-bolts. (c) welded headed studs. (d) mechanical expansion anchors. (e) undercut anchors. (f, g) adhesive (bonded) anchors. (h) Detailed descriptions of these anchors and their functionalities can be found elsewhere.



Cast-in-place and post-installed anchors. Load transfer mechanism of fastener.

Stresses near the anchor.

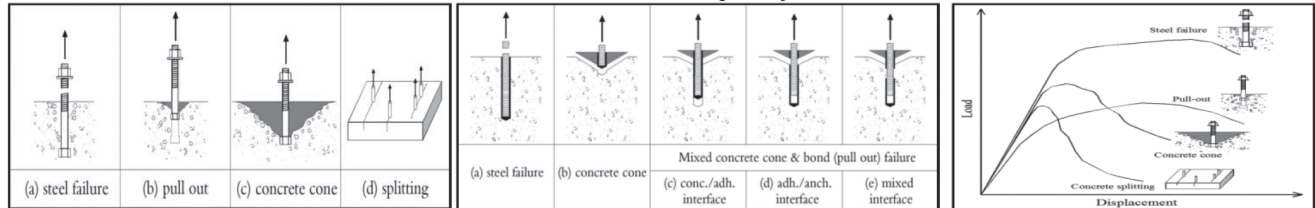
In general, fastening systems transfer and distribute applied tension loads to the concrete base material in various ways. The main load-transfer mechanisms for various fastening systems are typically identified as **mechanical interlock, frictional interlock and chemical bond**. Mechanical interlock is the key load-transfer mechanism for most cast-in-place anchors (e.g., headed studs, anchor bolts and anchor channels) and some post-installed anchors (e.g., undercut anchors). Mechanical interlock transfers external load using a bearing interlock between the anchor and the concrete base material. The frictional interlock and chemical bond are typical load transfer mechanisms for many post-installed anchors, including expansion anchors, bonded anchors and plastic anchors. Frictional interlock results from the generation of an expansion force, which give rise to a friction force between the anchor and the base material. Conversely, the chemical bond mechanism involves the transfer of the external load to the concrete base material via an adhesive bond.

Most commercially available fastening anchors utilize one or more of these mechanisms. The bearing reaction, friction force, and bond strength in all load-transfer mechanisms are in equilibrium with the

applied external load. The terms anchor, bolt, and fastener are used interchangeably in this work unless stated otherwise. The sections present the failure mechanisms of cast-in-place headed anchors and post-installed adhesive anchors under tension loads.

Failure Mechanisms of Anchors.

Cast-in-Place Headed Anchors. There are four possible failure modes for cast-in-place headed anchors loaded in tension are **steel failure, anchor pull-out, concrete cone breakout, and concrete splitting.** These failure modes are shown in the figure. Steel failure occurs if the steel in the anchor reaches its ultimate tensile strength while the concrete remains undamaged. This failure mode is rare but can happen if the anchor embedment depth is very deep. Pull-out failure occurs if the anchor is pulled out from the concrete base material. For headed anchors, this happens if the anchor head's bearing area is relatively small, in which case the bearing pressure under the anchor head may considerably exceed the concrete's compressive strength. As the anchor is pulled out, the concrete surrounding the anchor is locally crushed as shown in Figure. This failure mode can be avoided by enlarging the anchor head. Concrete cone breakout failure is characterized by the formation of a cone-shaped fracture surface in the concrete. The slope of the cone envelope concerning the surface of the concrete component varies from test to test but is 35° on average. The precise value of the slope depends on the state (compressive or tensile) of the stress fields in the base material at the anchorage zone. Tensile stress on the concrete acting perpendicular to the anchor load direction reduces the slope, whereas compressive stress increases it. For this failure mode, the ultimate tensile capacity of concrete is utilized.



Failure modes anchor under torsion. Failure modes anchor under tension. Load-displacement curves for an anchor in tension.

The failure mode is fairly common for various types of anchors, including headed anchors and adhesive anchors, in cases where the anchor's steel capacity is not exceeded. Finally, concrete splitting failure may occur during anchor installation (notably when using post-installed anchors such as expansion anchors, at the point when torque is applied to generate an expansion/friction force at the end of the anchor shank) or during anchor loading. This mechanism may also occur in headed anchors and undercut anchors that are pre-stressed during installation. Failure of this type may occur during anchor loading if the anchor is placed in a relatively thin concrete member or if it is positioned very close to a free edge in the concrete or if several anchors are installed in a line close to one another.

Two different types of fasteners are used to form the connections are **Cast-in systems and Post-installed systems.** The cast-in system is installed by securing it in a pre-defined location inside the formwork and cast into the concrete. To enable an efficient load transfer, the fastener is so-formed as to develop a mechanical interlock.

Post-installed Adhesive Anchors. Post-installed fasteners offer a versatile solution to the problem of anchoring in hard concrete, which typically consists of drilling a hole in the concrete member and installing the anchor. Typical load-transfer mechanisms utilized by post-installed anchors include mechanical interlock, bond, friction and in combination. Several failure modes are possible for post-installed adhesive anchors loaded in tension, notably steel failure, concrete cone breakout, and mixed concrete cone and bond/pullout failure; in the latter case, the bond failure may occur at the concrete/adhesive interface or the adhesive/anchor interface or both are shown in the figure.

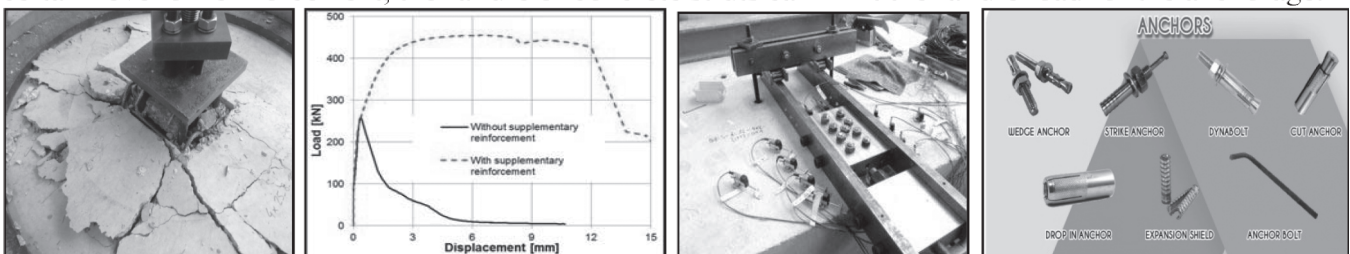
The failure mode of any given adhesive anchor is mainly determined by its embedment depth. Concrete cone breakout is the dominant failure mode when the embedment depth is very low (i.e., $h_{ef}=3 \cdot d$ to $5 \cdot d$ where d is the anchor shank diameter). This failure mode occurs if the bond strength of the adhesive is sufficiently large. The main failure mode for more deeply embedded adhesive anchors is combined concrete cone/bond failure. In this mixed-mode failure, a concrete cone with a depth of $h_c=2 \cdot d$ to $3 \cdot d$ forms at the top end of the anchor close to the concrete surface, and the bond fails over the length of the

anchor below the cone. For adhesive anchors with very deep embedment depths, the bond strength developed over the anchor's length may exceed the tensile strength of the steel in the anchor rod, leading to a steel failure. Idealized load-displacement curves for tension loaded headed anchors exhibiting various failure modes is shown in Figure. Among the failure modes, steel failure and pullout failure exhibit the greatest deformations at peak load and are therefore regarded as ductile failure modes. Conversely, concrete cone breakout failure and concrete splitting failure are characterized as brittle failure modes because their load-displacement curves show rapid declines after the peak load due to rapid and unstable concrete cracking.

Ductile Failure of Headed Anchors. It is rarely observed unless the anchor embedment depth is very large relative to the shaft diameter, which causes a steel failure, or the anchor head size is quite small relative to the shaft diameter, which results in a pullout failure. In general, anchorage ductility is highly desirable in applications where there are substantial life-safety concerns. However, a brittle failure mode covered by an appropriate safety factor is often acceptable. Whether the design is ductile or brittle, the failure load associated with the concrete must be predicted as accurately as possible to ensure a ductile failure or a sufficiently low probability of brittle failure. Therefore, the research presented in this thesis focused on failure modes associated with the concrete (i.e., failures caused by concrete cone breakout and concrete bending/splitting cracks).

Cast-in-Place Headed Anchors Under Tension Loads. A tensile loaded cast-in-place headed anchor that is placed in a large concrete component, far from concrete edges and adjacent anchors, often fails by pulling a cone-shaped concrete breakout body out of the concrete component. This failure mechanism governs the anchorage as long as the tensile strength of steel in the anchor is not exceeded and the concrete component is thick enough to prevent concrete bending/splitting cracking. Over the past few decades, several theoretical and experimental studies have been performed to characterize and explain the failure mechanisms of cast-in-place headed anchors under tension loads, and to determine their failure loads.

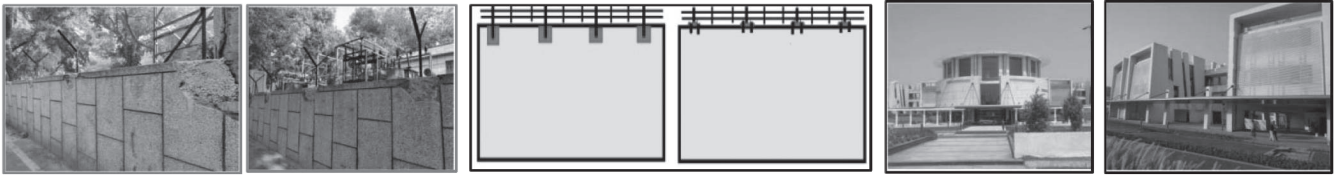
Anchorage with supplementary reinforcement under tension loading. The presence of supplementary reinforcement in a concrete member has a significant influence on the load-carrying capacity of anchorages subjected to tension loads. The anchorage in the concrete breakout body is achieved using the bond and bearing of a hook or bend. When the anchorage is loaded in tension, first the concrete cracks form the breakout body, and then the stirrups get activated. If the anchorage length of the stirrups within the concrete breakout body is small, they might reach bond failure before yielding resulting in lower resistance than potentially achievable. For stirrups with relatively large anchorage lengths, as in the case of closely spaced stirrups, resistance equal to the yield resistance of the stirrup can develop resulting in enhanced load and deformation capacity of the anchorage. However, beyond a certain level of reinforcement, the failure of concrete struts can limit the failure load for the anchorage.



Anchorage is subjected to tension. Supplementary Re-bars under seismic loading. Types of anchors.

The Necessity of Anchorage.

Fixing grills or fencing with angles on the boundary wall. During construction of the boundary wall, leave the brickwork/stonework at places where grills or frames of supports of fencing are to be fixed else break the brickwork or stonework. Generally, anchoring is done through MS angles by embedding it in concrete. If concrete is not properly cured, resulting in low strength and poor quality. Plastering is not proper, if shuttering of concreting is not properly adopted. Alternatively, complete the boundary wall first and then fix grills or angles without damaging or breaking brickwork through mechanical/chemical anchoring.



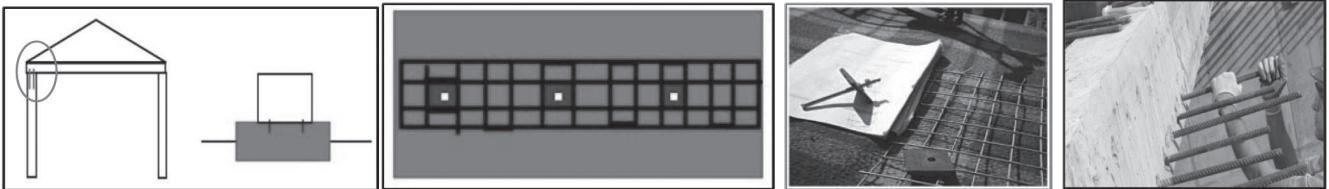
Fixing grills or fencing.

Fixing of canopies.

Fixing of canopies on existing columns/walls.

Vertical Extension of Buildings. Suppose no dowel bars have been left for vertical extension and some connectivity is required with the existing structure, Use anchoring techniques without damaging existing concrete.

Anchor Bolts: Suppose, forgot to cast anchor bolts in the foundation or beam for base plate fixing, use the chemical anchoring technique.



Vertical extension of buildings.

Anchor bolts fixing in a roof slab.

Fixing in to the wall.

Repair and Maintenance Works. In case of repair and maintenance, where anchoring is required, anchors can be easily used without breaking the substrate. When a pipe is to be embedded on the wall without breaking, anchoring can be an alternative.

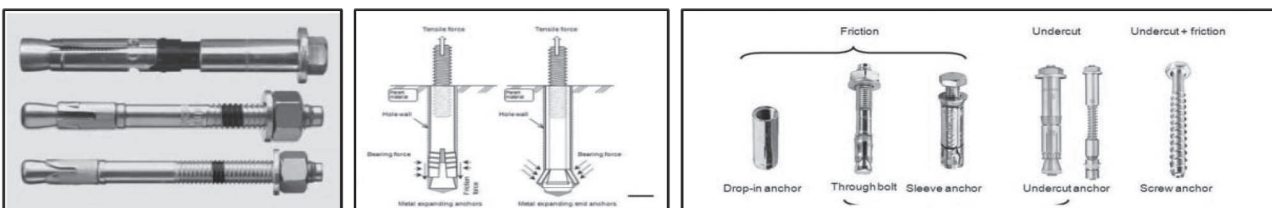
Rehabilitation. In rehabilitation works where extra reinforcement is to be added in the form of wire fabric/mesh, it can be anchored to existing structural members with chemical anchors.

Seismic Retrofitting. In seismic retrofitting of brick masonry structures, anchoring can be adopted.

Types of Anchors. Mechanical anchors, Chemical or Adhesive or Resin anchors.

Principles of Anchoring. Friction, Keying, Bonding, Combination of above. Mechanical anchors work on the principle of friction and keying, Chemical anchors work on the principle of bonding.

Mechanical Anchors. A mechanical anchorage relies mainly on friction in the interface between the tendon and the inner anchorage surface, so a compressive force perpendicular to the tendon has to be applied. Compression is normally obtained through a cone-shaped interface between a barrel and a wedge, or by clamping the tendon. Different types of mechanical anchorages are Expansion anchors, Torque expanding anchors, Displacement controlled anchors, Non-expansion anchors, Undercut anchors and Self-tapping screw anchors. Sleeve anchor, wedge anchor or drop-in anchor, is inserted in the concrete and expands upon tightening. This expansion causes the anchor to grip the wall of the hole and provide an extremely stronghold. Medium and light duty anchors are used in facades, curtain walls, ceilings, angles, tracks, channels, metallic sections, brackets, columns, air ducts, suspended ceilings, electric installations etc. In RCC. Insulation fasteners are used for insulating materials in concrete, bricks, and hollow brickwork. For light load applications, various anchors like frame anchors, impact anchors, cavity anchors, hook anchors, wedge anchors etc are also manufactured. Though mechanical anchor being a very popular and economical option are available, it has some limitations.



Mechanical anchors.

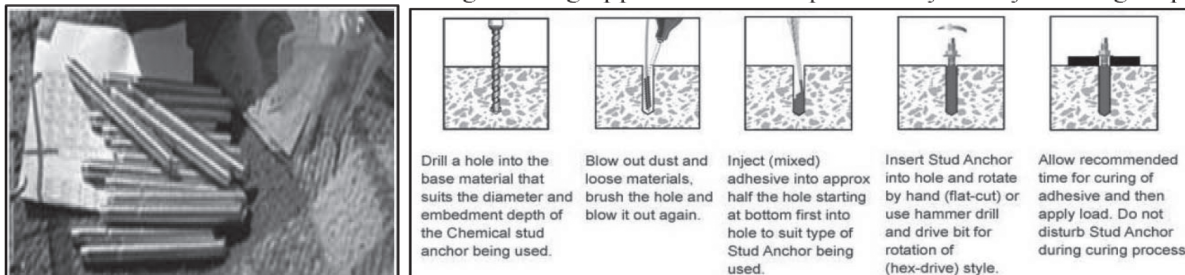
Metal expanding anchor.

Types of mechanical anchors.

Applications of Mechanical Anchors. Mechanical anchoring systems can be used for various applications for high to medium and light loadings. These are suitable for heavy loadings in steel construction, and dynamic loading from RCC columns and machines. For such loads, heavy-duty anchors are used which are suitable for both non-cracked and cracked concrete both. They have high

loading capacity and force-controlled expansion, and there is no rotation in the hole when the bolt is tightened.

Chemical Anchors: Chemical anchoring is a technique for fastening to concrete and similar substrates that provide more flexibility than mechanical anchoring. Chemical anchors are suitable for cracked and un-cracked concrete, brickwork, blockwork, lightweight concrete work, stonework etc. Thus chemical anchors can be used in most civil engineering applications except for very heavy loading requirements.



Chemical anchor.

Method of installing chemical anchors.

Chemical anchoring is generally done to provide starter bars for lintels, stiffener beams and columns or beams where a strong anchorage of bars is to be given. The epoxy adhesive anchoring system is used widely for anchoring purposes. Method of installing chemical anchors. Use drill bit size depending on the rebar going to be anchored to the structure. After drilling the hole, the hole should be cleaned with a hole cleaning pump to remove all dust inside. Then the resin should be injected with an injection anchor dispenser and pushed the bar inside while giving a torque to expel the excess resin out before hardening of the resin. The loading capacity can be increased by extending the embedment depth of the bar.

Chemical Fasteners. Chemical anchoring is a method of fastening in which a metal insert is bonded to concrete. Hilti uses two types of chemical anchors, Resin epoxy and Hybrid adhesives, that are designed to give the installer greater flexibility depending on the application. Chemical fixings create a secure, watertight bond. The chemical anchor is injected into the hole where it fills all irregularities to create an airtight seal with virtually no limit on depth. The molecular structure means an even distribution of stress too, so there's less risk of subsequent damage. Hilti Chemical use a wide range of chemical anchor fasteners, injectable mortars are designed for rebar applications and used on concrete and masonry.

Chemical Anchors Used in RCC Structures. There are many types of chemical anchors used in structures with different specifications, some of them is highlighted below.

(a) Polyester Chemical Anchor. Polyester chemical anchors are a common injection anchoring system in the market that is easy to use and apply widely. Two components are filled in various sizes of the dual injectable cartridge. It is a reactive resin used for the production of 2-component injection mortar. They are used for fixing steel dowels, staircases, handrails, building facades, sound barriers, pipelines, awnings, brackets, post-installation rebar connections. It can also be used for medium loading, threaded rod and rebar anchoring on dry concrete or un-cracked base.

(b) Unsaturated Polyester Chemical Anchor. An unsaturated polyester chemical anchor is a reactive resin used for the production of a 2-component injection mortar, whereby both unsaturated polyester resins dissolved in styrene (the original resin type) and styrene-free unsaturated polyester resins with styrene related monomers as a reactive solvent are used. Different formulations offer a versatile range of applications and benefits. In modern products, lower level resins are designed for use in masonry and uncracked concrete applications. Whilst at the top end, methacrylates and pure epoxies can be used in more stressful applications, such as cracked concrete, rebar and seismic conditions.

(c) Epoxy Adhesives Chemical Anchor. Chemical anchoring is used for structural works, mechanical and electrical services installations and also for metal works and carpentry works. In building construction sites, chemical anchoring plays a major role in fixing rebars, threaded rods and bolts as structural works, fixing for ducts in mechanical works and fixing handrails, supports, rails and windows and door frames as metal works.

(d) Epoxy Acrylate Chemical Anchor. Epoxy acrylate chemical anchor is a two-component resin of styrene free epoxy acrylate for use in concrete and masonry. It is designed as a fast curing, high strength resin fixing anchor for very high loads and critical fixings especially in corrosive environments or damp conditions. It is applicable for heavy, high-performance loads, rapid curing and low odour, based on styrene-free vinyl ester technology with high reactivity. It provides very good chemical resistance in highly aggressive environments or under humid conditions, even in underwater anchors. It is also used for fixations in solid construction supports or hollow materials, in walls, columns, facades, floors, etc.

(e) Pure Epoxy Chemical Anchor. Pure Epoxy Standard is a two-component 1:1 ratio pure epoxy bonded anchoring system for use in cracked and uncracked concrete under normal and seismic conditions. Developed for the most demanding structural applications and rebar connections, Chemical Anchor Pure Epoxy Standard guarantees a very high load-bearing capacity. It is designed especially for the Construction Industry. Few applications include anchoring of threaded rods, reinforcing bars or internally threaded rod sleeves into concrete (normal, porous & light) as well as solid masonry. It has a very high bond strength to concrete failure, thus making it suitable for very smooth climate conditions. It is ideally suited for high load applications, the resulting bond is stronger than the base material itself and as the system is based on the adhesion principle, no additional load stress is imparted to the base material as with expansion type anchors and are therefore ideal for close to edge fixing, reduced center and group anchoring and use in the concrete of unknown quality or low compressive strength.

(f) Hybrid Systems. The hybrid system includes a two-part chemical anchor that is designed to cure fast so you can load the fastening point earlier than you could with an epoxy anchor. It can be used anywhere requiring a threaded rod or rebar into concrete. Whether you require anchorage for structural steel connections such as steel beams or columns to concrete, structures such as racking, sound barriers or fencing, Highly reactive resins can be injected into the borehole before the insertion of the steel stud or bolt. The reacting mixture fills in all irregularities and makes the hole airtight with 100% adhesion, which creates extra load strength. It also reinforces the structure of the concrete walls as well as around the borehole, making it resistant to cracking. Finally, chemical anchoring allows the installer to make slight adjustments to the stud's alignment while the chemical mixture is still curing.

Steps to Fix a Chemical Resin Anchor. (a) Drill the hole(s). (b) Remove any loose material from the hole to get the best hold against a debris-free surface. (c) Using an applicator gun, inject the resin into the hole, mix properly before injecting it into the holes. For deeper holes use a resin nozzle extension tube on the end of a mixer nozzle. (d) Push the stud in the hole, twist it a few times to break any air bubbles up. It also pushes the resin into any voids in the hole. All the threads should have an even covering. (e) Add more resin if needed. Once all the studs are in, leave them alone depending on the brand of resin as well as the temperature.

Advantage Chemical Anchors. With chemical anchoring, a resin is injected into the hole before insertion of the stud. With this, the chemical naturally fills in all irregularities and therefore makes the hole airtight and waterproof, with 100% adhesion. And with mechanical anchors, each predetermined size, length (embedment) and diameter, has its own load capacity limits. Chemical anchors have virtually unlimited embedment depth, embed any length of the rod into the hole to increase the load capacity. Use a larger-diameter hole with a thicker rod to increase load capacity.

Conclusion.

Anchoring is an essential requirement in concrete members to join a component or member to an existing member. Any addition/ alteration, repair and maintenance of concrete members use mechanical/ chemical anchors according to the design and construction needs. Many companies are available to execute the anchoring works. However, engineers should have adequate knowledge of anchoring to adopt suitable methods and techniques to meet the site conditions and structure requirements.

“The human eye uses the eyebrow as an anchor point for the rest of the face.” ~ Anastasia Soare.

“Hope is the anchor of life.” ~ Lailah Gifty Akita.

அனுப்புநர்

திரு.பா.பொன்னையா, இ.ஆ.ப.,
நகராட்சி நிருவாக இயக்குநர்,
நகராட்சி நிருவாக இயக்குநரகம்,
சென்னை - 28 .

பெறுநர்

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ந.க.எண். 20782 /2021 / மாநா1

நாள் : 9.12.2021

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பொருள்: தமிழ்நாடு மாவட்ட நகராட்சிகள் சட்டம் 1920 பிரிவு 4-ன் படி ஆகிய
பேரூராட்சிகள் நகராட்சிகளாக அமைத்து உருவாக்கப்பட்டது - தகவல்
தெரிவித்தல் - தொடர்பாக

- பார்வை: 1. மாண்புமிகு நகராட்சி நிருவாகத் துறை அமைச்சர் அவர்களின்
நகராட்சி நிருவாகத்துறை மானியக்கோரிக்கை 2021-யின் போது
சட்டபேரவை அறிவிப்பு நாள்.24.08.2021.
2. அரசாணை (நிலை) எண்.94, நகராட்சி நிர்வாகம் மற்றும் குடிநீர்
வழங்கல் துறை, நாள் 01.11.2021
3. அரசாணை (நிலை) எண்.116, நகராட்சி நிர்வாகம் மற்றும் குடிநீர்
வழங்கல் துறை, நாள் 07.12.2021
4. அரசாணை (நிலை) எண்.117, நகராட்சி நிர்வாகம் மற்றும் குடிநீர்
வழங்கல் துறை, நாள் 07.12.2021
5. அரசாணை (நிலை) எண்.118, நகராட்சி நிர்வாகம் மற்றும் குடிநீர்
வழங்கல் துறை, நாள் 07.12.2021

பார்வை 1-ல் குறிப்பிட்டுள்ள தமிழ்நாடு 16-வது சட்டமன்ற பேரவைக் கூட்டத் தொடரில்
மாண்புமிகு நகராட்சி நிருவாகத் துறை அமைச்சர் அவர்களால் 24.08.2021 அன்று நகராட்சி
நிருவாகம் மற்றும் குடிநீர் வழங்கல் துறையின் மானிய கோரிக்கையின் போது “பள்ளப்படி,
திட்டக்குடி, மாங்காடு, குன்றத்தூர், நந்திவரம், கூடுவாஞ்சேரி, பொன்னேரி, திருநின்றவூர்,
சோளிங்கர், இடங்கனாச்சாலை, தாராமங்கலம், திருமுருகன்பூண்டி, கூடலூர், காரமடை,
கருமத்தம்பட்டி, மதுக்கரை, வடலூர், கோட்டக்குப்பம், திருக்கோவிலூர், உளுந்தூர்பேட்டை,
அதிராம்பட்டினம், மானாமதுரை, சுரண்டை, களக்காடு, திருச்செந்தூர், கொல்லன்கோடு, முசிறி,
இலால்குடி ஆகிய பேரூராட்சிகள், அதன் அருகே வளர்ச்சியடைந்துள்ள ஊராட்சிகளை
ஒன்றிணைத்து நகராட்சிகளாக மாற்றப்படும். மேலும், புஞ்சை புகளூர் மற்றும் TNPL புகளூர் ஆகிய
2 பேரூராட்சிகளையும் இணைத்து புகளூர் நகராட்சியாகத் தரம் உயர்த்தப்படும்” என
அறிவிக்கப்பட்டது.

அதன்பேரில், பார்வை 2-ல் காணும் அரசாணையில் சுரண்டை, களக்காடு,
திருக்கோவிலூர், உளுந்தூர்பேட்டை, குன்றத்தூர், மாங்காடு, கோட்டக்குப்பம், சோளிங்கர் மற்றும்
நந்திவரம்-கூடுவாஞ்சேரி ஆகிய 9 பேரூராட்சிகளை நகராட்சிகளாக அறிவித்து அரசாணை
வெளியிடப்பட்டது.

அதனைத் தொடர்ந்து பார்வை 3-ல் காணும் அரசாணையில் பொன்னேரி, திருநின்றவூர்,
திட்டக்குடி, வடலூர், அதிராம்பட்டினம், திருச்செந்தூர், கருமத்தம்பட்டி, காரமடை, கூடலூர் மற்றும்
மதுக்கரை, பள்ளப்படி மற்றும் திருமுருகன்பூண்டி ஆகிய 12 பேரூராட்சிகளை நகராட்சிகளாக
அறிவித்து அரசாணை வெளியிடப்பட்டது.



பார்வை 4-ல் காணும் அரசாணையில் மானாமதுரை, முசிறி, இலால்குடி மற்றும் தாரமங்கலம், இடங்கணசாலை ஆகிய 5 பேரூராட்சிகளை நகராட்சிகளாக அறிவித்து அரசாணை வெளியிடப்பட்டது.

பார்வை 5-ல் காணும் அரசாணையில் கொல்லங்கோடு-ஏழுதேசம் ஆகிய பேரூராட்சிகளை இணைத்து கொல்லங்கோடு நகராட்சியாகவும், புஞ்சை புகளூர் மற்றும் காகித ஆலை புகளூர் பேரூராட்சிகளை இணைத்து புகளூர் நகராட்சியாகவும் அறிவித்து அரசாணை வெளியிடப்பட்டது.

மேற்படி பேரூராட்சிகள் நகராட்சிகளாக தரம் உயர்த்தப்பட்டதைத் தொடர்ந்து கீழ்க்கண்ட அட்டவணையில் குறிப்பிடப்பட்டுள்ளவாறு நகராட்சி நிர்வாக மண்டல இயக்குநரக அலுவலகக் கட்டுப்பாட்டின் கீழ் செயல்படும் என தெரிவிக்கப்படுகிறது.

பேரூராட்சிகளிலிருந்து தரம் உயர்த்தப்பட்ட நகராட்சிகள், மாவட்டம் மற்றும் மண்டல இயக்குநர் அலுவலகம் விவரங்கள்

வ.எண்	மாவட்டம்	நகராட்சிகளாகத் தரம் உயர்த்தப்பட்ட பேரூராட்சிகள்	நகராட்சி நிர்வாக மண்டலம்
1	காஞ்சிபுரம்	மாங்காடு	செங்கல்பட்டு
2		குன்றத்தூர்	
3	திருவள்ளூர்	பொன்னேரி	
4		திருநின்றவூர்	
5	கடலூர்	திட்டக்குடி	
6		வடலூர்	
7	செங்கல்பட்டு	நந்திவரம்-கூடுவாஞ்சேரி	
8	இராணிப்பேட்டை	சோளிங்கர்	வேலூர்
9	விழுப்புரம்	கோட்டக்குப்பம்	
10	கள்ளக்குறிச்சி	உளுந்தூர்பேட்டை	
11		திருக்கோவிலுர்	திருநெல்வேலி
12	தென்காசி	சுரண்டை	
13	திருநெல்வேலி	களக்காடு	
14	தூத்துக்குடி	திருச்செந்தூர்	
15	கன்னியாகுமரி	கொல்லங்கோடு (ஏழுதேசம் இணைத்து)	தஞ்சாவூர்
16	தஞ்சாவூர்	அதிராம்பட்டினம்	
17	திருச்சிராப்பள்ளி	முசிறி	திருப்பூர்
18		லால்குடி	
19	கோயம்புத்தூர்	கருமத்தம்பட்டி	
20		காரமடை	திருப்பூர்
21		கூடலூர்	

22		மதுக்கரை	
23	திருப்பூர்	திருமுருகன்பூண்டி	
24	சிவகங்கை	மானாமதுரை	மதுரை
25	சேலம்	தாரமங்கலம்	சேலம்
26		இடங்கணசாலை	
27	கரூர்	பள்ளப்பட்டி	
28		புகளூர் (பஞ்சை புகளூர் மற்றும் காகித ஆலை புகளூர் இணைத்து)	

எனவே, இரண்டாம் நிலை நகராட்சிகளாகத் தரம் உயர்த்தப்பட்டுள்ள 28 நகராட்சிகளும் மேலே பட்டியலில் குறிப்பிடப்பட்டுள்ளவாறு சம்மந்தப்பட்ட நகராட்சி நிர்வாக மண்டல இயக்குநர்கள் கட்டுப்பாட்டில் இயங்கும் எனத் தெரிவித்துக் கொள்ளப்படுகிறது.

நகராட்சி நிர்வாக இயக்குநர்



ABSTRACT

Urban Development - Constitution of Urban Development Authority for Madurai as an Adhoc body - Orders Issued.

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HOUSING AND URBAN DEVELOPMENT [UD4(1)] DEPARTMENT

G.O.(Ms).No.145

Dated: 16.12.2021

பிலவ வருடம், மார்கழி திங்கள் 01,
திருவள்ளூர் ஆண்டு 2052

Read:

From the Director of Town and Country Planning
Roc.No.18237/2021(2)-T, dated.17.11.2021.

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ORDER:-

The following Announcement was made on 13.08.2021 in the
Revised Budget Speech 2021 - 2022:-

"New Urban Development Authorities will be formed for Madurai, the Coimbatore – Tiruppur Area, and for the fast growing Hosur area".

2. In the letter read above, the Director of Town and Country Planning has furnished a proposal for constitution of Urban Development Authority for Madurai citing the following:-

- i. Madurai city is the third largest city in Tamil Nadu. It spreads over an extent of 147.97 sq.km. It has a long tradition of culture and education. It has facilities such as international airport, railways, network of national highways with large trade and commercial activities. It is blessed with water reservoirs and the celebrated Vaigai river passes through the city as source of water supply and stabilised underground water table. In the last three decades, the city has been witnessing enormous growth in population thereby stressing the existing infrastructure amenities.
- ii. The city of Madurai has been witnessing enormous growth in population for the past three decades. This growth in population has caused an uneven development in the city and its contiguous areas and has resulted in straining the existing infrastructure such as roads, health and educational facilities, water supply and sanitation.
- iii. The Master Plan for Madurai which is under preparation will spell out a strategy for future development. In essence it will be a perspective plan which has anticipated the requirements of the Madurai planning area in all sectors of development.
- iv. The magnitude of the tasks required and the action contemplated in this area unlikely that the current administrative set up in the area can co-ordinate the work of implementing agencies to plan and share the future development of the Madurai Urban Area in an orderly manner. Moreover, today, developmental activities in Urban Areas are being implemented by a number of agencies without adequate co-ordination, divorced from the perspective of an overarching plan. It has, therefore become imperative to set up a separate Development Authority to ensure an orderly development in this area.

- v. The Tamil Nadu Town and Country Planning Act, 1971, currently does not provide for the constitution and functioning of such authorities. Therefore, action has been initiated for making necessary amendments in the above said Act and it may take some time for notification of the said, which is expected to take some time.
- vi. Meanwhile, during the initial stage of formation of the Authority, several preparatory activities need to be undertaken. To take up these activities, it has been proposed to initially constitute the Urban Development Authority for Madurai as an adhoc body as was done in the case of Chennai Metropolitan Development Authority earlier in 1972, pending amendment to Tamil Nadu Town and Country Planning Act, 1971. Besides, an Advisory Council and a Planning Cell were also constituted to advise and assist the Adhoc body in discharging its functions. The exact composition of the Urban Development Authority shall be finalized at the time of enacting amendments to the Tamil Nadu Town and Country Planning Act, 1971.

The Composition and functions of the Madurai Urban Development Authority, Advisory Council and the Planning Cell are detailed below:-

A. Madurai Urban Development Authority

Composition

- i. Principal Secretary, Housing & Urban Development Department - as Chairman.
- ii. District Collector - as Vice Chairman.
- iii. Head of Departments of Finance, Transport, Industries, Public Works, Municipal Administration and Water Supply, Rural Development and Panchayat Raj.
- iv. Director of Town and Country Planning - Ex-Officio.
- v. Commissioner, Madurai Corporation - Ex-Officio.
- vi. Managing Director, Tamil Nadu Housing Board - Ex-Officio.
- vii. Managing Director, Tamil Nadu Urban Habitat Development Board - Ex-Officio.
- viii. Managing Director, Tamil Nadu Water Supply and Drainage Board - Ex-Officio.

- ix. Two persons to be appointed by the Government of Tamilnadu in fields of Housing, Trade and Industry.
- x. One person from Academic Institution of repute involved in planning.
- xi. A fulltime Member Secretary appointed by Government of Tamilnadu.

Functions

- a) To prepare development plans for the area or for part of the area under its jurisdiction and to enforce and implement these plans. Such plans may provide for all or any of the matters that may be provided in the Regional Plan or Master Plan or Detailed Development Plan contemplated under the New Town and Country Planning Legislation.
- b) The formulation, subject to approval of Government, of any other plan or project for the development of the Madurai Urban Area or such part thereof, as may deemed necessary.
- c) To co-ordinate the execution of plans approved by the State Government for the development of any area within the Madurai Urban Area.
- d) To supervise the execution of any project for/within Madurai Urban Area, as may be entrusted to it by Government.
- e) To finance and execute any project in any plan for the development of Madurai Urban Area or any part thereof.
- f) To perform such other functions as may be prescribed or assigned by the Government.

B. Advisory Council

Composition

- i. Secretary, Department of Micro, Small and Medium Enterprises – Ex-Officio.
- ii. Director of Industries and Commerce - Ex-Officio.
- iii. Commissioner of Police, Madurai City – Ex - Officio.
- iv. Chief Engineer, Public Works Department - Ex-Officio.
- v. Chief Engineer, Highways and Rural Works - Ex-Officio.
- vi. Director of Health Services and Family Planning - Ex-Officio.
- vii. Director of Collegiate Education-Ex-Officio.
- viii. Additional Director/Joint Director of Town and Country Planning, at Head Quarters - Ex-Officio.
- ix. Three representatives of the Union Government of whom one shall be from the Railways.

- x. Two elected representatives of the Corporation of Madurai.
- xi. Three elected representatives of the local bodies in the area other than the Corporation of Madurai.
- xii. Four non officials to be nominated by the State Government of whom one shall be Engineer and one an Economist of repute.
- xiii. One person with knowledge of Architecture and Town Planning to be nominated by State Government preferably from among those who are members of the Institute of Town Planners, India.
- xiv. Two representatives representing the interest of Commerce and Industry.

Functions

To advise the Madurai Urban Development Authority in preparation and implementation of development plans.

C. Planning Cell

Composition

- (i) Senior Town Planner and supporting staff.
- (ii) The Engineer and adequate supporting staff.

Functions

To assist the Member Secretary of the Madurai Urban Development Authority in his office to discharge his duties.

3. The Director of Town and Country Planning has therefore requested to consider the above proposal for constitution of Urban Development Authority for Madurai.

4. After careful examination, the Government have decided to accept the proposal of the Director of Town and Country Planning and accordingly constitute, hereby the Madurai Urban Development Authority as an Adhoc body, an Advisory Council for the purpose of advising the Madurai Urban Development Authority on the formulation and co-ordination of plans for the development of Madurai Planning Area, and a Planning Cell for initiating specific plans and projects for Urban Development as detailed in para 2 above.

5. The Director of Town and Country Planning is directed to pursue further follow up action.

(BY ORDER OF THE GOVERNOR)

**DR.V.IRAI ANBU
CHIEF SECRETARY TO GOVERNMENT**

SECTION OFFICER



ABSTRACT

Public Works Department – Revision in the monetary limit for categories of Registration of Contractors - Registration of Contractors in Public Works Department at concerned Regional Chief Engineers Office, Public Works Department and Renewal of Live Certificate – Orders – Issued.

Public Works (G2) Department

G.O.(Ms) No.195

Dated: 14.12.2021

பிலவ – கார்த்திகை-28
திருவள்ளூர் ஆண்டு 2052

Read:

1. G.O.(Ms)No.1789, Public Works (G2) Department, dated 29.12.1992.
2. G.O.(Ms)No.222, Public Works (G2) Department, dated 08.04.1999.
3. G.O. (Ms)No.36, Public Works (D2) Department, dated 11.02.2008.
4. G.O.(Ms)No.221, Public Works (G2) Department, dated 16.08.2018
5. G.O.(Ms)No.267, Public (Special-B) Department, dated 07.05.2021.
6. G.O.(Ms)No.100, Public Works (D2) Department, dated 23.06.2021.
7. From the Engineer in Chief (Buildings) and Chief Engineer (Buildings), Chennai Region, Public Works Department, Chennai Letter No.HDO(A)/32710/2014-6, dated.05.07.2021.

ORDER:

The Hon'ble Minister (Public Works) during the discussion while moving the Public Works Demand No.39 on 27.08.2021 made the following Announcement on the floor of the Legislative Assembly:-

ஒப்பந்தக்காரர் பதிவு ஆண்டுக்கு ஒரு முறை புதுப்பித்தல் என்பதிலிருந்து மூன்றாண்டுகளுக்கு ஒரு முறை என மாற்றப்படும். புதிய ஒப்பந்தக்காரர் பதிவு மற்றும் புதிப்பித்தல், மண்டல தலைமைப் பொறியாளர்கள் அளவிலேயே இனி மேற்கொள்ளப்படும்

2. In the letter seventh read above, the Engineer-in-Chief (Buildings) and Chief Engineer (Buildings), Chennai Region, Public Works Department in his letter dated 05.07.2021 has furnished the following details:-

- (i) Based on the rules for the Registration of Contractors for undertaking Government works in Appendix XXIII of Tamil Nadu Public Works Department Code, the Government have issued orders in G.O.(Ms) No.1789, Public Works (G2) Department, dated 29.12.1992 with regard to the procedures for Registration of Contractors in Public Works Department / Highways Department.

- (ii) The recommendations of the Report of the High Level Committee under the Chairmanship of Justice Thiru. G. Ramanujam constituted to examine and recommend procedural reforms and other measures for eliminating and preventing corruption and administration have been examined by Government and among other things, in the Government Order second read above the following orders were issued regarding Registration of Contractors:-

Sl. No.	Recommendations of the High Level Committee	Orders of Government
1	The existing categorisation of contractors into five classes with reference to the value of works they are considered competent to execute may continue	The monetary limit for categories of Registration of Contractors shall be revised as follows: Class-I : Above Rs.75 lakh Class-II : Upto Rs.75 lakh Class-III : Upto Rs.30 lakhs Class-IV : Upto Rs.15 lakh Class-V : Rs.6 lakh
2	Registration of contractors shall be done at two levels. One at the level of Executive Engineer in regard to categories IV and V and the other at the level of Superintending Engineer in regard to categories I, II and III. Registration at each level shall be decided by Committee of Officers.	Registration of Contractors of Class V only shall continue to be done by the Executive Engineers. The other classes of contractors shall be registered by the Superintending Engineers. There is no need of a Committee for taking decision on registration of contractors.

3. In the Government Order third read above, among others, orders have been issued for the functioning of Water Resources Department and Public Works Department as two separate departments.

4. In the Government Order fourth read above, the following orders have been issued regarding registration of contractors:-

- (i) Registration of all the contractors in all Classes I to V i.e. Division Level, Circle Level and State Level shall be done as a single window system by the Engineer-in-Chief, Water Resources Department and Chief Engineer (General), Public Works Department, Chennai-5.
- (ii) The applications received in the office of the Engineer-in-Chief, Water Resources Department and Chief Engineer (General), Public Works Department, Chennai-5 from the contractors with payment

of prescribed application fee shall be sent to the respective Division / Circle in which territory the contractor intending to register, for thorough scrutiny of the applications as per the rules / orders in force for ensuring the eligibility of the contractors for registration and for verifying the bonafide of the evidences produced by the applicants. After that, the applications may be sent back to the Engineer-in-Chief, Water Resources Department and Chief Engineer (General), Public Works Department, Chennai-5 with recommendation of the Superintending Engineer / Executive Engineer concerned.

- (iii) Hereafter, the application for the renewal of contract registration for every year shall be submitted to the office of the Engineer-in-Chief, Water Resources Department and Chief Engineer (General), Public Works Department, Chennai-5, before the expiry date of renewal, so as to keep the contractor registration alive. The contractor registration live certificate will be valid only for a period of one year from the date of issue of renewal order.
- (iv) All the records / registers along with relevant files, in original, in respect of the existing registered contractors in all the Circles / Divisions shall be handed over to the Engineer-in-Chief, Water Resources Department and Chief Engineer (General), Public Works Department, Chennai immediately.

5. In the Government Order fifth read above, among others, the Government have issued the following orders:-

“The subject relating to Water Resources Department has been allocated to the Hon’ble Minister for Water Resources and the subject relating to Public Works Department has been allocated to the Hon’ble Minister for Public Works”.

6. In the Government Order sixth read above orders have been issued for formation of a separate GENERAL UNIT in the office of the Engineer-in-Chief (Buildings) and Chief Engineer (Buildings), Chennai Region, Public Works Department, Chepauk, Chennai to deal with all establishment matters of Public Works Department viz., Recruitment, Preparation of Estimate of vacancy, Panel proposals, Promotions, Transfer and Postings, Pay fixation, Disciplinary matters, Retirement, Pension proposals, as per the provisions of existing Statutory Acts and Rules.

7. In his letter seventh read above, the Engineer in Chief (Buildings) and Chief Engineer (Buildings), Chennai Region, Public Works Department has further stated that during the Meeting held by the Hon’ble Minister for Public Works Department with the PWD Contractors and Officials of Public Works Department on 19.06.2021, the following decisions were taken:-

- (i) Recommended for 3 years for the renewal of Live Certificate instead of 1 year.

- (ii) New Registration of Contractors may be registered and Renewal of Contractors Live Certificate may be issued at concerned Regional Chief Engineer (Buildings) of Public Works Department.

8. The Engineer in Chief (Buildings) and Chief Engineer (Buildings), Chennai Region, Public Works Department has requested orders of the Government on the following proposals:-

- (1) The New Registration of Contractors in Public Works Department may be registered at concerned Regional Chief Engineer (Buildings) of Public Works Department.
- (2) The contractors who are getting registered in Public Works Department may renew their Live Certificate at concerned Regional Chief Engineer (Buildings) of Public Works Department.
- (3) The validity period of Renewal of Contractor's Live Certificate for every year, as ordered in the Government in G.O. (Ms) No.221, Public Works (G2) Department, dated 16.08.2018, may be modified, as validity period of renewal of Contractors Live Certificate for 3 years.

9. The Government have also decided to revise the Class slabs for the contractors taking into consideration the escalation cost over the years and low value procurement and delegation of powers with respect to Tender Award Committee, since the Class slabs fixed vide Government Order second read above are very low.

- (iv) The validity period of Renewal of contractors live certificates shall be 3 (three) years.
- (v) The Registration shall be Maintained in an electronic ledger/ format and visible from Chennai Headquarter at all times.

10. This order issues with the concurrence of Finance Department vide its U.O. No. 55244/PW-I/2021, dated 13-12-2021.

(BY ORDER OF THE GOVERNOR)

**SANDEEP SAXENA
ADDITIONAL CHIEF SECRETARY
TO GOVERNMENT (FAC)**

SECTION OFFICER



SOUTHERN CENTRE ACTIVITIES

02.12.2021 - 03.12.2021

தலைமையகத்தின் வருடாந்திர கூட்டமும் முன்றாவது பொதுக்குழு மற்றும் மேலாண்மைக்குழு கூட்டமும் டிசம்பர் 2 மற்றும் 3ந் தேதியில் நடைபெற்றது. ஜெய்பூரில் நடைபெற்றது. தென்னக மய்யத்தின் சார்பில் 24 உறுப்பினர்கள் கலந்து கொண்டு சிறப்பித்தனர். அக்கூட்டத்தில் அகில இந்திய அளவில் 202021ம் ஆண்டிற்கான "OVER ALL BEST CENTRE" விருது நமது மய்யத்திற்கும் "BEST PUBLICATION AWARD" நமது சதான் பில்டர் மாத இதழுக்கும் அறிவிக்கப்பட்டது.

14.12.2021

கட்டுமானத் தொழிலாளர் நலவாரியத்தின் சார்பில் நடைபெற்ற கூட்டத்தில் மாநிலத்தலைவர் திரு. R. சிவக்குமார் அவர்களும், மய்யத்தலைவர் திரு. L. ஸாந்தகுமார் அவர்களும் கலந்து கொண்டனர்.

15.12.2021

30வது அகில இந்திய கட்டுநர் மாநாட்டு ஏற்பாடு குறித்து நமது மய்ய அலுவலகத்தில் ஆலோசனைக்கூட்டம் நடத்தப்பட்டது. இதில் முன்னாள் அகில இந்தியத்தலைவர் திரு. B. சீனய்யா அவர்களும், முன்னாள் அகில இந்தியத் துணைத்தலைவர் திரு. ஸ்ரீராம் அவர்களும் கலந்து கொண்டு ஆலோசனைகள் வழங்கினர். இதில் சேவாரத்னா பீஷ்மா திரு. R. இராதாகிருட்டினன், உடனடி முன்னாள் அகில இந்தியத்தலைவர் திரு. Mu. மோகன், முன்னாள் காப்பாளர் திரு. J.R. சேதுராமலிங்கம் அவர்கள், அகில இந்திய துணைத்தலைவர் திரு. S. அய்யநாதன், அவர்கள், மாநிலத்தலைவர் திரு. R. சிவக்குமார் அவர்கள், தென்மண்டல செயலாளர் திரு. K. வெங்கடேசன் அவர்கள், மய்யத்தலைவர் திரு. L. சாந்தகுமார் அவர்கள், துணைத்தலைவர் திரு. R.R. ஸ்ரீதர், மய்யச்செயலாளர் திரு. A.N. பாலாஜி அவர்களும் கலந்து கொண்டனர்.

அன்று மாலை நடைபெற்ற செயற்குழு மற்றும் பொதுக்குழு கூட்டத்தில் தென்னக மய்யத்தின் 2022ம் ஆண்டிற்கான நாட்குறிப்பினை அகில இந்திய துணைத்தலைவர் திரு. ஷி. அய்யநாதன் அவர்கள் வெளியிட பீஷ்மா திரு. ஸி. இராதாகிருட்டினன் அவர்கள் பெற்றுக்கொண்டார்.

16.12.2021

அன்று மாண்புமிகு தமிழக முதல்வர் திரு. M.K. ஸ்டாலின் அவர்களை நேரில் சந்தித்து கட்டிட வரைவு பட அனுமதி காலத்தினை 5 ஆண்டிலிருந்து 8 ஆண்டுகளாக உயர்த்தியமைக்காவும், மனைப்பிரிவு மற்றும் மனைகளுக்கு 60 நாட்களுக்குள் அனுமதி வழங்கத்தக்க வகையில் ஒற்றை சாளர முறை விரைவாக அறிமுகப்படுத்தப்படும் என்று அறிவித்தமைக்காவும் நன்றி தெரிவிக்கப்பட்டது.

21.12.2021

அன்று நமது மய்ய அலுவலகத்தில் உள்ள பத்மபூஷன் A. ராமகிருஷ்ணா கூட்ட அரங்கில் மாநில அளவிலான மய்யத்தலைவர்கள் மற்றும் குழுத்தலைவர்கள் கூட்டம் நமது மய்யத்தின் உபசரிப்பில் வெகு விமரிசையாக நடைபெற்றது. இக்கூட்டத்தில் 2022 ஆண்டிற்கான மாநில நாட்குறிப்பினை அகில இந்திய துணைத்தலைவர் திரு. S. அய்யநாதன் அவர்கள் வெளியிட பீஷ்மா திரு. R. இராதாகிருட்டினன் அவர்கள் பெற்றுக்கொண்டார்.

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