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Contents

ஆசிரியர் மடல்	4
மய்யத் தலைவர் மடல்	5
பவள விழா நினைவலைகள்	6
Successful Waterproofing of Flats and Slopped Roofs	8
Roman Cement Concrete	10
Recycling Plant	11
Government Pushing GST to meet April, 2016 Deadline	13
Regulation for Group Developments	15
The National Small Industries Corporation Ltd (A Government of India Enterprise)	16
Specifications for Civil Engineering Works	22
Damage Patterns and Failure Mechanisms of Bridge Pile Foundation Under Earthquake	29
Southern Centre Activities	33
Dicoloimer	

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ஆசீரீயர் மடல்



வணக்கம்

புத்தர் தமது சீடர் ஆனந்தாவுடன் பிரயாணம் செய்து கொண்டிருந்தார்.

ஒரு கிராமத்தின் வழியே செல்லும்போது அந்த ஊர் மக்கள் புத்தருக்கு மலர் தூவி சிறப்பான வரவேற்பு அளித்து அவரை வணங்கி வழிபட்டனர். அங்கே அவர்களுடன சிறிது காலம் தங்கியிருக்க வேண்டினர். புத்தர் அமைதியுடன் தன் வழியில் தொடர்ந்து பயனப்பட்டார். கிராம மக்கள் புத்தருக்கு அளித்த மரியாதைகளை நினைத்து பெருமையுடன் சீடர் ஆனந்தா புத்தரை பின் தொடர்ந்தார். புத்தர் தனது திருவோட்டை சீடர் ஆனந்தாவிடம் தந்துவிட்டு மேலும் நடந்து சென்றார்.

மாலையில் வழியில் அடுத்த கிராமத்துக்கு சென்றனர். புத்தர் எப்பொழுதும் அடுத்த வேளை உணவை பிச்சை எடுத்து உண்பது வழக்கம். அதன்படி அவரது திருவோட்டை தனது சீடரிடமிருந்து கேட்டார். அப்போது அவர் " ஆனந்தா இந்த திருவோடு யாருடையது " என்று கேட்டார். ஆனந்தா " குருவே அது உங்களுடையது " என்றார்.

ஒரு வீட்டின் முன் பிச்சை கேட்டார். அந்த வீட்டிலிருந்து வந்த பெண்மணி இவர்களை கண்டதும் எரிச்சலடைந்து "உங்களுக்கு கை கால் நன்றாக தானே இருக்கிறது உழைத்து சாப்பிடுவதை விட்டு பிச்சை எடுத்து சாப்பிடுகிறீர்களே சோம்பேறிகள் " என்று திட்டி விரட்டினார். புத்தர் அமைதியாக புன்னகைத்தபடி கிளம்பினார். அவர்கள் தங்கள் பயணத்தை தொடர்ந்தனர். புத்தர் தன் கையில் இருந்த திருவோட்டை தனது சீடர் ஆனந்தாவிடம் தந்து " ஆனந்தா இந்த திருவோட்டை உனக்கு தந்துவிட்டேன் இனிமேல் நீயேவைத்துக்கொள் " என்று கூறினார். ஆனந்தா அதை பெற்றுக் கொண்டார். சிறிது தூரம் அமைதியாக நடந்தனர்.

ஆனந்தாவுக்கு மன வருத்தம் தாங்கவில்லை. " புத்தர் பிரானே எனக்கு அந்த பெண்மணி தங்களை திட்டியதை நினைத்து வருத்தமாக இருக்கிறது. அந்தப் பெண்மணியை பதிலுக்கு ஏதாவது நான் பேசிவிட்டு வருகிறேன். காலையில் பக்கத்து கிராம மக்கள் தங்களை எப்படி புகழ்ந்தார்கள். அந்தப் பெண்மணிக்கு தாங்கள் யாரென்று விளக்கிவிட்டு வருகிறேன் " என்று அனுமதி கேட்டார். புத்தர் "ஆனந்தா உன் கையில் இருக்கும் அந்த திருவோடு யாருடையது என்று கேட்டார்" ஆனந்தா " அது என்னுடையது" என்றார். புத்தர் காலையில் "அது என்னுடையது என்றாயே " என்றார். ஆனந்தா " இன்று மாலை எனக்கு அதை தந்து விட்டீர்கள் நான் பெற்றுக் கொண்டேன். அதனால் அது என்னுடையது " என்றார்.

புத்தர் "காலையில் கிராம மக்கள் எனக்கு தந்த வாழ்த்துக்களை அவர்களிடமே விட்டுவிட்டேன். மாலையில் அந்த பெண்மணி எனக்கு சொன்ன வார்த்தைகளையும் அவரிடமே விட்டுவிட்டேன். அவர் தந்ததை நான் ஏற்றுக் கொள்ளவில்லை. எதுவும் எனக்கு சொந்தமில்லை. அதனால் எனக்கு எதுவும் சுமையாக இல்லை அமைதியாக இருங்கள் " என்றார்.

> வேண்டாமை அன்ன விழுச்செல்வம் ஈண்டில்லை யாண்டும் அஃதுஒப்பது இல்.- திருக்குறள்

அன்புடன் மு. மோகன்



மய்யத் தலைவர் மடல்



5

அன்புள்ள உறுப்பினர்களுக்கு, வணக்கம்

நமது சங்கத்தின் நிரந்தர உறுப்பினரும், V.G.P. குழுமத்தின் தலைவருமான டாக்டர். V.G. சந்தோசம் அவர்கள் 15.08.2015 அன்று 79வது பிறந்த தின விழாவை கொண்டாடினார். அந்த விழாவில் நானும் அகில இந்திய முன்னாள் தலைவர் திரு, R. இராதாகிருஷ்ணன் அவர்களும் நேரில் சென்று வாழ்த்தினோம்.

19.08.2015 அன்று நடைபெற்ற செயற்குழு மற்றும் பொதுக்குழு கூட்டத்தில நமது மய்யத்தன் முன்னாள் மாநிலத்தலைவர் திரு. P. நரசிம்மலு அவர்களின் 70வது பிறந்த நாள் விழா கொண்டாடப்பட்டது. அகில இந்திய முன்னாள் தலைவர்கள் திரு. R. இராதாகிருட்டிணன், திரு. M. கார்த்திகேயன், அகில இந்திய முன்னாள் துணைத்தலைவர் டாக்டர். D. துக்காராம், செயற்குழு மற்றும் பொதுக்குழு உறுப்பினாகள் பிறந்தநாள் வாழ்த்துக்களை தெரிவித்தனர். 22.08.2015 அன்று மாநில அளவிலான கூட்டம் தேனியில் மிகச் சிறப்பாக நடைபெற்றது. அதில் நானும் நமது மய்யத்தைச் சேர்ந்த 20க்கும் மேற்பட்ட உறுப்பினர்கள் கலந்து கொண்டோம். மத்திய அரசின் கீழ் இயங்கும் National Small Indsutries Corporation Ltd (NSIC) நிறுவனம் கட்டுநர்களுக்கு தொழிற்கடன் வழங்குவது பற்றி கருத்தரங்கம் சவேரா ஒட்டலில் 26.08.2015 அன்று நடத்தப்பட்டது. மண்டல பொது மேலாளர் திரு. V. ஆறுமுகம் அவர்கள் மிகச் சிறப்பாக அனைவருக்கும் புரியும் விதத்தில் எடுத்துக் கூறினார். Tulsyan Steel நிறுவனத்தின் முதுநிலை பொது மேலாளர் திரு. S. சந்திரசேகரன் அவர்களும் உரையாற்றினார். இந்த கருத்தரங்கம் நடத்துவதற்கு தேவையான நிதி உதவியை NSIC நிறுவனமும் Tulsyan Steel நிறுவனமும் கொடுத்தது. அவர்களுக்கு சங்கத்தின் சார்பாக என் நன்றியை தெரிவித்து கொள்கிறேன். அனைத்து Affiliated Association-ம் இணைந்து BAI-ன் தலைமையில் வீடு கட்டும் அனைத்து உறுப்பினர்கள் அன்றாட பிரச்சனை குறித்து கூட்டம் காஸ்மோ பாலிடன் கிளப்பில் 28.08.2015 அன்று நடைபெற்றது.

வருகின்ற அக்டோபர் 16,17 மற்றும் 18 தேதிகளில் House Hunt Expo 2015 கண்காட்சிக்கு குழுத்லைவர் திரு. L. சாந்தகுமார் அவர்கள் மிகச்சிறப்பாக செயல்பட்டுக்கொண்டிருக்கிறார். அவருடன் எப்போது அழைத்தாலும் உடன் வந்து அவருடைய ஒத்துழைப்பை கொடுக்கும் நமது அகில இந்திய முன்னாள் தலைவர் திரு. R. இராதாகிருட்டிணன் அவர்களுக்கும் என் நன்றியைத் தெரிவித்துக்கொள்கிறேன். வீடு கட்டும் அனைத்து நிறுவனங்களும் இக் கண்காட்சியில் பங்கு கொண்டு பயனடையுமாறு கேட்டுக்கொள்கிறேன்.

அன்புடன் О.К. செல்வராஜ்

மய்யத்தலைவர்





பவள விழா நினைவலைகள்



R. இராதாகிருட்டிணன்

சென்ற இதழில் 7வது அகில இந்திய மாநாடு வரை நிகழ்வுகள் தொகுத்து வழங்கப்பட்டது. இதனை தொடர்ந்து 8வது அகில இந்திய மாநாடு சென்னையில் (அன்றைய மதராஸ்) நடைபெற்றது. 1978ம் ஆண்டு டிசம்பர் திங்கள் 16,17,18 தேதிகளில் 8வது மாநாடு மிகச் சிறப்பாக சென்னை தேனாம்பேட்டை ஆபரட்ஸ்பரி திருமண மண்டபம் மற்றும் திறந்த வெளி மைதானத்தில் நடைபெற்றது.

8வது அகில இந்திய மாநாடு அதுகாரும் நடைபெற்ற மற்றைய மாநாடுகளை விட மிகவும் சிறப்பாக நடைபெற்ற மாநாடு என்று அகில இந்தியாவில் இருந்து கலந்து கொண்ட பிரதிநிதிகள் பாராட்டைப் பெற்றது. அன்றைய காலக்கட்டத்தில் அகில இந்திய தலைவராக திரு. H.S. Dugal அவர்கள் இருந்தார். தென்னக மய்யத்தலைவராக திரு. M.N. ராசாராம் அவர்களும், செயலாளராக திரு. ரங்கநாத ஆச்சார் அவர்களும், பொருளாளராக கிரு. கார்த்திகேயன் அவர்களும் பணியாற்றினார்கள் என்பது இங்கு அறியப்பட வேண்டிய செய்தியாகும். மாநாட்டுக்குழுத்தலைவராக திரு. G.K. ஷெட்டி அவர்கள் பொறுப்பேற்று மிகச் சிறப்பாக பணியாற்றி மாநாட்டின் வெற்றிக்கு அரும்பாடுபட்டார் என்பது இங்கு குறிப்பிடத்தக்கது. மாநாட்டு வரவேற்புககுழுத்தலைவராக அடியேன் பொறுப்பேற்று பணியாற்றியது நான் பெற்ற பெரும்பேராக இன்றளவும் என் நினைவலைகளின் நிகழ்வாக இடம்பெற்று இருக்கிறது என்றால் அது மிகையாகாது. என்னோடு இணைந்து வரவேற்புக் குழுவில் திரு. பழனி முதலியார், திரு. A.S. ராசகோபால் அவர்களும் சிறப்பாக செயல்பட்டார்கள்.

மாநாட்டினை அன்றைய தமிழக முதல்வர்

6

மாண்புமிகு பாரதரத்னா M.G. ராமச்சந்திரன் அவர்கள் துவக்கி வைத்தார். அன்றைய தமிழக ஆளுனர் His. Excellency Thiru Prabudass Palwari அவர்கள் முதன்மை விருந்தினராக கலந்து கொண்டார். மாநாட்டின் மற்ற நிகழ்ச்சிகளில் அன்றைய மத்திய அமைச்சர் மாண்புமிகு திரு. பா. ராமச்சந்திரன் அவர்களும், மாநில அமைச்சர் மாண்புமிகு பன்ரொட்டி ராமச்சந்திரன் அவர்களும் கலந்து கொண்டு சிறப்பித்தனர் என்பது இங்கு நினைவில் கொள்ளத்தக்கது. மாநாட்டோடு இணைந்து கட்டுமானப் பொருட்களின் கண்காட்சியும் அதே வளாகத்தில் மாண்புமிகு முதலமைச்சரால் துவக்கிவைக்கப்பட்டு மிகச்சிறப்பாக நடைபெற்றது. கண்காட்சி குழுத்தலைவராக திரு. சங்கர கிருட்டிணன், குட்டி பிளஷ் டோர் நிர்வாக இயக்குநர் பொறுப்பேற்று பணியாற்றினார். அவருடைய பணி அனைவரது பாராட்டினை பெற்றது இங்கு குறிப்பிடத்தக்கது. அன்றைய தென்னக மய்யத்தின் முன்னோடிகளாம் கிரு. நீலகண்ட அய்யா, கிரு. J.N. பட்டேல், திரு. சுப்ரமணியன், திரு. காசி விஸ்வநாதன் திரு. போரலிங்கய்யா போன்றவர்களின் அயராத பணியால் மாநாடு மிகச் சிறப்பாக நடந்தேறியது. மாநட்டில் மூன்று நாட்களில் கலை நிகழ்ச்சிகளும் அனைவரது பாராட்டினைப் பெற்றது. முதல்நாள் திருமதி. சித்ராவிஸ்வேஸ்வரன் அவர்களின் நாட்டிய நிகழ்ச்சியும், இரண்டாம்நாள் திரு. லால்குடி ஜெயராமன் அவர்களின் வயலின் நிகழ்ச்சியும், மூன்றாம் நாள் திரு. A.V. ரமணனின் மெல்லிசை நிகழ்ச்சியும் நடைபெற்றது. அன்றைய காலக்கட்டத்தில இந்த மூவரும் அகில உலக புகழ் பெற்ற கலைஞர்கள் என்பது இங்கு குறிப்பிடத்தக்கது.

அதே போன்று மூன்று நாட்களும் இரவு விருந்துகளும் அனறைய சென்னையின் மிகச் சிறந்த உணவு விடுதிகளில் ஏற்பாடு



செய்யப்பட்டது. முதல்நாள் தாஜ்கோரமண்டல் ஓட்டலிலும், இரண்டாம் நாள் அம்பாசிடர் ஓட்டலிலும், மூன்றாம் நாள் கன்னிமாரா ஓட்டலிலும் ஏற்பாடு செய்யப்பட்டது. மதிய உணவு மாநாட்டு அரங்கில் நமது கலாச்சாரப்படி வாழை இலை போட்டு பரிமாறப்பட்டது. மாநாட்டு வளாகத்திலேயே அன்றைய நாட்களின் சிறந்த பிரபலமான மௌன்ட்பேட்டன் மணி என்ற சமையல் கலை நிபுணரால் விருந்து தயார்செய்யப்பட்டது என்பது இங்கு குறிப்பிடத்தக்கது.

மாநாட்டின் ஒவ்வொரு நிகழ்வுகளையும் துல்லியமாக ஏற்பாடு செய்து எந்தவிதமான குறைகளும் வரக்கூடாது என்று கவனமாக பெருமுயற்சிகள் மேற்கொள்ளப்பட்டதன் விளைவுதான் அனைவருடைய ஏகோபித்த பாராட்டையும் நமது மய்யம் பெற்றது என்று சொன்னால் அது மிகையாகாது.

8வது அகில இந்திய மாநாட்டின் போற்றுதற்குரிய சிறப்பம்சமாக அகில இந்திய அளவில் இதுகாரும் நடைபெற்ற மாநாடுகள் அனைத்தையும் விஞ்சத்தக்கவகையில் இருந்தது என்பதாகும். அந்த மாநாட்டின் பயனாக நமது சங்கத்தின் பரிமாணம் பன்மடங்கு உயர்ந்து அதன் பலனாக சங்கம் வளர்ச்சி பாதையில் பயணிக்கத்துவங்கியது. மேலும் பல மய்யங்கள் உதயமாக 8வது மாநாடு பெரிய அடித்தளமாக அமைந்தது. அதுகாரும் தமிழகக்கில் கென்னக மய்யம் மட்டும் இயங்கி வந்தது. மநாட்டிற்கு பிறகு 1980ல் புதுவை, மதுரை, கோவை, திருச்சி, தஞ்சை, ஈரோடு, சேலம், நெய்வேலி போன்ற மய்யங்கள் துவங்கப்பட்டன. நமது சங்கம் மாநில அளவிலும் மய்ய அரசு அளவிலும் அங்கீகாரம் பெற இந்த மாநாடு பேருதவியாக அமைந்தது. இந்தச் சிறப்புமிக்க மாநாட்டின் வரவேற்பு குழுத்தலைவராக பணியாற்றிய அரிய வாய்ப்பு அடியேனுக்கு கிட்டியதை பெரிய பாக்கியமாக இன்றளவும் நான் கருதிக்கொண்டிருக்கிறேன். அதன் மூலமாக நம் மய்யத்தின் மூத்தவர்களுடனும், அகில இந்திய அளவிலான மூத்த முன்னோடிகளுடனும் நெருங்கி பழகக்கூடிய வாய்ப்பினை அடியேன் பெற்றேன். இந்த மாநாட்டின் மூலம் மாநாட்டிற்கு பிறகு நமது மய்யத்திலிருந்து பல அகில இந்திய தலவர்கள் உருவாக்கப்பட்டார்கள் என்பது இங்கு குறிப்பிடத்தக்கது.

மேலும் நினைவலைகள் தொடரும்

இவண்

இரா. இராதாகிருட்டிணன்.



பிறர் முதுகுக்கு பின்னால் நாம் செய்ய வேண்டிய வேலை "தட்டிக் கொடுப்பது மட்டும் தான்"

-விவேகானந்தர்



Successful Waterproofing of Flats and Slopped Roofs

M.Karthikeyan

Past President BAI, Specialist in Repairs and Rehabilitation

Waterproofing is a very complex Subject and requires extensive knowledge of construction materials, Structural behavior and the construction process to enable a watertight structure.

Water Leakage is ultimately a symptom just like fever is indicative that something is wrong with our body. A proper understanding of the application area and the conditions the system will be subjected to is very crucial for giving desired results. There is no magic and there is no one and all product which will solve all water leakage problems. The choice of products will depend on various factors.

Leakage can occur due to various factors and affect the serviceability of building

- 1. Inadequate curing -Less strength
- 2. Inadequate steel using in the structure
- 3. Inadequate concrete member thickness
- 4. Design which uses lower strength concrete than required
- 5. High water cement ratio leading to less than specified concrete strength
- 6. Inadequate or over compaction of concrete leading to honeycombs
- 7. Overloading of structure during construction
- 8. Inadequate propping of slab/beam
- 9. Early removal of shuttering
- 10. Overloading of structure by owner due to storing heavy materials after construction
- 11. Making openings after construction and not sealing it effectively
- 12. Fire damages

Hence adequate knowledge of the above will help in designing and checking the structure during con-

struction to ensure that water leakage does not occur.

It is obvious that such mistakes occur at various parts of the building and hence the solution to each should be tackled independently.

Typical parameters and characteristics of the product will be helpful for selection of appropriate system for relevant application.

- Elongation %
- Tensile strength
- Bond strength
- Adhesion strength (wet/dry areas)
- Weather impermeability
- Weather resistance
- Shore A Hardness

It is obvious that an entire treatise on waterproofing will constitute a book. Hence we will concentrate on waterproofing of areas like flats terraces and Domed structures since this is the most common type of leakage that most people face (other than basement).

The options for flats areas are waterproof coatings, membranes and capillary based waterproofers. Each has its own advantages based on the situation. However the challenge is for large roof spans and for Domed Structure. Choices are plenty in elastomeric range from two component cementitious Acrylic, single component Pure Acrylic systems to single component polyurethane waterproofing coating systems. While every system has its own advantages and differentiation can be drawn. It is very important to choose the right systems balancing the service life expectancy with Economics.

In this particular structure in Bangalore, a two component high performance elastomeric flexible cementitious coating systems was recommended considering the requirement of waterproofing and structural aspects. The coating has around 400% elongations and has good adhesion and bond strength to old and new Cementitious substrates.





The bond strength has been further improved with an intermediate impregnation repellent acrylic polymer coat for ensuring the interface adhesion between concrete and coating which is the key for success in waterproofing of exposed terraces.

Important guidelines that we need to consider while waterproofing roofs:

- It is critical to make the mother slab itself completely waterproof. Hence the heart of a waterproofing a roof slab is to apply a strong, fiber filled, tough, breathable, elastomeric waterproof coating over the entire mother slab including below the parapet wall. This is very important since every parapet wall will cracks. Reaches the slab will be prone to leakage in many cases. And now a few guidelines regarding coatings.
- 2. The first defense against water leakage is an adequate slope to drain out water from flat terraces before it penetrates the slab and leaks below. Water ponding should be avoided at all costs. It is strongly advisable to give 1:100 slopes. Note that this can be achieved by brick batcoba or integral cement based waterproofing using well burnt brickbats. Please note that this treatment may develop cracks in certain places if not done correctly. However, it will still perform its stated function of draining away most of the water from the slab.
- 3. The waterproof coating should be coated over the entire slab and should be done in two parts. The first part is coating the area below the proposed parapet wall the day after concreting. Two coats shall be applied 600mm wide (like a band) from the edge of the roof slab all round the perimeter of the building. During this time, the slab shall be cured by placing thick gunny bags or straw over the entire roof slab and shall be sprayed with water to keep the slab continuously wet. The usual practice of building cement bunds the next day and filling up with water shall be postponed for a day until the waterproof coating has been applied. After that, one brick high parapet wall shall be built all around the edge and inside mortar bunds shall be built, all the while taking care to see that gunny bags are kept wet. After that, water shall be pounded for minimum 15 days. The second part of coating is to be applied over the rest of the slab anytime after 15 days, but should be protected immediately by brick batcoba or integral cement based waterproofing. While laying the protective bricks batcoba, utmost care is to be taken to ensure that the coating is not damaged. Personal supervision is required at this stage.

- 4. Note that many engineers recommend a concrete screed on top of the slab due to the fact that it can be applied quickly. This is not recommended. One the density of regular concrete is much more than brick bat coba and hence adds to weight on the slab. Two, a uniform thickness of screed will not be able to provide a 1:100 recommended slope for primary water drainage.
- 5. Most engineers/ contractors build the parapet wall first and then insist that while coating is being done, they will provide a coving of mortar at the wall floor junction. Firstly, the coving is never cured correctly. Second, masons typically use very rich mortar to do the coving which invariably leads to enormous number of cracks because of high cement content. Water will invariably leak through this, enter the space below the parapet wall and then leak into the slab.
- 6. If at all the parapet wall has already been built, then the second, less desired choice would be to build the coving (maximum 75 mm wide) and cure it with wet gunny bags for 10 days before applying the waterproof coating. The waterproof coating shall be applied on the mother slab and extended over the coving and onto the parapet wall for a minimum height of 300 mm. while coating over the coving, a nonwoven polyester mesh 150mm wide shall be applied after the first coat and then two more coats shall be applied on it to ensure that the wall floor joint is watertight.
- 7. Finally, the importance of surface preparation before waterproof coating cannot be overstressed. High pressure water jetting is strongly recommended to remove dust and open up the surface so that the mother concrete slab surface shall be able to hold the waterproof coating perfectly. Basically the porous nature of concrete has to be exposed for improving the performance of any coating systems. A strong penetrating film forming primer is a must.
- 8. Quality skilled application from mixing and applying the waterproof coating within its recommended setting time is very important it is no use selecting the right material and trying to save on application cost by giving the job to a person who does not have adequate training. Company trained and authorized applicators are normally the best bet. Such trained applicators will also ensure that the right amount of materials is used in grid pattern to ensure that the coating thickness remains uniform.

In conclusion, apart from selecting the right prod-



uct, following good practices of application it is equally very important to have a site representative during construction who will supervise the work and is very crucial to ensure successful waterproofing. Progress photographs must be made part of the submittal process. A properly discussed waterproofing program involving the manufacturer, applicator and owner can ensure good waterproofing which will last for a long time. Last, but not least, the advice of a good waterproofing consultant can make all the difference between a watertight structure and a structure that is saddled with problems of leakage. Note that prevention is always better than cure. Trying to solve water leakage issues after a few years invariably costs much more than doing it right in the first place. Plus, it avoids the hassles associated with repairing of the structure while the structure is in use.

Roman Cement Concrete

S.Ramanathan

10

When the MullaiPeriyar dam issue was ats peak in 2011, many were having a false notion that the main dam had surki concrete (broken brick + Lime) sandwiched between stone masonry walls. The writer made extensive study and spoke before the IEI State Center, Chennai with a lot of slides in Nov 2011. It was proved that the infill is Roman Concrete., which is of broken stones, lime, sand and a binder either broken tiles or ashes. In this dam broken tiles are used.

A mortar consisting of one part of broken tiles, twoparts of lime and three parts of sand are ground in pugmill and mixed with three times of 3"-2" BSS broken stones. This forms the Roman Concrete which is now proved to have strength of M19 cement concrete.



A few days back Mr.M.Karthikeyan of the BAI sent a note on the Roman Concrete, which is reproduced with slight alterations:

A 1982 earthquake in the Naples area of Italy created a concrete-like rock reinforced with fibers that's similar in composition to the concrete used by ancient Romans. The "rock" was created from a series of chemical reactions within the volcano, and some experts believe the Romans observed similar phenomena, leading to the creation of the long-lasting concrete mix.. Thus Ancient Roman Concrete Was Inspired By Volcanic Chemistry.

Similar way the scooter was invented.. During World War II, ground technicians have to attend to one plane after the other. The technicians have to dart from one aircraft to the other quickly. They got used motor cycle frames and engines; fitted worn out air plane tyres and used them on the runaways without mud guards. This later became the present day scooter.. Scoot means ' to go quick '.

While travelling fast in the scooters to various places, the army men observed that the cement concrete roads, run- ways etc laid with haste during war, without any uniformity in mix all stood well without any damage. This observation lead to the concept of Mix Design.. There are so many similar inventions.



Recycling Plant

V.G. Sakthikumar Whole time Director Schwing Stetter India Pvt. Ltd.



Concrete is the world's second most consumed material after water, and its widespread use is the basis for urban development. It is estimated that 25 billion tonnes of concrete are manufactured each year. Twice as much concrete is used in construction around the world when compared to the total of all other building materials combined.

Construction and demolition waste generation has exceedingly increased around the world to about 40% annually. Out of which, concrete constitutes to about 80% of the total waste. Therefore, it is necessary to recycle concrete waste to recycled aggregate and recycled aggregate concrete. Sustainable development is focused through usage reduction of natural raw materials and consumption of recycled goods.

Recycling of slurry water is necessary to avoid ground water contamination which poses a great hazard in the ground water table. The solution to it is in recycling the concrete and the slurry water. The benefits to it are that it reduces the production of greenhouse gas emissions and other pollutants by reducing the need to extract raw materials and ship new materials to long distances.

Conservation of natural resources and a responsibility towards a greener future enabled SchwingStetter to manufacture arecycling plant, RA 12.The use of recycled aggregates from construction and demolition wastes is showing great interest in construction because it is a huge money saver for every company, cuts down the cost on effort of transport and manpower. It conserves natural resources and reduces the space required for the landfill disposal.

Concrete and its ingredients:

Concrete is a mixture of cement, water, and aggregate material. Cement is made by heating a mixture of limestone and clay containing oxides of calcium, aluminium, silicon and other metals in a kiln and then pulverizing the resulting clinker. The fine aggregate particles are usually sand. Coarse aggregate is generally gravel or crushed stone. When cement is mixed with water, a chemical reaction called hydration occurs, which produces glue that binds the aggregates together to make concrete.

Concrete Washout:

After concrete is poured at a construction site, the chutes of ready mixed concrete trucks and hoppers of concrete pump trucks must be washed out to remove the remaining concrete before it hardens. Equipment such as wheelbarrows and hand tools also need to be washed down. At the end of each work day, the drums of concrete trucks must be washed out. This is customarily done at the ready mixed batch plants, which are usually off-site facilities, however large or rural construction projects may have on-site batch plants.

Wet concrete recycling:

Builders often order a little more ready mixed concrete than they actually need, so it is common for concrete trucks to have wet concrete remaining in their drum after a delivery. This unused concrete can be returned to the ready mixed plant and either (1) used to pour precast concrete products (e.g., highway barriers, retaining wall blocks, riprap), (2) used to pave the ready mixed plant's yard, (3) washed into a reclaimer, or (4) dumped on an impervious surface and allowed to harden, so it can be crushed and recycled as aggregate. Unused wet concrete should not be dumped on bare ground to harden at construction sites because this can contribute to ground water and surface water contamination.Schwing Stetter recycling plant RA 12 helps in conserving the environment by not contaminating the ground water through recycling of slurry water and reusing it in making concrete.

Schwing Stetter's RA 12 can recycle the concrete at a washing capacity for normal concrete at 12m3 per hour. The major benefits to RA 12 are easy operation, fully automatic, no wastage of aggregates or raw materials, short vehicle downtimes during cleaning, no disposal costs, exceptionally resistant to wear, variable installation possibilities and low operating costs.





Operation of SCHWING Stetter's RA 12 is based on reverse flow principle. This provides quick intake of concrete. It separates aggregates in various sizes ranging from 63 mm to 0.2 mm. Vibrators are available for free concrete flow and aggregate flow. Drum rollers are provided with nylon ring for increased life, maintenance door provided for easy access to wash drum, drive protection cover provided for safety.



Typical system for recycling wash water/ aggregate recovery is that the surplus concrete is fed into the washing drum with the help of vibrators in the hopper. Depending on the system, upto two trucks can be unloaded simultaneously. The boom pump delivers water to Transit mixer for washing Transit Mixer washout concrete discharges into the charging hopper and flows into the drum. The Drum rotates to separate the aggregate and slurry water by reverse flow method. The slurry water gets collected into the slurry tank. The aggregates gets collected through vibrating sieve. The agitator stir the slurry tank in regular interval to avoid deposition. The rinsing pump delivers water to drum through vibrating sieve and charging hopper.Batching pump delivers slurry water to batching plant for concrete production.

Our happy customers are quite a many: Leighton, Larsen and Toubro at their DhirubhaiAmbani International Convention centre were able to reuse the remaining concrete from 4 lakhs m3 from the construction site. For every 50 numbers of transit mixers washed per day through RA 12,a total of 10 lakhs can be saved yearly.

Schwing Stetter are the best in the next generation - recycling plant. RA 12 offers easy to use, low noise equipment wherein it separates aggregates and slurry from the concrete to be reused. The major benefits of concrete recycling are keeping concrete debris out of landfills saves landfill space, recycled gravel reduces the need for gravel mining and using the recycled concrete as the base material for roadways reduces the pollution involved in construction, satisfying legal authorities guidelines of not allowing waste water containing cement slurry should be allowed to be flushed into municipal drains, minimum payback period of capital investments made on RA 12 system.



Dream, Dream, Dream.

Dreams transform into thoughts and thoughts result in action.

Dr. A.P.J. Abdul Kalam



Government Pushing GST to meet April, 2016 Deadline

S.D. Kannan Chairman, Taxation Committee



13

Even though Parliament's Monsoon Session could not turn into success, the Indian Government did not step-back and has been significantly working towards the success of Goods and Services Tax ("GST") to be able to meet the April, 2016 deadline. The Government has pressed the pedal on the much needed administrative ground work for rolling out the ambitious Indirect tax reform on time.

IT Infrastructure

As per the Revenue Minister, the IT Infrastructure for GST implementation is being kept ready, so that as soon as the legislation gets approved, the revenue department will be in a position to take the necessary follow-up actions in terms of ordinary legislations and executive actions required for its support.

It also plans to use Large Taxpayers Units (LTU) for registration of services that are pan-India in nature, such as banking, insurance and telecommunications.

Draft Legislation

The Central Board of Excise and Customs ("**the CBEC**") has set up an exclusive directorate and is also training around 500 officers, who will further train others. These officers are involved in preparing three draft legislations – Central GST, State GST and Integrated GST.

As stated by the Revenue Secretary, three different committees are preparing the said three legislations and these committees include senior CBEC officers, officers of department of revenue and of the finance and taxation department of State Governments. Out of the three committees, one has already finalised the draft, and the other two are expected to finish by September 15.

The Two Verticals

Two dedicated verticals are being created to deal with policy and implementation of the new tax regime by the CBEC. As stated by VS Krishnan, a CBEC member, "Work is going on full steam...Sub-groups under our officials and that from states are working on the law and procedures... directorate forservice tax will make way for a directorate for GST with two verticals".



The said verticals are being set up for performance management and taxpayer services respectively to be able to respond timely to the GST requirements, keeping in mind the Government's resolve of maintaining ease of doing business. The new directorate of taxpayer services will have the power to mandate third-party audits and studies to ascertain the satisfaction level of key stakeholders with tax practices so that corrective steps can be taken.

Special Session

14

Shri. Modi's reform agenda suffered a major blow on Thursday, August 13, 2015, when the lawmakers ended the Monsoon Parliament session without approving the much awaited <u>Constitution (122ndAmendment) Bill, 2014</u> on GST (**"GST Bill"**) with the Rajya Sabha adjourning sine die.

In the hope of making GST a reality by the set deadline, the Modi Government is pondering over calling a Special Session of the Parliament in the second week of September to pass the GST Bill and is also in talks with all political parties to get the requisite 2/3 majority in Rajya Sabha where the NDA is in a minority. As per senior Ministers, the Session is expected to be a two and a half day or three day affair.

Congress's take on convening the Special Session

Even though most of the parties are on board for the GST Bill, Congress wants the tax rate at 18% to be incorporated into the law. The same has been found difficult by the Government to accept as this decision should be left to the GST Council. Also the reduction in Centre's weightage in the council is not agreeable.

The Government is trying to rally support and put Congress under pressure by arguing that, it would be in "national interest" to back the reform to help India avoid a blowback from the Chinese crisis.

Source: Compilation from Economic Times, The Hindu and other News Columns.



Regulation for Group Developments

S. Ramaprabhu, Joint Secretary



To be continued..,

- (15)Vehicular ramp in setback spaces around building blocks may be permitted subject to the condition that the clearance of the proposed ramp from the property boundary / street alignment shall be minimum 1.5 metres and a clear motor able driveway of min. 3.5 m. in width is available around the building block.
- (16)The structures incidental to the main activities such as water closet / pump room, transformer room, transformer yard, electric room shall not be construed as individual block for the purpose of these rules. However, these structures may be permitted in the prescribed set back space provided that they do not fall in the drive way and its height does not exceed 4mts., provided further that transformer and electrical rooms floor area does not exceed 15 sq.m. and W.C and pump room per block does not exceed 6sq.m.
- (17)In cases of residential developments exceeding 100 dwelling units in primary residential use zone, commercial and institutional uses not exceeding 10 per cent of the floor area of the building at lower habitable floor levels, may be allowed (not for any industrial use) as incidental uses required for the occupants of the remaining residential developments within the premises.
- (18)In areas where sewage system provided by the Metro water/ Local body concerned is not available and

(a) Where number of dwelling units exceeds 50 nos. or 2500 sq.m. of commercial area (for this purpose 50 sq.m. is equated to one dwelling unit) sewage treatment plant shall be provided and maintained for the disposal of the sewage within the site itself with prior clearance from the Metro water / Pollution Control Board as the case may be on location and design:

(b) Where number of dwelling units is less than 50 nos. or 2500 sq.m. of commercial area, septic tank with upflow filters shall be provided and maintained for the disposal of the sewage within the site itself.

- (19)Any construction with roof over it in the terrace floor for A.C. Plant/ structures shall be counted, as a floor and categorization of type of building shall be done accordingly.
- (20)In cases where the extent of the site where residential or predominantly residential developments proposed exceeds 10000 sq.m. (1hectare), the developer shall

reserve minimum ten per cent of the site area (excluding roads if any handed over to local body) and provide housing thereon for lower income groups with dwelling units not exceeding 45 sq.metres. In floor area each, either within the site proposed for group development or in a location within a radius of 2 k.m. from the site under reference. The developer or promoter or owner shall sell these small dwelling only for this purpose. No conversion or amalgamation shall be permissible in these cases of lower income group dwellings.

- (21)In residential / predominantly residential developments with dwelling units exceeding 100 in number, the design should include waste management infrastructure and at least a closed non polluting storage provision for solid waste storage within the premises preferably with direct access from the abutting road shall be provided so that the local body can collect this stored waste from it.
- (22)In the interest of the public for better circulation in the area and also to ensure that the proposed development does not block access to the properties around, in cases of large developments where link roads have to be provided for connectivity to the adjoining lands / areas, through the site applied for development, the Authority reserves the right to insist the applicant to set apart such road spaces within the site and the applicant shall hand over the same free of cost through a registered gift deed to the authority or Local body designated by it for declaring it as public road. In such cases set back from these roads to the buildings proposed shall be provided as prescribed in these regulations.
- (23)The space set apart for formation of a new road proposal in Master Plan / Detailed Development Plan or road widening / street alignment shall be transferred to the Authority or the Agency or the Local Body designated by the Authority through a registered Gift Deed before actual issuance of planning permission. The exact mode of conveyance of the land shall be consistent with the relevant enactment and regulations. In such cases 'Transfer of Development Rights' (TDR) certificate may be obtained to the extent eligible as per regulations given in the Annexure XXI.

Courtesy: CMDA.....

To be continued



The National Small Industries Corporation Ltd

(A Government of India Enterprise)

Schemes of Nsic for the Development of Micro, Small & Medium Enterprises

MARKETING SUPPORT:

Single Point Registration for Government Purchase Programme:

- Get registered with NSIC to avail the following benefits:
- Issue of tender sets free of cost
- Exemption from payment of earnest money
- In tender participating MSEs quoting price within price band of L1+15 per cent shall also be allowed to supply a portion upto 20% of requirement by bringing down their price to L1 Price where L1 is non MSEs.

Infomediary Services:

• Become a member and avail small business related information through www.msmemart.com, Market intelligence, Tender & other business leads, E&E Services, Spare Capacity, etc.

Consortia and Tender Marketing:

- NSIC facilitates small enterprises to participate in tenders and procure orders from Government departments, public sector undertaking and other bulk buyers
- Improve your business opportunities through participating in consortia and tender marketing scheme

Distribution of Scarce Raw-material:

16

• Bulk procurement of basic raw materials like Aluminium, Zinc, Copper, Iron & Steet etc. and distribution at competitive rates to small units

- Timely availability in small quantities to reduce blockage of funds by small enterprises
- Distribution of Polymer products of Indian Oil Corporation Ltd at Chennai & Madurai to the SMEs.

Buyer Seller Meet:

- Bulk Buyers, such as Railways, Defence, Communication Department are invited to participate in Buyer Seller Meets.
- Participating small enterprises enhance their opportunities by becoming vendors to bulk buyers

Exhibition & Technology Fairs:

- Small enterprises are exposed to international practice through participation in international exhibition.
- Participation in exhibition enhances business prowess of small enterprises.

CREDIT SUPPORT

Raw Material Assistance:

• Avail facility for procurement of raw material at concessional interest rates for short term against Bank Guarantee.

Credit facilitation:

- To meet your credit needs, contact NSIC for access to various commercial Banks.
- The small enterprises can choose / change its bank through NSIC's strategic alliances with commercial banks for availing credit facilities of any amount
- Credit available at competitive interest rates



National Small industries Corporation Ltd (NSIC) நிறுவனம் கட்டுநர்களுக்கு தொழிற்கடன் வழங்குவது பற்றிய கருத்தரங்கம்









VGP குழுமத்தின் தலைவரும் நமது நிரந்தர உறுப்பினருமான டாக்டர். V.G. சந்தோஷம் அவர்களின் 79வது பிறந்த நாள்(15.8.2015) விழாவில் நமது அகில இந்திய முன்னாள் தலைவர் திரு. R.இராதாகிருட்டிணன் அவர்களும், மய்யத்தலைவர் திரு. O.K. செல்வராஜ் அவர்களும் கலந்து கொண்டு தங்கள் வாழ்த்துக்களை தெரிவித்தனர்.

முன்னாள் மாநிலத்தலைவர் திரு. P. நரசிம்மலு அவர்களின் 70வதுபிறந்த நாள் விழா. (19.8.2015)





நமது துணைத்தலைவர் திரு. C. சதீஷ் குமார் அவர்கள் Rotary Club of Chennai Maduravoyal தலைவராக பதவியேற்றல்.



மதுரை மய்யத்தின் 2014-15ம் ஆண்டின் மகாசபைக்கூட்டம்.

தேனி மய்யத்தின் உபசரிப்பில் தேனியில் நடைபெற்ற இரண்டாவது மாநில அளவிலான கூட்டம் 2nd STATE LEVEL MANAGING COMMITTEE & GENERAL COUNCIL MEETING OF TAMILNADU & PUDUCHERRY Date : 22-08-2015 Venue : THEM Provided by : BUILDERS' ASSOCIATION OF INDIA - THENI CENTRE



கூட்டத்தில் கலந்து கொண்ட உறுப்பினர்கள்.





வாழ்கையில் வெற்றி பெற நல்ல நண்பர்கள் தேவை;

வாழ்நாள் முழுவதும் வெற்றி பெற ஒரு எதிரியாவது தேவை...

Dr. A.P.J. Abdul Kalam

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Thanking you in anticipation your early response. With regards,

K. Venkatesan Hon. Secretary

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Specifications for Civil Engineering Works

Colonel. P Nallathambi, ME(Structural Engg), MBA, FIE, FIV, Principal Structural Consultant

Introduction

22

Specifications are very important document in Civil Engineering works. It will guide the participants such as client, contractor and site executives to adopt proper procedure during execution of the projects. There are various specifications are adopted in Civil Engineering works, such as contract specifications, technical specifications, general specifications and particular specifications etc.. The civil works primarily comprises of preparation of drawings, technical specifications and post contract award management. Specification includes the responsibility to ensure integration of environmental requirements in the drawings and technical specifications.

The specifications are to be very comprehensive and contain not only standards of the construction materials but also provide guidelines for execution of works, testing for quality assurance and mode of measurements for billing etc. Specifications are to be part of contract document and it should take cognizance of field conditions. It is necessary to consider the views of different participants who are involved in the project and prepare the specifications accordingly.

The CPWD has been publishing the specifications from time to time. They are very comprehensive and useful in execution of works and are used as guide by a number of Engineering Departments, Public Sector Undertakings, Architects and Builders. For more details, freely download the specifications from cpwd.gov.in/ Publication/speci vol2.pdf web site. There are many other websites available for downloading the specifications. They are: (a) Baba Atomic Research Center (BARC), www.barc.gov.in/tenders/TechSpecACED.pdf (b) IGCAR, http://www.igcar.ernet.in/tenders/technical spec.pdf (c) Air India, http://mmd. airindia.co.in /aimmd/pfd/SPECIFICATIONS%20VOL%20II.pdf (d) The Indian Association for the Cultivation of Science (IACS), http://www.iacs.res.in/ tender/ civil 294/TS for Civil work.pdf (e) Atomic Energy Regulatory Board, Error! Hyperlink reference not valid. (f) NCSCM (National

Centre for Sustainable Coastal Management) Anna University, Chennai , http://envfor.nic.in/ sites/default/ files/tenders%20quotions/ 02-NCSCM%20Volume%20 2%20-%20Techical% 20Specifications.pdf (g)Coal India Ltd, https://www.coalindia.in/ DesktopModules / DocumentList/ documents/ MCEWPt1_ver241107F. pdf (h) IIT Mumbai, http://www1.iitb.ac.in/ IPS2013/CiviITech.pdf and many more government organizations.

Necessity of Specifications for Civil Works

Construction industry is on a roll because of large investments in infrastructure and housing enabling introduction of modern technologies of construction and the construction materials. Rapid depletion of fossil fuels, concerns about green house gases and energy efficiency has added a totally new dimension to construction business. The need for energy efficient design, smart materials and fixtures, water conservation measures and environmental protection cannot be over emphasized. Anything created today are to last for half a century and must take into account aesthetics, ergonomics, life time costs and ease of maintenance. Every one should remain conscious of looking after the most expensive real estate, plan and execute the work taking all factors into consideration. Specifications are meant to help the initiative of the planner who must keep himself abreast of technological development and prevailing market trends. The makes of the products available in the market to be incorporated in the building construction have been identified and included in the specifications.

The main causes leading to disputes is faulty and ambiguous provisions in tender documents. The correct drafting of specifications and special conditions for inclusion in tender documents is very important. Specifications should be practicable, giving due regard to the limitations of materials and workmanship. Standards of tolerance and finishes should be consistent with functional, architectural and structural requirements of the completed work. Constructional requirements should conform to standard sizes and patterns





available in the market. Special sizes are expensive and require extra time for manufacture and delivery. It is also important to visualize an article which is being specified lest on actual, execution it is found completely out of proportion with the type of construction. The specifications are intended to amplify, but not to repeat the information shown on drawings.

General Specifications.

General specifications cater for all items of work and different variations of each item of work likely to be encountered in the works services. General specifications may not be relevant to a particular contract. For example the complete and elaborate specifications for plastering using all different kinds of mortar and various finishes that can be obtained in plaster work like smooth/ sand faced/ rough cast/ pebbledash etc. Therefore, all the detailed and elaborate specifications are provided in the general specifications.

Particular Specifications.

The particular of concrete used, kind of materials and finish required in a particular work is clearly stipulated in the contract. It also specifies the kind of workmanship, quality control and execution methodology required for a work in question are given in the particular specification. Hence, the "particular specifications" are by their very nature, very brief.

Technical Specifications.

The technical specifications are given for the items of works described in the schedule of quantities and will provide guidance for proper execution of work to the required standards. It may also be noted that the specifications are of generalized nature and these shall be read in conjunction with the description of item in schedule of quantities and drawings. The work also includes all minor details of construction which are obviously and fairly intended and which may not have been referred in these documents but are essential for the entire occupation in accordance with standard engineering practice. Unless specifically otherwise mentioned, all the applicable codes and standards published by the Indian Standard Institution and all other standards which may be published by them before the date of receipt of tenders, shall govern in all respects of design, workmanship, quality and properties of materials and methods of testing, methods of measurements etc. Wherever any reference to any Indian Standard specifications occurs in the documents relating to this contract, the same shall be inclusive of all amendments issued if any, up to the date of receipt of tenders.

Wherever brand names and makes are specified in these technical specifications, documentary evidence in support of the equivalence of brand(s) and make(s) are to be submitted for the approval of Engineer-in-Charge of the project. In case there is no IS specification for the particular work, such work to be carried out in accordance with the instructions in all respects, and requirements of the project- in- charge.

Special Conditions

Each part of tender/ contract document, particular specifications etc have a specific purpose. Some type of stipulations like restrictions to be imposed, information to be given to tenderers, facilities to be afforded to contractor, issue of electrical energy, mobilization advance, etc, peculiar to a job, but which do not find and appropriate place in other parts of the tender documents are compiled and incorporated in the tender in the form of special conditions.

Typical Specification Details

A typical specifications for construction of a building is given as Annexure. It briefly gives an idea of various specifications can be adopted for sub structure and super structure, walls, floors etc. Since the specification list is very large, few items are only mentioned here. If any reader is interested, he may contact us by mail to send the full details.

Conclusion

Every one involved in construction work should be very clear before commencement of the civil works about their requirements, standards, quality control of work and their methodology to be adopted. All these aspects should be covered in contract agreement as specifications to avoid dispute between the takers at the later stage. Inclusion of proper specifications in the agreement will leads to smooth, faster and economy in civil construction works.

"Ask for the Moon and Get It.

The Secret to Getting What you want by Knowing How to Ask"- Percy Ross



TYPICAL SPECIFICATIONS FOR THE BUILDING WORKS							
S.No.	Item of Work	Brief Specification	Remarks				
1	Anti Termite Treatment	Anti termite treatment to foundation, trenches, filling under floors, junction of walls & floors, soil along external perim- eter of buildings etc shall be provided as per provision of IS 6313-1981.	(a)Chlorophyrophos, Lindane - 20 EC , Gammax 20 (b)The work to be carried out by specialist firm approved by PCI Ltd Association. The work to be carried out as per IS 6313 (Part II) :1981 (pre- con- struction) and IS 6313 (Part III) :1981 (post-con- struction) as per the manufacturer's instructions with the warranty of minimum 10 years.				
2	Foundation. (a) Plain cement concrete footing lean concrete	 (i) PCC 1:4:8 type D2 below wall, column footings, raft foundation and plinth beams in normal conditions. (ii) PCC 1:3:6 type C2 below wall, column footings, raft foundation and plinth beams in wet conditions. 	 (a) Soil testing shall be done for all projects unless reliable data is held as per the instruction given by the Zone. (b)Grade of concrete to be decided on case to case basis based on type of soil. Use of PPC/ Fly ash mix for aggressive environmental condition and in non structural members. Use of silica fume mix as per IS 15388:2003 is recommended for high strength concrete and top most roof slab to make it impervious. 				
	(b) RCC Footing.	 (i) Concrete of minimum grade M25 (Design Mix) or RMC over lean concrete for normal areas. (ii)Concrete of minimum grade M30 (Design Mix) or RMC over lean concrete for coastal area. 	 (c) In coastal areas where atmospheric corrosive environment exists, cover as specified in clause 25.4.2 of IS 456 : 2000 for the exposure condition shall be provided. (d)CR Steel in water retaining structures and sewage related structures (e)Seismic provisions as per IS 1893: 2002 and Reinforcement detailment shall be provided as per IS 13920: 1993. 				
	(c)RCC Raft Foundation.	 (i) Concrete of minimum grade M25 (Design Mix) or RMC for normal areas. (ii)Concrete of minimum graded M30 (Design Mix) or RMC over lean concrete for coastal areas. 	(f) Fusion bonded epoxy coated / CR steel for marine structure and most severe exposed conditions (g) Ready mix concrete as per IS 4926				
3	Damp Proof course	 (a) 20 mm thick in CM 1:2 with water proofing compound as recommended by manufacturer and apply evenly a coat of blown bitumen grade 85/25 @ 1.5 Kgs/SM and blend with clean sand 0.05 Cum/SM. (b) 40mm thick PCC 1:2:4 with water proofing compound in the proportion as recommended by manufacturer. 	 (a) DPC on all walls except where plinth beam is provided at plinth level. (b) If plinth beam is at GL, DPC to be provided. (c) No DPC at dwarf wall. (d) DPC shall be provided on doors opening also. 				
4	Super Structure	 (a) RCC columns, beams/slabs using minimum M-25 design mix concrete for RMC for normal areas. (b) RCC columns, beams/slabs using minimum, M-30 grade concrete or RMC for severe exposure condition, Refer Table 5: IS 456: 2000. 	(a) Increased cover as specified in clause 25.4.2 of IS 456 of 2000 for the exposure condition and use of CRS bars / Fusion bonded epoxy coated /Zinc coat- ed steel in water retaining/ sewage structures (b) Crumple joints shall be treated at all floors and corridors level.				
	(c) Load bearing walls.	 (i) Brick masonry in CM 1:6. (ii) Squared rubble masonry regular coursed in CM 1:6 for walls and CM 1:4 for pillars. (iii) RR masonry, min 38 cm thick, brought to course in CM 1:6 at intervals of 60 cm. (iv) 200mm thick PCC solid block type masonry conforming to IS 2185 -1979 laid in CM 1:6. 	 (a) Crushing strength of bricks shall not be less than 75 Kg/Cm2 upto double storey with load bearing walls. (b) Flat iron wall ties at every one meter shall be provided in brick panel walls with column in seismic zone III and above. (c) Suitable strengthening measures to be provided for seismic forces. (d) Bricks of crushing strength Min 35 Kg/Cm2 for non load bearing walls. 				



	(d) Partition walls.	 (i) Half brick / Fly ash brick wall in CM 1:4 with RCC band at lintel level 2 Nos 8mm dia TMT bars to be provided at every fourth course except at lintel where RCC lintel band is provided. Reinforcement to continue above lintel level also. (ii) 100mm thick pre-cast PCC 1:3:6 solid blocks in CM 1:6 with 2 Nos 8mm TMT bars at very fourth course as above. 	(e)Space for dumb valet shall be provided (f) Masonry work in framed structure shall be started from top to bottom floor.
5	Roofing	 (a) RCC roof slab laid to slope using minimum M-25 grade concrete (Design Mix) or RMC for normal areas. (b) RCC roof slab laid to slope using minimum M-30 grade concrete for coastal areas. (c) AC sheet/CGI sheets/FRP/ sheet Galvalume / Zincalume colour coated steel sheet 0.55 mm thick over steel/ tubular/wooden trusses/purlins and steel structures shall be given shop coat of primer before erection. (d) FRP sheet/ Galvalume / Zincalume colour coated steel sheet 0.55 mm thick over steel/ tubular/wooden trusses/purlins and steel structures shall be given shop coat of primer before erection. (d) FRP sheet/ Galvalume / Zincalume colour coated steel sheet 0.55 mm thick over Pre Engineer Steel roof structure. (e) HP Clay tiles/ Mangalore pattern roofing tiles of reputed make set and jointed in cement slurry over 20mm thick screed in CM 1:4 mixed with WPC as per manufacturers recommendations over RCC slab laid to slope 	 (a) Generally the following slopes will be adopted for roofs:- (i) Stn with more interse rain fall 1:20 (ii) Stn with moderate rain fall 1:30 (iii) RCC roof laid in slope 1:3 in very heavy rainfall areas and for Architectural features. (b) Effect on cost due to slope (b) Grade of concrete to be decided on case to case basis based on location of structure. (c) Increased cover & CRS/ Fusion bonded epoxy coated steel (d) Rain water from roof upto two storey bldgs shall be allowed to fall freely except for important bldgs). For more than two storied bldgs,rain water down take pipes shall be provided for roof drainage using UPVC pipes, type "A" as per IS 13592- 1992.
6	Flooring		
	(a) PCC Flooring	 (i) Ground Floor: 40mm thick PCC 1:2:4 type B1 over 75mm thick PCC 1:5:10 type E2 over rammed earth sand/cush- ion. (ii) Indoor and Courtyard flooring. 25 - 50 mm thick PCC 1:2:4 type B1 over 50 - 100 mm thick PCC 1:5:10 type sub base. (iii) Over RCC slab: Average 40mm thick PCC 1:2:4 type B1 over a coat of neat cement slurry @ 3Kg/sqm over RCC slab. (iv) PCC polished tiles. Size 250 x 250 x 20 mm laid over 20 mm CM 1:4 with sub base in GF and after applying cement slurry as above in other floors. 	 (a) To be finished even and smooth with steel trowel without using extra cement. (b) Floors to be laid in bays not exceeding 0.9 x 0.9M and using 3mm thick glass/PVC dividing strips. (c) Panel size shall be of max 2 sqm and its max length to breadth ratio is 1.5 m. (d) Only one batch of cement for each room/floor. (e) For Black cotton soil upto a depth of 30 cm to be replaced with sand/ Moorum.
		 (v) PCC flooring for garages in Officer's quarters 50mm thick PCC 1:2:4 type B1 over 100mm thick PCC 1:4:8 type E2 over rammed earth/sand cushion. (vi) PCC flooring for 'B' vehicles 100mm thick PCC 1:2:4 type B2 over 100mm thick PCC 1:5:10 over rammed earth/sand cushion. 	(f)To avoid cracks in flooring necessary expansion / construction joints shall be formed and filled with sealing compound Same specifications for hard standing around work- shop.



	(vii) PCC tiled flooring using factory made tiles. 18 mm thick factory made design tiles over 100mm thick PCC 1:2:4 type B2 over 100mm thick PCC 1:5:10 over rammed earth/sand cushion.	For vehicle flooring laid as per the manufacturer's instruction.
	 (viii) PCC flooring for workshop for 'B' vehicles and repair bays 15 to 30mm thick wear proof topping (hardonate/ironite) over 100mm to 150mm thick PCC M-15/M-20 over 150mm thick consolidated hard core (WBM). (ix) Heavy Vehicle Flooring: 20 to 40mm thick wear proof topping (hardonite/ironite) over 100 to 150mm thick PCC M20/M25 type B1 over 100mm thick PCC 1:5:10 type E2 over rammed earth/sand cushion. (x) Light Vehicle Parking: Pre cast coloured PCC interlocking tiles flooring over sand layer where light vehicles parking is proposed. (xi) PCC Rigid Pavement for Hard Standing. The rigid pavement for hard standing. The rigid pavement for hard standing. The spacing and type of joints shall be provided as specified in SSR pt I section 20.B.6.11. 	
(b) Terrazzo Flooring	(i) Ground Floor: 10mm thick layer of terrazzo topping over 30mm/25mm thick PCC 1:2:4 type B1 over 75mm thick PCC 1:5:10 type E2 over rammed earth/sand cushion.	(a)In drawing-cum-dining room of officers accn white cement with or without pigment to be used for terrazzo flooring.
	(ii) Over RCC slab:10mm /15mm thick layer of terrazzo topping over 30mm/25mm thick PCC 1:2:4 type B1 over a coat of neat cement slurry @ 3Kg/ sqm.	(b) Grey cement to be used in all other locations.(c) Mixing of gray cement and white cement in any proportion shall not be specified.
	(iii) Ground Floor: 20mm/22mm thick pre- cast terrazzo tiles set jointed and pointed in neat cement slurry over 20mm thick screed in CM 1:6 over 75mm thick PCC 1:5:10 type E2 over rammed earth/sand cushion.	(d) In Multi-storied building and where there is dan- ger of cracks developing in floors, tile flooring should be provided.
	(iv) Over RCC Slab: 20mm/22mm thick pre cast terrazzo tiles set jointed and pointed in neat cement slurry over 20mm thick in CM 1:6 over RCC slab after ap- plying cement slurry @ 3 to 4 Kg/Sqm.	(e) The size of marble chips or floor shall be of grade I or grade 2
(c) Coloured Ceramic Tiles.	(i) Ground floor – 7mm thick , 400 x 400 mm (min) size coloured ceramic tiles grade B11(a) matt superior finish flooring set and jointed in neat cement slurry and pointed with colour cement to match over 20mm thick screed in CM 1:4 over PCC 1:5:10 type E2 over rammed earth/sand cushion	(f) Terrazzo flooring in domestic accn of officers and type IV and above is authorized for all rooms (50% of area for upto type III civilian quarters), lobbies verandahs, stair cases & passages.



	(ii) Over RCC slab: 7 mm thick 400 x 400 mm (min) size coloured ceramic tiles grade B11(a) matt superior finish over 10mm thick screed in CM 1:4 over 23mm thick PCC 1:2:4 type B1 padding concrete over RCC slab subject to inclusion in AA as an addl cost.	(g) Kitchen/WC/bath and toilet of all quarters are authorized terrazzo flooring OR Non skid ceramic tiles Grade B1 superior finish
(d)Stone Flooring:	Polished Kota/Shahabad/cuddapah stone Flooring 20/25mm thick over 20mm thick screed in CM 1:6 over PCC sub base/RCC slab.	To be used wherever economical, in passages/stair cases entrance hall where wear and tear is heavy on floor.
(e) Ceramic Tiles.	7mm thick 400 x 400 mm (min) size coloured ceramic tiles over 10mm thick screed in CM 1:3 over 20mm thick PCC 1:2:4 type BO over RCC slab/PCC sub base.	Officer's institute, Officers mess, admn bldg etc as applicable.
(f) Granolithic Concrete Flooring.	Granolithic concrete (1:1:2) topping as per clause 13.34 on page 139 of SSR 91 part I over 75mm thick PCC 1:2:4 over 100mm thick hard core.	For heavy duty floors where hard wearing surface is required, may be dusted with carborandum powder.
(g) Wooden Flooring	Ist class hard wood flooring over 2nd class hard wood frame work as applica- ble over 50mm thick PCC 1:2:4 type B1 over PCC sub base.	(a)Authorised for main hall of Gym and stage of lecture-cum-cinema hall, squash court & where technically specified.(b) All hidden faces of timber are to be giver preser- vative treatment and well ventilated.
(h) Rubber/PVC Floor- ing.	Rubber/PVC sheet/the flooring over 40mm thick PCC 1:2:4 type B1 over PCC slab base.	Wherever dust free environment / electrostatic charges are involved .
(j) Floor for Mechanical Laundries.	Granolithic concrete topping as above over RCC floors/100mm thick well con- solidated hard core over rammed earth in ground floor.	Wherever dust free environment / electrostatic charges are involved .
(k) Polished Stone Flooring.	18-20mm thick marble/granite stone laid on 20mm thick screed on CM 1:6 over RCC slab/PCC sub base.	For entrance hall/staircases of prestigious buildings.
(I) Acid Resistant Flooring.	Acid resistant bricks 75mm thick/tiles 15 to 30mm thick vitreous ceramic unglazed set, jointed and pointed in chemical resistant mortar, resin type set in 10mm thick screed of CM 1:2 (Chemical resis- tant) over 40mm thick PCC 1:2:4 over 75mm thick PCC 1:5:10over rammed earth/sand cushioning.	For battery charging room, armament shop, labora- tories etc where technically required.
(m) Stone set Flooring/ Paving.	Stone set of size 200 to 250mm long, 150 to 200 mm wide & 150mm deep & sides dressed bedded in CM1:3, 20 mm thick, joints grouted in CM1:2 with an admixture of metallic floor hardener such as Ironite/hardonate, 5% by weight of cement & struck flush. Edge stone set to be of size 250 to 300 mm long, 150 to 200 mm wide & minimum thickness to be 450mm.	
(n) Flooring for POL & Lubricating Stores etc.	150mm thick sand filling over 75 mm thick PCC 1:2:4 type B1 over 75mm thick sub base PCC 1:5:10 type E2 over well rammed earth/sand cushion.	



	(o) Vitrified Tiles Floor- ing.	Vitrified tile flooring of size min 600mm X 600 mm shall be provided s	
	(p) Wooden Flooring as False Flooring.	Wooden flooring may be provided as false flooring over PCC/RCC floors as required as reqd	
	(q) Designer Tiles.	In porch, path, Swimming pool side walks, service ramps etc	
	(r) Inter Locking Pavers/ Tiles.	Inter locking pavers/ tiles over 75 mm sand cusion over hard ground be provided at common approach, Hard standing.	Vehicle parking area, where the ground is very loose, the inter locking tiles are laid with sand cusion over hard standing of 150 mm thick PCC 1:2:4 laid over 150 mm thick hard core over 150 mm thick moorum filling, laying alternate base or joints filled with bitumen if laid continuously.
	(s) Floor Finish with Spike Roller.	Spike rolling to the concrete surface whilst the concrete is green. Pressing expanded metal of the mesh to d depth of 3mm and removing carefully.	
7	Glazing.	(a) 3 to 4mm thick sheet glass.(b) 3 to 4mm thick pin headed/frosted glass.	3 to 4mm thick glass panes to be used for panels upto 0.5Sqm and for panels exceeding 0.5Sqm, thickness of the glass shall be 5mm. 0.5 Sqm, thickness of the glass shall be 5mm. To be used in following locations:- (a) All WC/bath rooms in living accn. (b)Lower panels of windows of living accn (c)Windows of store rooms.
		(c) Heat absorbing glass panes and plain glass with sun control film of required thickness as per manufacturer's instruction.	For air conditioned rooms.
		(d) 4 to 5 mm thick tinted glass in im- portant bldgs like offrs mess institute & auditorium etc	For air conditioned rooms.
		(e) Structural glazing with aluminium frame work	
8	External Plastering/ Pointing.	(a) 5mm thick in CM 1:4 with WPC over a coat of 10mm thick in CM 1:6.	(a) For normal stations.
		(b) Exposed surfaces of RCC works to be rendered with 5mm thick plaster in CM 1:3 after making heeling marks on RCC floor.	(b) For coastal & heavy rain intensity areas, plaster shall be 20mm thick in 2 layers with outer layer 10mm thick in CM 1:4 with WPC.
		 (c) 15mm thick cement plaster sand faced/rough cast in 2 layers or pebble dash over 15mm cement plaster. (d) Washed sand grit plaster 25mm thick with base coat 12.5mm thick in CM 1:6 and finishing coat 12.5mm thick in CM 1:1.5 with crushed marble chips. 	 (c) External faces of built in cupboard/ward robes shall be plastered 5mm thick in cement mortar 1:3 with WPC on RCC surfaces and 5mm thick in CM 1:4 with WPC over 10mm thick for brick/block masonry. (d) External plastering shall be taken upto 150mm below ground level.
		(e) Flush/keyed pointing in CM1:3 for stone/brick masonry.(f) Raised pointing in CM 1:3 for RR Masonry.	(e) Synthetic fibers such as recron 3S or equivalent mixed in cement mortar as per manufacturers in- structions to reduce shrinkage cracks dampness etc



Damage Patterns and Failure Mechanisms of Bridge Pile Foundation Under Earthquake



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Introduction

Pile foundation is a widely applied deep foundation type for civil structure. It is easily fit for complex geologic settings and all kinds of load conditions, especially for soft soil foundation. Pile foundation is widely used in bridge construction, for its large bearing capacity, well stability and small differential settlement compared to other foundation types. According to the damage statistics of bridges in the past strong earthquakes over last thirty years, the structures with pile foundation have a better aseismic performance than those without pile foundation, but damages were also found in pile foundation. However, compared to superstructure, there were fewer reports about earthquake damages of pile foundation, the reason of which may be that pile foundations are embedded underground, which make their damages hard to be found. Since 1960s, several major earthquakes, such as the 1975 Haicheng, 1976 Tangshan and 1995 Hyogoken-Nanbu (Kobe) earthquakes etc., gave excellent indications of bridge pile failure performance, and enrich our understandings about the bridge pile foundation during earthquake loading.

Earthquake Damage of Bridge Pile Foundation

Lots of factors will cause damage of bridge pile foundation under earthquake, such as soil conditions, excessive inertia force caused by superstructure and incorrect design of piles. According to the damage statistics of pile foundation, its failure modes are complex, but soil displacement and sandy soil liquefaction are the most common ones, while the amplification effect of ground motion and excessive deformations of piles are also included. According to the investigation and research of historic strong earthquakes over recent several decades, the damage patterns of bridge pile foundation can be summarized as follows:

- (1) Crushing failure of pile shaft, or integral settlement of pile and pier due to shear failure. This failure pattern was observed in the 1995 Hyogoken-Nanbu and 1976 Tangshan earthquake.
- (2) There is no obvious lateral movement or signs of settlement for pile, but many crowded zonal cracks with different width around pile surface can be found. This kind of pile failure pattern can be found in Tangshan and Niigata earthquakes, 1964.



- (3) Detachment between pile cap and pile head due to shear and bending failures in pile head, and the inadequate (or nonexistent) structural connecting measures. It can be found in the Hyogoken-Nanbu earthquake.
- (4) Failure of the welded joint of pile cap due to buckling damage of piles.
- (5) Girder falling due to the movement of pier supported by pile foundation.
- (6) Failure of inclined pile. Bank soil moves to the center of river, which will cause torsional deformation in abutment. Such damage pattern can be found in Tangshan earthquake.





Detachment failures between pile head and pile cap, Higashi bridge, Hyogoken-Nanbu earthquake

(7) Pier deformation, girder falling or pier penetrating bridge deck due to pile settlement or lateral bending deformation under earthquake loading, both of which are the result of pile not located on steady soil or its insufficient design length.

Failure Patterns of Bridge Pile Foundation with no Liquefaction-Induced Phenomena

Seismically-induced bridge pile failures can be described as damage with no liquefaction-induced and liquefaction-induced phenomena. Meanwhile, pile failure modes with no liquefaction-induced phenomena can be described as follows:

- (1) Failure caused by inertial force of superstructure. The main positions of damage are joints between pile head and pile cap or the top of pile. The main failure modes are tension, compression and compression-shear failure.
- (2) Pile Failure due to excessive bending moment and shear force at the interface between soft and hard soil layer.
- (3) Pile settlement due to its insufficient vertical bearing capacity. Friction force of soft soil decreases when Pile settlement due to its insufficient vertical bearing capacity. Friction force of soft soil decreases thixotropy of soft soil occurs under earthquake loading.
- (4) Retaining wall and soil slope around pile foundation or ground load will make nearby soil instable when earthquake occurs, which consequently makes pile subject to lateral compression and excessive bending moment, leading to its failure.

Failure Patterns of Pile Foundation with Liquefaction-Induced Phenomena

Soil liquefaction was primary cause of bridge foundation distress. Pile damage with liquefaction-induced phenomena can be classified as damage without soil lateral spreading and with soil lateral spreading. The large lateral deformation of ground induced by lique-



Pile body sinking, Copper highway bridge, Alaska earthquake, 1964

faction under earthquake loading is one of the main reasons of the damage of structures. To some extent, it is the most main form of earthquake damage of bridge in the liquefiable zone.

Pile damage without soil lateral spreading

In the case of liquefiable but no soil lateral spreading condition, there appears various phenomena when earthquake occurs, such as sand erupting, water oozing, detachment between pile cap and soil etc. If the distributions of load, quality of liquefied soil and thickness of liquefied soil are non-uniform, the bridge foundations often produce a quite large uneven settlement under earthquake action. In the case of uniform distributions, pile maybe failed at the interface between liquefied soil and un-liquefied soil or at pile head with little uneven settlement.

Failure mechanisms of pile with soil lateral spreading

Bridges are often located at the impact band of rivers, where there exist a lot of liquefiable sand and silty layers with gentle slope (00~50), where lateral spreading easily happen under earthquake loading. When soil liquefies under earthquake loading, its shear resistance will decrease, therefore, liquefied layer with its nonliquefiable overburden layer maybe slide to river along the interface between liquefied layer and its overburden layer. Many bridges collapsed in this mode. This kind of failure mode can be found in Tangshan earthquake and the 1975 Haicheng earthquake in China. After the investigation of previous earthquakes, Damage to bridge pile with lateral soil spreading was attributed to several mechanisms:



- 1. Shear failure and bending failure of piles in the middle and bottom of liquefied layers because of lateral compression of piles induced by soil movement.
- 2. Flexure-shear failure caused by seismic inertial force while pile head is fixed.
- 3. Due to uneven settlement of superstructure, great horizontal displacement and additional bending moment are generated in tall structure. With this additional bending moment, the interior side pile bears tensile stress, so earthquake damage of piles can be relieved and there maybe exist only one plastic hinge for side pile.

Force of pile shaft under earthquake loading

The force of pile shaft under earthquake loading can be classified as two types: 1) additional dynamic stress, which is induced by soil-pile-superstructure interaction. 2) additional static stress, which is the consequence of the lateral deformation of pile shaft. When soil produces lateral movement under earthquake loading, pile will produce lateral deformation due to the lateral thrust of soil. When soil doesn't produce lateral movement under earthquake loading, piles only bear additional dynamic stress that is induced by soil-pile-superstructure interaction. If soil produces lateral movement under earthquake loading, piles bear additional dynamic stress and additional static stress that is produced by soil lateral movement. In most cases, the latter plays a more important role than the former. Structurally, pile is connected with superstructure through pile cap. Pile movement must be coordinated with soil movement, which results in dynamic stress in pile. On the other hand, the seismic inertial force of superstructure is transmitted to pile through pile cap. which also results in dynamic stress in pile. Therefore, the dynamic stresses that the pile bears under earthguake loading include the two parts above.

Failure mechanism of pile

The failure mechanism of pile is related to the force





conditions of pile under earthquake loading, so the failure mechanism can be subcategorized to three types:

- (1) The failure caused by additional dynamic stress that is induced by vibration. Such failure mode generally occurs when the ground motion level is high, the quality of pile is poor, and the soil layer is weak. Under such conditions, the reaction forces to piles from surrounding soil are relatively small, the deformation of piles are relatively large, and relatively big additional dynamic stresses are generated in pile shaft.
- (2) The failure caused by additional static stress that is induced by soil lateral movement. Such failure mode usually occurs at bank-side site.

It provides two conditions for such failure mode to take place:

- 1. The soil of bank-side site is usually very weak, and is easy to produce large permanent deformation under earthquake loading;
- 2. Due to the slope of bank-side site, when earthquake occurs, soil element will produce static shear stress whose direction will be the same as the bank slope, thus, soil lateral movement will be generated along the stress direction. The statistics of previous earthquake damages indicate that such failure mode tend to take place at relative low ground motion level.
- 3. The length of pile penetrating into steady soil layer is not enough or pile tip don't arrive at steady soil layer, so pile foundation is easy to lose bearing capacity due to liquefaction of sandy soil under earthquake loading.

Countermeasures and Suggestions on Bridge Pile Design

Liquefaction-induced large deformation of soil is the most main reason for bridge pile damage, so prevention measures to pile must be taken in seismic design.

Site selection and survey of engineering geology

(1) In bridge route design, the destruction to natural balance condition of site should be avoided be-



cause it causes high and steep free face during construction.

- (2) The purpose of survey is to ascertain the thickness and buried depth of liquefiable soil layers, grade of soil interface, ground slope, history of river channel, and retaining structures of bank etc.
- (3) With regards to the region with large-area liquefiable soil, the principle, which is 'bypass rather than pass through', should be abided by, in order to thoroughly eliminate potential dangers to the bridge structure.

Aseismic construction measures of pile

Generally, liquefiable soil layer shouldn't be used as bearing layer for pile. However, in liquefiable soil area, driving pile not only can make sand layer tighter and stronger, but it can also reach steady soil layer by passing through the liquefiable soil layer. According to the earthquake reconnaissance investigation, the pile foundations used in liquefiable soil area had good performance under earthquake loading, so pile foundation is a suitable choice for liquefiable foundation. In liquefiable soil area, end resistance, lateral resistance and horizontal resistance of piles are very small or even close to zero. If pile foundation is used in liquefiable soil area, the following requirements need to be satisfied:

- (1) Pile shaft should penetrate into steady soil layer, and the length of pile should be determined by calculation and must be no less than 4.0/[] ([], relative flexibility factor of pile). For the piles with medium diameter, the penetrating length should be no less than 7~14 times of the diameter. When the soil of steady layer is gravel soil, sandy gravel, coarse middle sand or hard clay, the penetrating length should be no less than 0.5m.
- (2) Fixity of pile head needs to be strengthened. According to the investigation of earthquake damage and relevant reports, whether piles are located in liquefiable soil or not, the maximum bending moment and shear force will be generated in pile head, so the failure modes, such as misplacement, pulling out, and fracture of steel etc, easily take place. The junction between pile cap and pile head is the most vulnerable position under earthquake loading, so strengthening the fixity of pile head is an important measure to relieve earthquake damage of piles.
- (3) It is necessary to pave compacted gravel soil or sand cushion with the depth of 200~300mm under pile cap.
- (4) In order to make up for the deficiency of calcula-

32

tion method, the reinforcement of pile should be strengthened nearby the interface of liquefiable soil layer. From the top of pile to the location which is $2\sim3$ times of pile diameter below the liquefiable interface, the amount of longitudinal reinforcements and stirrups of pile should be the same as that of the top of pile.

(5) When it has the possibility of soil lateral spreading, special attentions should be given to shear design and construction requirements of pile shaft.

Concluding Remarks

Predicting the behavior of bridge pile foundation under earthquake loading is a very complex problem involving consideration of design ground motions, superstructure response and soil-pile-superstructure interaction. Thus, lessons from historic earthquake are beneficial to pile seismic design. According to the failure patterns and failure mechanisms of bridge pile foundation described above, the following conclusions can be obtained:

- (1) Failure modes of bridge piles are complex, but soil expanding and sand liquefaction are the most common ones, while the amplification effect of ground motion and excessive deformation of pile are also included.
- (2) The analysis on failure patterns and failure mechanisms of bridge piles indicate that, the failure probability of bridge piles in the slope or bank-side site is higher than that of pile with large displacement induced by earthquake liquefaction.
- (3) When soil large displacement with liquefaction-induced occurs, bridge piles bear horizontal stresses, which include dynamic stress induced by inertial forces of superstructure as well as additional stress induced by soil lateral movement. In most cases, the latter plays a more important role than the former.
- (4) With regards to site selection for engineering, it is necessary to keep the site clear of the region with large-area liquefiable soil. Even if not, the location of piles must be far from bank slope, especially far from abrupt slope.
- (5) With regards to the pile foundations in the liquefiable soil, it is necessary to take active preventive measures such as enhancing horizontal bearing capacity of piles, strengthening the fixity between pile head and pile cap, foundation consolidation etc.





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மய்யத்தலைவர் திரு O.K. செல்வராஜ் மற்றும் கவுரவ செயலாளர் திரு. K. வெங்கடேசன் ஆகியோர் The National Small Industries Corporation Ltd (NSIC), முதுநிலை மேலாளர் திரு. B. இராமமூர்த்தி அவர்களை சந்தித்து 26.08.2015 அன்று BAI சார்பாக கூட்டம் நடத்த முடிவெடுக்கப்பட்டது.

06.08.2015

ஆகஸ்ட் மாதம் 1ந்தேதி முதல் கட்டுமான பணியிட தொழிலாளர்கள் ESI திட்டத்தின் கீழ் கொண்டுவரப்படுவார்கள் என்று தொழிலாளர் மற்றும் வேலை வாய்ப்பு அமைச்சகத்தின் அறிவிப்பைத் தொடர்ந்து அந்த திட்டத்தின் அமுலாக்கத்தைத் தெளிவு பெற CREDAI வசார்பாக ஓட்டல் ரெஸிடென்ஸி சென்னையில் மாலை 3 மணி அளவில் விளக்கவுரைக்கூட்டம் ஏற்பாடு செய்யப்பட்டது. அக்கூட்டத்திற்கு M/s. Fox Mandal & Associates மற்றும் M/s. T.S. Gopalan & Co ஆகிய சட்ட நிறுவனங்களிலிருந்து வல்லுநர்கள் வரவழைக்கப்பட்டு ESI மற்றும் EPF பற்றிய விளக்கம் அளிக்கப்பட்டது

இதில் அகில இந்திய முன்னாள் தலைவர் திரு. R. இராதாகிருட்டிணன் அவர்கள் Panel Discussion வல் கலந்து கொண்டு தன் கருத்தைத் தெரிவித்தார் என்பது குறிப்பிடத்தக்கது. இக்கூட்டத்தில் தென்னக மய்யம் சார்பாக மய்யத்தலைவர் திரு. O.K. செல்வராஜ், உடனடி முன்னாள் அகில இந்திய துணைத்தலைவர் திரு. L. மூர்த்தி, மாநிலத்தலவர் திரு. N. ரகுநாதன், Taxation Committee Chairman திரு. S.D. கண்ணன், பொதுக்குழு உறுப்பினர்கள் திரு. M.A. ஜேசுராஜராஜன் மற்றும் திரு. L. சாந்தகுமார் ஆகியோர் கலந்து கொண்டனர்.

12.08.2015

மாநில அளவிலான மாநாடு மற்றும் பொதுக்குழு

கூட்டம் பற்றிய கலந்தாய்வுக்கூட்டம் நமது மய்ய அலுவலகத்தில் மாலை 4 மணி அளவில் நடைபெற்றது. இதில் முன்னாள் அகில இந்திய தலைவர்கள் திரு. R. இராதாகிருட்டிணன், திரு. M. கார்த்திகேயன், முன்னாள் அகில இந்திய துணைத்தலைவர் திரு. D. துக்காராம், முன்னாள் மாநிலத்தலைவர்கள் திரு. P. நரசிம்மலு, திரு. Mu. மோகன், மாநிலத்தலைவர் திரு. N. ரகுநாதன், குழுத்தலைவர் திரு. L. மூர்த்தி, முன்னாள் மய்யத்தலைவர்கள் திரு. S. அய்யநாதன், திரு. R. சிவக்குமார் மற்றும் மய்ய நிர்வாகிகள் ஆகியோர் கலந்து கொண்டனர்.

19.08.2015 மய்ய செயற்குழு கூட்டம்

மய்யத்தின் ஐந்தாவது செயற்குழு கூட்டம் சென்னை, தியாகராய நகர், ஆந்திரா கிளப்பில் மாலை 6.30 மணிக்கு நடைபெற்றது. விருந்து உபசரிப்பாளர்கள் திரு. K. ராம்குமார், திரு. S.E. மோகன்பாபு, திரு. K. கோட்டீஸ்வரி சவுத்திரி, திரு. A. சத்தியநாரயணா. இக்கூட்டத்தில் முன்னாள் மாநிலத்தலைவர் திரு. P. நரசிம்மலு அவர்களின் 70வது பிறந்தநாள் விழா கொண்டாடப்பட்டது.

22.08.2015 மாநில அளவிலான கூட்டம்

இரண்டாவது மாநில அளவிலானக் கூட்டம் தேனியில் தேனி மய்யத்தின் சிறப்பான உபசரிப்புடன் நடைபெற்றது. இக்கூட்டத்தில் தென்னக மய்யம் சார்பாக அலுவலக நிர்வாகிகள், மூத்த தலைவர்கள், பொதுக்குழு / மேலாண்மைக்குழு உறுப்பினர்கள் உள்பட 20 பேர் கலந்து கொண்டு சிறப்பித்தனர்.

25.08.2015 Affiliated Association சார்பானக் கூட்டம்

Affiliated Association கலந்தாய்வுக் கூட்டம் தென்னக மய்யத்தின் தலைமையில் காஸ்மோ பாலிடன் கிளப், அண்ணாசாலை, சென்னை 2-ல்



ஏற்பாடு செய்யப்பட்டது. பொதுவாக CMDA / DTCP வயில் உள்ள பிரச்சனைகளைப்பற்றி ஆலோசிக்கப்பட்டது. தென்னக மய்யம் சார்பாக அகில இந்திய முன்னாள் தலைவர் திரு. R. ,இராதாகிருட்டிணன், அலுவலக நிர்வாகிகள், மாநிலத்தலைவர் திரு. N. ரகுநாதன், முன்னாள் மய்யத்தலைவர்திரு. S. அய்யநாதன், பொதுக்குழு /மேலாண்மைக்குழு உறுப்பினர், மேலும் பல்வேறு Affiliated Asssociation -யைச் சேர்ந்த அலவலக நிர்வாகிகள் உள்பட 36 பேர் இக்கூட்டத்தில் கலந்து கொண்டனர். இக்கூட்டம் Flat Promotion Association Chennai South சார்பாக விருந்து உபசரிப்பு ஏற்பாடு செய்யப்பட்டது.

26/08/2015 NSIC - Marketing Workshop

தென்னக மய்யம் The National Small Industries Corporation Ltd (A Govt. of India Enterprises) உடன் இணைந்து சவேரா ஓட்டல், சென்னையில் கூட்டம் காலை 10 மணி முதல் 1.00 மணி வரை ஏற்பாடு செய்யப்பட்டது. மய்யத்தின் சார்பாக NSIC மற்றும் Tulsyan நிறுவனங்களிளலிருந்து வந்திருந்த அதிகாரிகளுக்கு பூங்கொத்து மற்றும் பொன்னாடை அணிவித்து கவுரவிக்கப்பட்டனர்.

மய்யத்தலைவர் திரு. O.K. செல்வராஜ் அவர்கள் திரு. D. ஆறுமுகம், Zonal General Manager, NSIC, திரு. B. இராமமுர்த்தி, Senior Branch Manager, திரு. ஸ்ரீவத்சன் - NSIC திரு. சந்திரசேகரன் Chief General Manager - Tulsyan திரு. ராமநாதன் மற்றும் அகில இந்திய முன்னாள் தலைவர் திரு. R. இராதாகிருட்டிணன், காப்பாளர் திரு. J.R. சேதுராமலிங்கம், மாநிலத்தலைவர் திரு. N. ரகுநாதன், முன்னாள் மாநிலத்தலைவர் திரு. P. நரசிம்மலு, திரு. Mu. மோகன், முன்னாள் மய்யத்தலைவர்கள் திரு. S. அய்யநாதன், திரு. R. சிவக்குமார், அலுவலக நிர்வாகிகள், செயற்குழு / பொதுக்குழு உறுப்பினர்கள், பல்வேறு நிறுவனங்களிலிருந்து கலந்து கொண்ட அதிகாரிகள் அனைவரையும் வரவேற்று கூட்டத்தை துவக்கி வைத்தார். Marketing Workshop என்ற பொருள் மீது திரு. D.ஆறுமுகம் - Zonal Genl. Manager -NSIC கட்டுநர்களுக்காக கட்டுமானப் பொருட்கள் வாங்குவதற்கு கடன் வசதி அளிப்பது பற்றி மிகவும் கௌிவாக எடுத்துரைத்தார். மற்றும் உறுப்பினர்கள் சார்பாக கேட்கப்பட்ட சந்தேகங்களுக்கும் மிகவும் நிதானமாக மற்றும் விரிவாகப் பதிலளித்தார். திரு. சந்திரசேகரன் - Chief General Manager - Tulsyan அவர்கள் கட்டுமானத் தொழிலுடன் தங்கள் நிறுவனத்துக்குள்ள வலுவான தொடர்பை பற்றி எடுத்துரைத்தார். மேலும் திரு. இராமநாதன் - Tulsyan - தங்கள் நிறுவன தொழிற்சாலையில் கட்டுமானத்திற்கு தேவையான கம்பிகள் உற்பத்தியாகும் விவரத்தை Power Point மூலமாக எடுத்துரைத்தார்.

தென்னக மய்யம் சார்பாக திரு. D. ஆறுமுகம் -Zonal General Manager - NSIC மற்றும் திரு. சந்திரசேகரன் - Chief General Manager - Tulsyan ஆகியோருக்கு நினைவுப் பரிசு வழங்கப்பட்டு கவுரவிக்கப்பட்டனர். கவுரவ செயலாளர் திரு. K. வெங்கடேசன் அவர்கள் இக்கூட்டத்தை ஏற்பாடு செய்ய துணைபுரிந்த NSIC, Tulsyan நிறுவன அதிகாரிகளுக்கும், மேலும் இக்கூட்டத்தில் கலந்து கொண்டு சிறப்பித்த அனைவருக்கும் நன்றி கூறினார்.

28.08.2015 போராட்டக்குழுக் கூட்டம்

நமது மய்ய அலுவலகத்தில் CMDA - Development Rules - revision கோரும் மனு அளிப்பது பற்றிய கலந்தாலோசைனைக் கூட்டம் நடைபெற்றது. இதில் மய்யத்தலைவர் திரு. O.K. செல்வராஜ், கவுரவ செயலாளர் திரு. K. வெங்கடேசன், கவுரவ பொருளாளர் திரு. K. அண்ணாமலை, இணைச் செயலாளர் திரு. S. இராமப்பிரபு, மாநிலத்தலைவர் திரு. N. ரகுநாதன், முன்னாள் மாநிலத்தலைவர் திரு. Mu. மோகன் மற்றும் பல்வேறு Affiliated Association -யைச் சார்ந்த அலுவலக நிர்வாகிகள் கலந்து கொண்டனர்.

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34

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