An ISO 9001, ISO 14001 and OHSAS 18001
Certified Company

GAMMON
Builders to the Nation

GAMMON BULLETIN

Volume : 9401

Jan - Sept. 2016

GAMMON

Towering Performance by GAMMON
Changing skyline of Raigarh

"It is unacceptable that children die every year due to lack of electricity. Lets end energy poverty"

[Billionaire Richard Branson is one of the most flamboyant and successful enterprenure in the world - the founder of long string of Virgin Companies]

IMS POLICY

Editorial

We are pleased to publish January - September, 2016 issue of Gammon Bulletin.

We take pleasure in presenting some of our recent significant achievements, successes, learning and events from across the country to our Gammon family, our esteemed customers and other beloved stake holders.

The lead article in the Bulletin is on Construction of Diaphragm Walls for Gomti River Front at Lucknow, U.P. This is one of the flagship Projects of U.P. State Government and also dream Project for people of the State. This Project was executed on fast track basis and all Milestones were achieved ahead of schedule registering record-breaking progress of 2.13 km of Diaphragm wall in a month in terms of physical progress and correspondingly Rs. 73 Crores Billing in a month in terms of financial progress. Achieving such consistent performance month after month, was due to meticulous macro and micro planning, commensurate mobilization of matching resources duly line balanced, highest level of involvement from motivated team at site, positive attitude, team work, deep involvement of customers' team etc. Site team has implemented several creative construction-friendly ideas and innovative construction methodologies while keeping an eye on cost-effectiveness and the same has been achieved without compromising on quality and safety considerations. The success story of this prestigious mega project, highlights the fact that if project is mobilized in right earnest and initially execution is started on fast track basis without loss of time; a positive cycle is triggered which in turn results in improved progress unlike several projects where initial delays lead to triggering of negative vicious cycle.

The second Article titled "Formwork Failure - A Construction Killer" touches upon the topic of Formwork which is equally important facet of Construction. The Article describes various Dos and Don'ts as regards Design and Construction aspects of safe Formwork systems. Few case studies of some classic Formwork failures are eye openers and lessons learnt from these failures are worth noting.

In our quest to continually improve the Bulletin, we will be glad to receive feedback and suggestions from our valued readers to make Gammon Bulletin more and more interesting and informative for the readers.

Your feedback and suggestions may please be sent to
bulletin@gammonindia.com or
mushab@gammonindia.com

CONTENTS

DIAPHRAGM WALLS FOR GOMTI RIVER FRONT AT LUCKNOW

Prakash Brahmapurkar, Dwarika Pramanick & M. S Jambagi

Prakash Brahmapurkar

Dwarika Pramanick

M. S Jambagi

1. INTRODUCTION:

Conceived by the Irrigation Department of Uttar Pradesh, the Channelization of Gomti River from Harding Bridge to Downstream weir at Lucknow is a dream Project for the people of Uttar Pradesh. This river front development encompasses landscaping, beautification, plantation, mini Cricket stadium, world class musical water fountains, shopping complex, food courts, jogging & cycling tracks etc. The main objective of the Project includes beautification, supply of water for the Lucknow city and to improve the Ground water tables and environmental conditions of Lucknow city. Over a period, the holy Gomti River has become polluted due to disposal of sewage water & garbage into the river through small rivers & Nallahs running through capital city. Govt. of Uttar Pradesh is desirous to make Gomti river pure & bring back it's reputation of 'NIRMAL GOMTI'
Irrigation Department of UP awarded this prestigious Project to Gammon India Ltd amidst stiff competition.

LOA for the above project was issued on 16th March'15 and the Contract Agreement was signed on 26th Mar'15. The Project had very tight schedule of 24 Months with two seasons of intervening monsoon spanning eight months in between.

2. CONCEPTUALIZATION OF DIAPHRAGM WALLS

The Diaphragm walls offer efficient and robust solutions as retaining structures across different geology and for varying depths to meet the stringent requirements. In post monsoon period, there remains very little surface flow in the river, but as a matter of fact, entire River flows over 8 to 16 m thick sand bed. Hence RCC diaphragm wall was conceived with a view to serve dual purpose i.e. to act as aguide to the flow and also to act as Retaining structure which confine the river edges/boundaries up to the flood/water level at RL: 106.00m.

The Concept of Providing RCC Diaphragm Wall is to provide a guide to the river and a clear water way of 100m-130m.

We have constructed 600 mm thick M-35 RCC diaphragm wall which is acting as a retaining structure over the passive earth pressure resistance offered by the soil bellow scour level and RCC D-wall Dead Man anchor wall which possess galvanized anchor bar of 32mm dia. with 18.86 t anchor capacity. Wherever the RCC D-Wall Dead Man anchoring is not possible because of the land constrain we have proposed and constructed cantilever Diaphragm Wall which is 1m thick with 18.5 m depth.

To maintain the water level at RL of 106.00m at River, Irrigation Dept. of Lucknow has proposed to install Inflatable Water filled Rubber dam system on the existing wier located at Down-stream of Gomti barrage on River. This work was also awarded to Gammon India Ltd. This system need to be imported from foreign country like Austria, Korea or Malaysia.

The contractual scope of work is to construct 15.180 Km of Diaphragm wall along the river. The Depth of RCC Diaphragm wall is 16.0 m. We had successfully completed 15.1km up to 31st July'16 and this is much ahead of the scheduled completion date of the project. Our daily average production of concrete was as high as 750 cum.

The pace of the work was so fast that we have achieved our 1st contractual mile-stone of 3 Km 45 days early, 2nd mile-stone by 166 days early & finally 3rd mile-stone for completion of 15.180 was also achieved ahead of schedule. Due to this speedy progress of work client approved additional length for diaphragm wall construction.

Gammon had started its Journey in the construction of Diaphragm wall in early 1980's where Gammon has executed 600m wide and 1.2km long Diaphragm wall for underground metro work and since then there is no looking back. Gammon also executed intake well at patna with Diaphragm wall method for the first time in the country. The project of Gomti being 16km of length is the largest Diaphragm Wall Project.

3. MAIN OBJECTIVES:

The Main objectives of providing R.C.C Diaphragm wall for Channelization of Gomti River are:

1. Beautification (Tourism).
2. Drinking Water Supply.
3. Improving the Ground Water Table and Environmental Conditions of surrounding Area.

4. GEOLOGICAL CONDITIONS:

At this location surprisingly no rock strata is available till depth of 20m. As per design considerations depth of Diaphragm wall is finalized as 16 m where the strata is very dense silty clay which is supposed to resist the load exerted water and sand with support of the earth other side of the river. Standard penetration tests were carried out in very dense fine grained soil, silty sand and sand. The subsoil conditions encountered in the drilled boreholes indicated that in the first 3.75 m the subsoil consisted of silty sand, followed by 8.75 m the soil consisted of poorly graded silty sand and 20.0 m silty clay of medium plasticity. At a depth of 12.75 – 17.25 m, the sand became cemented with very high SPT values (35-40). Ground water table is approximately 3.0 m below the Earth Ground Level. Soil is mostly silty clay of medium Plasticity (63%) with poorly graded siltysand (20%) and silt sands (17%).

5. DESIGN CRITERIA

Following Design parameters were considered:

1. Catchment Area = 190.00 Sq. Km
2. Design Flood Discharge = 150000 Cusec
3. Channelization width=130m
4. Existing Sill level at Barrage =100.8m.
5. High Flood Level = 111.8m
6. Lower promenade level = 106.00m (At Gomti Barrage)
7. Rise of gradient in up-stream = 10 cm in 1Km.
8. Silt Factor = 0.76
9. Scour depth=1.5 times Normal scour depth as per IRC-78-2000 Clause 703.2
10. Existing river bed width between embankments shall be kept as it is.
11. Toe of discharge Structure =RCC wall in the form of Diaphragm

Following Loading Conditions were considered for Diaphragm wall Design:

1. Submerge back fill behind Diaphragm wall from RL. 106.00 to River bed Level and river bed level dry with vehicular surcharge of 1.2m.

2. River at HFL condition scour in river bed up to 1.5R (R=Normal Scour Depth) and submerge back fill beyond the diaphragm wall.

3. In diaphragm wall design passive resistance should have a factor of safety of 2 and in seismic condition factor of safety of 1.5.

4. Sudden draw down of 2.7m with corresponding hydrostatic pressure shall be taken in to account.

Design of Tie/Anchorage.

1. The Tie member shall be anchored with Dead Man Anchor by providing thread in rebar with Check Nuts.

2. The factor of safety for dead man anchor shall be 2 for passive resistance.

Alternative Checks for Diaphragm Wall.

1. Over all stability of Diaphragm wall should also be checked by slip circle method.

2. Stability check shall be made for submerged back fill beyond the Diaphragm Wall and river dry.

3. Stability check shall also be made for scour up to 1.5R and submerge back fill beyond the Diaphragm Wall.

Protection Works for Tie/Anchorage against Scour.

1. R.C.C apron of 300mm thickness in M-15 Grade of concrete of length 14m with end key of 2.5m depth, with top and bottom nominal reinforcement of 10mm torsteel at 200 mm c/c both ways shall be provided.

Reference to IS Codes.

1. IS: 4651 (part-II)- 1989 (CODE OF PRACTICE FOR PORTS AND HARBOUR – PLANNING AND DESIGN – CODE OF PRACTICE PART-II Earth PRESSURE),

2. IS: 9556-1980 (CODE OF PRACTICE FOR FOR DESIGN AND CONSTRUCTION OF DIAPHRAGM WALLS),

3. IRC: 78-2000 (FOUNDATION AND SUBSTRUCTURE),

4. IS: 4651 (PART-III) – 1974 (PLANNING AND DESIGN OF PORTS AND HARBOURS PART-III LOADING),

5. IS: 456-2000,

6. IS: 9527 (PART-III) – 1983 (CODE OF PRACTICE FOR DESIGN AND CONSTRUCTION OF PORT AND HARBOUR STRUCTURES PART-III SHEET PILE WALLS).

5. CONSTRUCTION SEQUENCE FOR RCC DIAPHRAGM WALL

The length of Diaphragm wall to be constructed is approximately 8 Km at both sides of River Gomti and maximum depth is up to 16 m. For the construction of Diaphragm walls, Hydraulic / Mechanical Grab have been deployed.

5.1 Fixing of alignment for Diaphragm Wall:

Alignment of Diaphragm Wall is fixed on the ground with the help of Total Station as per the relevant drawing. Proper alignment of Diaphragm Wall shall be maintained by means of guide wall.

5.1 Construction of Guide wall:

Guide wall of 1.20 m depth is made of reinforced cement concrete. Distance between internal faces of guide wall has been maintained 650mm. Filled portion was compacted properly and then only excavation activity for guide wall was started.

Bund making for Construction of Guide Wall

Shuttering for Guide Wall

Concreting of Guide Wall

5.2 Construction of Diaphragm Wall :

Construction of Diaphragm Wall isdone by alternate panel method. In these method primary panels are cast first leaving suitable gaps in between. Successive panels and closing panel are then cast in this gap. Two stop end tubes were used at the ends of primary panels and one stop end tube to support concrete and to form suitable joints with the adjacent panel. The shape of the successive panel end is such as to form proper joint with previous panel. 580 mm dia. MS hollow pipes were used as stop end tube. The semicircular shape shall provide the proper joint between adjacent panels. Length of panels are marked on the guide wall prior to start of trenching work.

5.3 Boring / Trenching

Boring is carried out by Hydraulic / Mechanical Rigs. The most of the Hydraulic Machine are able to control the vertical motion of grab. Initially grabbing/ boring were done from guide wall top up to founding level in three bites.

Trenching With Hydraulic Rig

During boring operation, the excavated trench will be filled with the Polymer slurry of minimum density 1.04 gm. /cc to

prevent collapse of bore and grabbing still continued up to the specified depth as mentioned in the relevant drawing. Continuous supply of Polymer slurry was maintained in bore during the entire trenching process to have a constant head above the ground water level. Necessary tests like density, PH value, viscosity etc. have been carried out at site until a consistent working pattern is established, taking into account the mixing process, blending of freshly mixed polymer with previously used slurry etc. Contaminated polymer isde - silted in the tank by means of special chemicals and for reuse for further trenching.

Usually panel width shall vary from 3.0 m to 6.0 m, so that the entire trenching is completed in two or three cuts as per grab size. Panel width may vary as per site conditions. During trenching operation adequate care is being taken to keep the bore vertical to such an extent so that it meets the permissible limits specified in the technical specification. To maintain verticality of trench following measures have been adopted:

1. Machine positioning- Hydraulic machine shall be placed on relatively firm and leveled ground and level of Machine shall be checked by means of sprit level.

2. During trenching grab should rotate by 180 degree after every three to four grabbing operation.

To check the verticality, distance between grab rope and guide wall face has been monitored. After completion of boring up to specified depth, the boring equipment is shifted to another location.

Disposal of spoil:

Spoil removed from the excavation is separated from the slurry employed in the excavation process. The same is disposed of as quickly as possible to locations as directed by the employer's representative and in such a manner that spillage and annoyance be minimized.

Contaminated slurry, not suitable for re-use, is removed from the site and disposed off.

5.4 Fixing of stop end tubes

Fixing of Stop End tubes

Stop end tubes were lowered up to the bottom of trench maintaining pre-specified distance marked on the guide wall. The center of stop end tubes shall match with the panel markings on Guide wall. Shutter release oil was applied on stop end tubes. During placing of stop end pipes, verticality is monitored by means of plumb bob to make the same vertical enough to meet the requirements specified in the technical specifications.

5.5 Cleaning of excavated trench

After trenching is completed the polymer slurry is checked for sand contents and suspended particles by taking samples at various depths using samplers and if found, needs to be de-silted. The special polymer compound was used for de-siltation. The special chemical compound will settle all the suspended particle to the bottom and the bottom will be cleaned by grabbing.

5.6 Placing of reinforcement steel

Reinforcement cage fabricated near by the panel or in the fabrication yard. Cage fabricated duly tying with binding wire and wherever required welding was done. The cage lifted by two point lifting method and placed in the trench. Care is taken to maintain position of cage and cover. Suitable arrangement is adopted for resting the reinforcement cage to have proper level of anchor bars. For anchor bar couplers necessary pockets arrangement is provided. To form pocket, thermo col of required size having hole at center of appropriate size is provided so as to accommodate the coupler in the reinforcement cage. The thermocol covered with ply wood board. The weep holes of PVC pipe of 110mm diameter as per the specification and are covered with geo-Cloth material to avoid concrete slurry to enter into it and was fixed at proper locations as per the drawing.

Placing of Reinforcement Cage

5.7 Concreting

Concrete to be used in Diaphragm Wall is of M35 grade with slump of 150 mm to 190 mm.

Concreting of D-Wall

Concreting is done by Tremmie method. Pouring of concrete will continued till it accumulates in vertical Tremmie pipe up to top of funnel. The Tremmie pipe then raised so as to release the concrete in a single continuous flow. Care has taken so that bottom end of Tremmie pipe remains immersed in concrete. The operations remain continued till the good concrete reaches 200 mm above the cut-off level of Diaphragm Wall. The length of Tremmie pipe is reduced by removal of Tremmie segment stage by stage. Concrete was conveyed from mixing plant to placing location by means of transit mixer.

5.8 Removal of stop end tube

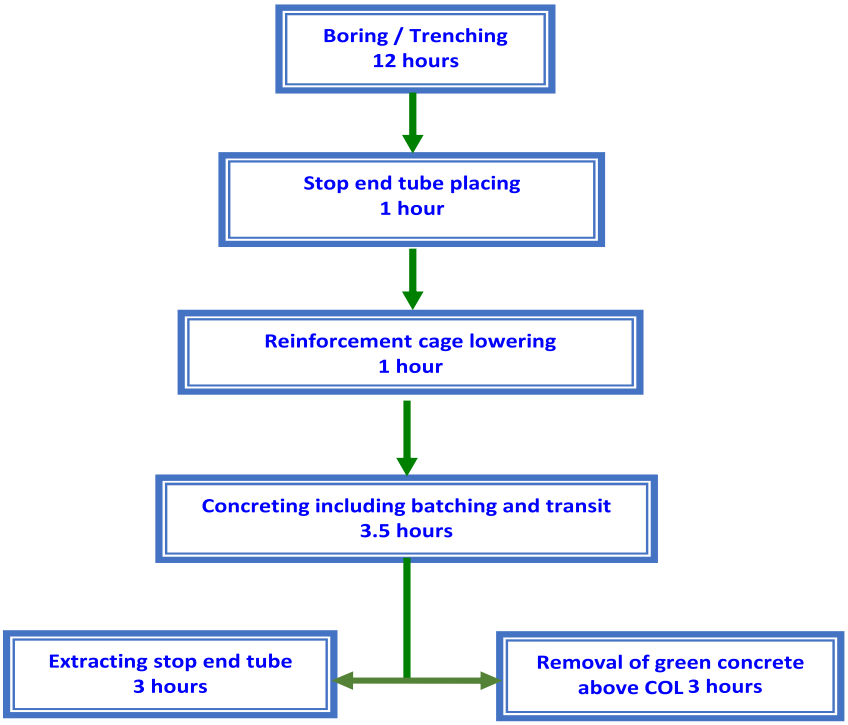
The end tubes are taken out gradually with the help of a Crane/Hydraulic Jacks after initial set of concrete. During concreting the stop end tubes were moved slightly up and down with the help of Crane/Hydraulic Jack so as to avoid formation of bond between stop end tube and concrete. Adequate care has taken during removal of stop end tube so that no damage is caused to the concrete placed against them.

Removing of Stop end tube

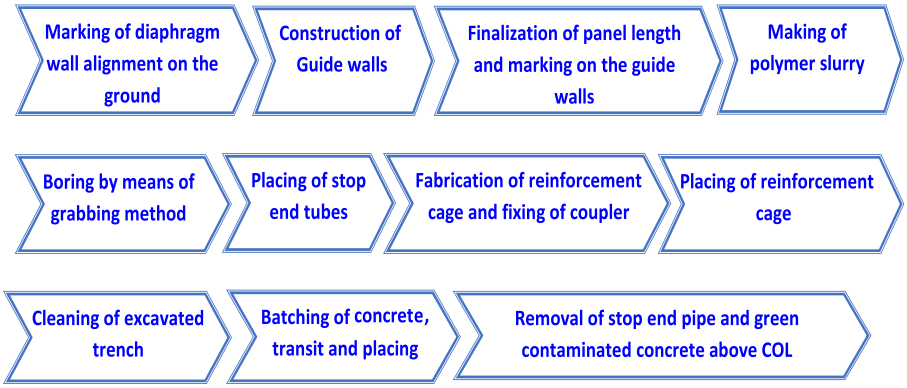
5.9 Chipping and removal of bad concrete

We alsofollowed habit of removing bad concrete above cut-off level to minimize/expedite chipping work by manual means while concrete is still green without disturbing setting process of Diaphragm Wall concrete.

TYPICAL TIME CYCLE FOR DIAPHRAGM WALL CONSTRUCTION



6. STAGE WISE CONSTRUCTION SEQUENCE



7. CONTINGENCY PLAN

In the event a delay or breakdown occurs during the concreting operation, there will be an alternative concrete arrangements to ensure that an adequate supply of concrete to the tremmie is available at all times so that placement is continuous.

In the event of the sudden loss of polymer slurry depending on the loss of polymer at which depth or level, the excavation stopped and backfilled with excavated materials first, followed by cement-sand mortar or lean concrete; so as to plug the cause of such polymer loss which might have been caused by abandoned sewer, pipe lines and etc. The backfilled trench shall then be re-excavated on the next working day.

If due to some reason cement-mortar and lean concrete are not available, then platform soil has been used to backfill during such emergency time with the use of excavator.

In the event of trench collapse at the bottom of guide wall, cutter frame will be withdrawn, followed by the immediate backfill of trench with earth up to the bottom of the collapse. Polymer slurry will be used to pump back to the plant while backfilling to the trench is being carried out.

The collapsed area below the guide wall is then filled with lean concrete. Area of trench collapse cordoned off and 'danger' signage were placed.

In the event of trench collapse at the bottom of the guide wall due to the heavy collapse at certain depth, the trench was backfilled with soil up to the bottom of the heavy collapse zone and follow by the lean concrete to fill such heavy collapse zone.

Excavation rig used to move further away from the collapse vicinity and cordoned off immediately. Till the arrival of concrete supply, excavator helps to discharge the backfills oil, from a safe distance into the collapse trench.

In the event of power failure in the midst of the Diaphragm wall excavation, all control valves of the polymer slurry supply were used to close immediately, and cutter frame will be withdrawn from the trench.

9. QUALITY ASSURANCE

Apart from carrying out the construction as per the specified sequence, the following steps have been taken to enhance the quality of our Diaphragm walls works.

Quality Assurance:

The trench cutter equipped with display monitor wired to inclinometers mounted onto the cutter frames and control knobs in the operator's cabin actuating adjustable trust plates mounted to 12 positions of the cutter frame as well as control over the rotational speeds of cutter drums will enable the operator to check and control trench verticality to within 1 in 200 tolerance during excavation.

Precaution:

With the inevitably large and heavy construction of the trench cutter, which comprises a 35 ton (for BC-30) or 45~50 ton (for BC-50) cutter frame mounted on to a 110 ton crawler base crane, level platform of adequate bearing capacity must be provided and due care must be exercised during the movement of rig, especially around turns and along raps, not exceeding 1:100.

10 SAFETY PRECAUTIONS:

A trained Safety manager is deputed as in-charge for entire safety works. Safety manager review and coordinate construction phase plan to include the hazard and risk analysis and its mitigation plan.

Safety manager have the authority and duty assigned by the Project Manager to suspend the works in case of deviation from an approved working occurs that could risk injury to person or equipment or properly loss. Safety Manager organizes and report findings from monitoring and measurement activity.

Necessary safety precaution is the part of the job. All workers related with the

construction are provided with PPE. Periodical checking of cranes, wire ropes is done by user and plant engineers. After boring, the trench is covered with iron mesh till other activity starts. In the case of collapse of excavated trench, the same will back filled immediately with lean concrete.

All open trenches were barricaded or covered with mesh reinforcement, together with display of warning signboards during non-working hours to cordon off and prevent accidental vehicular roll-ins as well as safeguard personnel from falling into trench. No trench left unattended during rest days and a personnel used to assign to monitor and replenish the level of polymer slurry in trenches to maintain stability.

On achieving 3.5 million safety man hours without lost time accident at site, Hon'ble additional Labour Commissioner of Lucknow Region and Executive Engineer of Sharda Cannel, Lucknow Division, Irrigation Department of Lucknow issued certificates to Gammon.


OFFICE OF THE ADDITIONAL LABOUR COMMISSIONER
LUCKNOW REGION, LUCKNOW UP
SAFETY ACHIEVEMENT AWARD
This certificate is awarded to
GAMMON INDIA LIMITED


IRRIGATION & WATER RESOURCES DEPARTMENT, UTTAR PRADESH
SAFETY ACHIEVEMENT AWARD
This certificate is awarded to
GAMMON INDIA LIMITED

10. STORAGE OF CONSTRUCTION MATERIALS:

1. Cement: Bagged cement werestored in a suitable weather tight warehouse in such a manner as to provide easy access for workers and inspector. Each consignment is stacked separately with a flag showing the date of receipt and uses cement bags as First –In-First-Out (FIFO) basis. The no. of bags in each stack is not be more than12. Proper record is maintained for procurement and consumption of cement bags.

2. Reinforcement steel: Reinforcement steel is stored diameter wise near by the works location on wooden sleeper.

3. Aggregates: Coarse and fine aggregates are stored near by the concrete batching plant and adequate care is taken to avoid contamination between different sizes.

4. Polymer : Polymer is stored in dry and covered place.

11. ACHIEVEMENTS:

Gammon's team of Gomti River Project has been awarded and appreciated for achieving 1.6 Km diaphragm Wall in Aug. 2015 and 3.0 Km Diaphragm Wall Milestone , one month ahead of Schedule.

ACHIEVERS AWARD FROM CLIENT


IRRIGATION DEPARTMENT, UTTAR PRADESH
ACHIEVER AWARD
THIS CERTIFICATE IS AWARDED TO
M/S GAMMON INDIA LTD. MUMBAI

12. CREDITS

With continuous assistance from Corporate Office, Mumbai, Gomti River Project Team has accepted all challenges including completion of Diaphragm wall construction before target dates.

Project Team wishes to place on record able mentoring by Dr. N. V. Nayak. and guidance in all technical as well as commercial matters. Authors wish to place on record the contribution and guidance given by Mr. Roopsingh Yadav & Mr. Sidh Narayan Sharma without which this fast track execution of the project was not possible. All other staff from U.P. Irrigation Department has also played a vital role to complete the job in time. All the Engineers had worked round the clock along with GIL team to achieve the target.

Authors also wish to place on record contribution of GIL team at site who worked relentlessly against all the odds and achieved such magnificent results.

In the golden history of Gammon group of Companies, Gomti River Project team has achieved unbelievable turnover of Rs. 73 Cr. in a single month by constructing 2.13 km Diaphragm wall which is a record breaking progress.

13. CONCLUSIONS

The Channelization of Gomti River from Harding Bridge to Downstream weir at Lucknow being a dream project for the people of Uttar Pradesh was executed on fast track basis. Monthly peak speed of 2.13 Km of Diaphragm Wall was achieved in the month of Feb.2016. It may be noted that these fast track achievement was registered without any compromise on quality of structure nor at any time safely aspects were relaxed or overlooked in a bid to achieve maximisation of physical progress.

Apart from achieving optimum time cycles, several creative and innovative ideas were implemented on this project.

GILMPSES OF GOMTI SITE

BEFORE (MARCH 2015)

AFTER (MAY 2016)

MAHATMA GANDHI KALWA KURTHY LIFT IRRIGATION SCHEME, TELANGANA

Kondapalli Rao
Project Manager

A. B. Bhutada
Sr Vice President

Valued at Rs. 632 Crores, the above Project located in Mahabubnagar District in Telangana, was taken up under the EPC System by Gammon India Ltd.

Designed to provide irrigation and drinking water facility to the chronically draught affected, upland areas in Mahabubnagar District by lifting water from the river Krishna from the foreshore of the NilamSanjeeva Reddy Sagar (Srisailam Reservoir)[] , this project starts with First lift at Regumangadda of KollapurMandal of Mahabubnagar District.

Features of the scheme and components

The Scheme envisaged to irrigate 3.40 Lakh acres of land utilizing 25 TMC of water by series of 3 lifts located as follows:

- Lift-1 (Stage-1) at Regumangadda with static lift of 95 m.
- Lift-2(Stage-2) at Jonnalaboguda with static lift of 86 m.
- Lift-3 (Stage-3) at GudipalliGattu with static lift of 117 m.

The above 3 lifts are interconnected with series of balancing reservoirs, gravity canals and tunnels along with other relevant components.

The following are the brief details of the project in sequential order.

Lift-III Features

- This is located in Gouridevipalli Village, GopalpetMandal, Mahabubnagar District in Telangana state The main aim of this scheme is to lift the water from the Jonnalaboguda Balancing Reservoir to GudipalliGattu balancing reservoir.

Hydraulic Particulars:

FRL of Jonnalaboguda Balancing Reservoir : EL +407.000m

FRL of Gudipalli Gattu Balancing Reservoir : EL +502.000m

MDDL : EL+389.75

Features and Hydraulic Particulars of Lift-III

1. Canal approach at the entry of Tunnel :

Discharage : 92.05 Cumecs

Length : 95m.

Reservoir end level : EL 389.027

Tunnel entry level : EL 382.000

Silt Trap Size : 3m x3m x2m

Bed Width at Tunnel entry : 12.230m

2. Tunnel to Surge pool :

Length : 6.156Km

Entry Level :382.000m

Exit to surge pool level :373.00 m

Slope : 1 in 685m

Diameter : 6.85m

Shape : Horse shoe with concrete lining.

3. Surge pool :

Length across : 94m

Breadth along water way : 40m

Bottom Level : EL +371.25

Silt trap size : 3mx3mx2m

MDDL : EL + 389.75

MWL : EL +396.00

4. Draft Tube:

Size : 5.00 m x 2.15 m

Length : 55m

Bottom Level of Surge pool side : 373.050m

Bottom Level of Pump house side: 366.438m

5. Pump house :

Size of Pump house : 80mx20mx118m

No. of pumps : 5 No's

Pump Type : Vertical Francis turbine type

Pump Capacity : 5x650 Cusecs/each

Motor Capacity : 5No's x 30 MW each

Power Supply : 220KV/11KV

Centre line of the Pump : EL +371.00

Diameter of Spiral Casing : 1.8m

Motor Transformers : 5 No's of 35 MVA

Station Transformers : 2 No's of 20 MVA

SFC Transformers :3 pairs / 6 No's

Static Head (Design head)

a. Max. : 117m
b. Min. : 117m
c. Designing Head : 117m

6. Annexe

Bottom floor level : EL 453.50

Size : 94mx15.5mx15m

Middle floor level : EL 459.00

Size : 94mx15.5mx15m

Middle floor level : EL 464.500

7. Service Bay

Size : 25m x 25m

Floor Level : EL 470.00

8. EOT Crane

Operating level : EL 481.00

Capacity : 80 Ton

9. Pressure mains

Length : 5 Nos x 250m

Diameter : 2.6m

Thickness : 14 mm

Maximum delivery level : EL 506.00

(Centre line of delivery line at highest point of cistern)

10. Cistern:

Size : 41m x 41m

Maximum water level :EL 503.00 (Ogee weir level)

Cistern Bottom level : EL 498.00

This project will cover parts of Kollapur, Nagarkurnool, Achampet, Kalwakurthy and Wanaparthy Thaluks of Mahabub nagar District to irrigate an anycut of 3,40,000 acres with 3 stages lifts between RL +244.400m to +502.000m

First Unit of Project already started lifting water & balance pumps will be available in sequential manner. Also entire project is stated to be commissioned by 30th June 2017.

WORKS-IN-PROGRESS

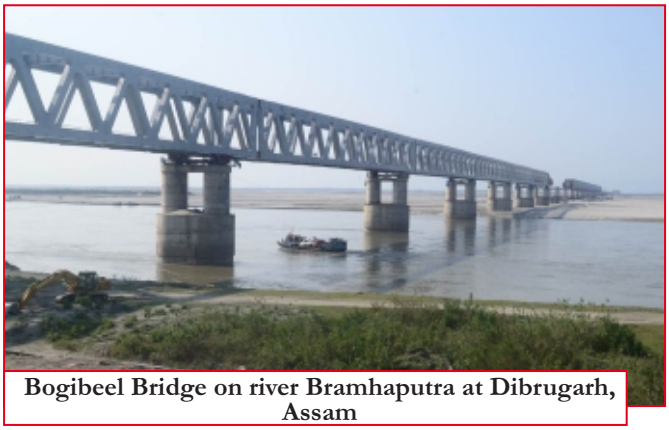
SH-69 Road Works , Bihar

BR-3 Road Works, Bihar

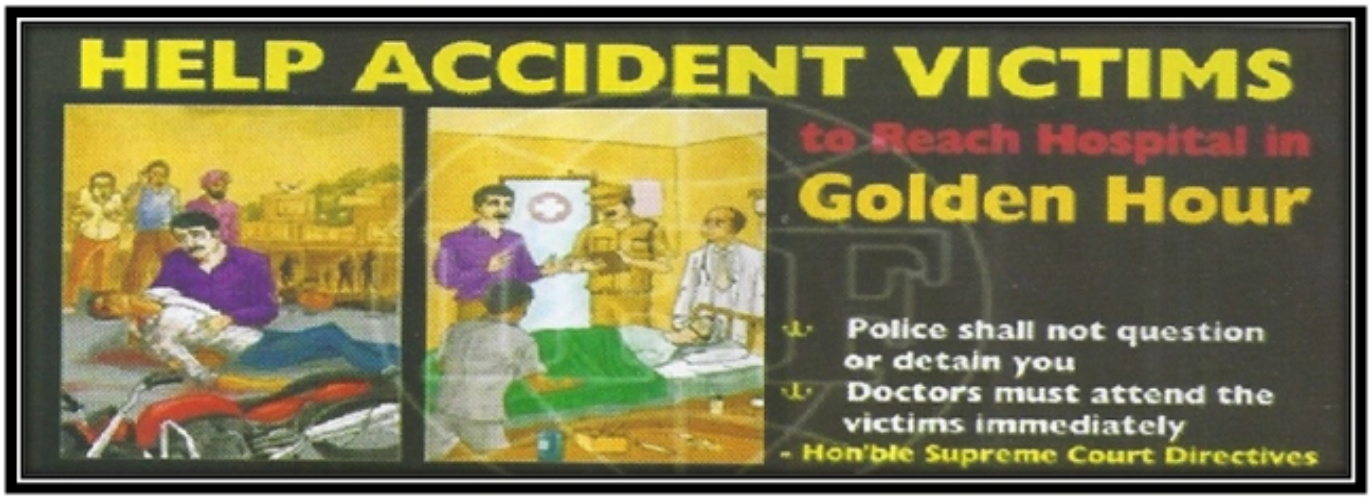
Well Foundation at Mahi Bridge, Gujrat

Sagarkatte Bridge at Mysore, Karnataka

Intake Structure at Kalpakam



Bogibeel Bridge on river Bramhaputra at Dibrugarh, Assam



Top Thirty Life - Transforming Powerpacked Quotes

- M. U. Shah

History has witnessed several radical transformations of lives e.g. robber Valmiki becoming great Saint Valmiki or a poor farmer's son (Abraham Lincoln) becoming a President of USA inspite of repeated failures or an ordinary matriculate person becoming a greatest inventor (Thomas Alva Edison) or an ordinary farmer becoming a billionaire. What triggered such transformations? In many cases a small piece of advice or little coaching trigger such transformations.

Here is a precious collection of such powerpacked Quotes from the greatest and most successful human beings of the world who are speaking based on their personal experiences. These quotes have in them power to transform our lives. Packed with dynamite kind of life - transforming power in them, these quotes are worth their weight in gold - rather platinum.

Consider reading these Quotes and if convinced, consider implementing these in your life and you will see a radical transformation in your attitude, your health, wellbeing and wealth and once this positive spiral is triggered, no one can stop you from reaching at the top in hierarchy - whatever may be your field of endeavor.

Attitude	1.	 "The greatest discovery of our generation is that human beings can alter their lives by altering their attitudes of mind." **- William James of Harvard**
	2.	 "We cannot change our past... we cannot change the fact that people will act in a certain way. We cannot hange the inevitable. The only thing we can do is play on the only one string we have, and that is our attitude. I am convinced that life is 10% what happens to me and 90% of how I react to it. And so it is with you... we are in charge of our Attitudes." **- Charles R. Swindoll**
	3.	 "A man who is self-reliant, positive, optimistic, believes in himself and undertakes his work with the strong desire for success, magnetizes his condition. He draws to himself, the creative power of the universe." **- Dr. Norman Vincent Peale**
	4.	 "The greatest day in your life and mine is when we take total responsibility for our attitudes. That's the day we truly grow up." **- John C. Maxwell**
Faith	5.	 " If ye have faith...nothing shall be impossible unto you." **- Jesus Christ**
	6.	 "Nothing on earth is greater than the human mind in potential power. The average individual is capable of much greater achievement than he has ever realized" **- Dr. Norman Vincent Peale**
	7.	 "If you think you can or if you think you can't, you are right in either case" **- Henry Ford**
Goals	8.	 "Get going. Move forward. Aim High. Plan a takeoff. Don't just sit on the runway and hope someone will come along and push the airplane. It simply won't happen. Change your attitude and gain some altitude. Believe me, you'll love it up here at top." **- Donald Trump**
	9.	 " A Goal casually set and lightly taken is likely to be freely abandoned at the first obstacle itself." **- Zig Ziglar**
Hard Work	10.	 "The average person puts only 25% of his energy and ability into his work. The world take off its hat to those who put in more than 50% of their capacity and stands on its head for those few and far between souls who devote 100%". **- Andrew Carnegie**
	11.	 "I would like to work half a day. I don't care if it is first twelve hours or second twelve hours" **- Kammons Wilson, CEO, Holiday Inn.**
Responsibility	12.	 "Responsibilities gravitate to the persons who can shoulder them". **- Elbert Hubbard**
	13.	 "The price of greatness is responsibility ". **- Winston Churchill**
Team Work	14.	 "You may have the greatest bunch of individual stars in the world, but if they don't play together, the club won't be worth a dime ". **- Babe Ruth**

Risk	15. 	"The biggest risk is not taking any risk. In a world that's changing really quickly, the only strategy that guaranteed to fail is not taking risks ". **- Mark Zukerberg**
	16. 	"A ship in harbour is safe but that is not what ships are built for ". **- William G. T. Shedd**
Leadership	17. 	"As a leader of people, you have to be great listener, a great motivator, be very good at praising and bringing out the best in people ". **- Richard Branson**
	18. 	" You can buy a man's time, you can buy man's physical presence, you can buy a measured number of skilled muscular motion per hour, but you cannot buy initiative, enthusiasm, devotion or loyalty - you, as a leader, have to painstakingly earn these" **– Clarence Francis**
Success	19. 	"Most people fail not because of lack of ability or intelligence but because of lack of desire, direction, dedication and discipline". **- Shiv Khera**
	20. 	"Success doesn't mean the absence of failures; it means the attainment of ultimate objectives. It means winning the war, not every battle". **- Edwin C. Bliss**
Excellence	21. 	"The quality of a person's life is in direct proportion to their commitment to excellence regardless of their chosen field of endeavor". **- Vince Lombardi**
	22. 	"If a man is called to be street sweeper, he should sweep streets even as Michelangelo painted or Beethoven composed music or Shakespeare wrote poetry. He should sweep streets so well that all the hosts of heaven and earth will pause to say, here lived a great street sweeper who did his job excellently". **- Martin Luther King, Jr.**
People Management	23. 	"I will pay more for the ability to deal with people than for any other ability under the sun". **- John Rockefeller**
	24. 	" I have always believed that the way you treat your employees is the way they will treat your customers, and that people flourish when they are praised, Sir " **- Richard Branson**
Criticism	25. 	"When I am tempted to criticize I will bite on my tongue; when I am moved to praise I will shout from the roof tops." **- O G Mandino**
	26. 	"Criticize the performance; not the performer-rather praise the performer" **- Zig Ziglar**
Art of Giving	27. 	"We cannot help ourselves without helping others. We cannot enrich our lives without enriching others. We cannot prosper without bringing prosperity to others". **- Janette Cole, Spellman College**
	28. 	"No person was ever honored for what he received. Honour has been the reward for what he gave." **- Calvin Coolidge**
Paradigm Change	29 	"Usually the first problems you solve with the new paradigm are the ones that were unsolvable with the old paradigm." **- Joel A. Barker**
	30	"How many centuries did it take for us to discover that the caterpillar and the butterfly were the same entity? We spend most of our lifetimes like a caterpillar struggling to survive, and only thinking of our immediate needs. The metamorphous which we undergo is extremely painful, but unless we endure the metamorphous, we will remain as caterpillars. When we live with our souls, we are like a butterfly, gliding above the ground and enjoying the true beauty of the world."

FORMWORK FAILURE - A CONSTRUCTION KILLER

Sameer S Malvankar
Manager-Engineering

1. Preamble

Almost every construction operation in every part of the world utilizes formwork and shoring systems in order to support structural elements, materials and workmen. The construction industry is a multifaceted industry, characterised by a broad range of high risk activities and complex work arrangements. The collapse of formwork used for supporting concrete slabs, decks and roofs is a matter of big concern. The collapse of forms or scaffolds not only leads to work delays and property loss, but has also been responsible for numerous worker injuries and deaths. It is a fact that Construction industry has the largest number of work related deaths than any other industry. Accidents not only affect workers but also their families. The demand for construction speed is having a disastrous effect on worker's health and safety. Related technology has advanced quite well over a period, hence focus need to be shifted to form work & shoring Technology

2. Causes Of Formwork Failure

"Formwork failures can be attributed to human error, substandard materials and equipment, omission, and inadequacy in design. Careful supervision and continuous inspection of formwork during erection, concrete placement, and removal can prevent many accidents". (ACI 347)

There are several causes which results in formwork failure. Some of the major causes include:

- Providing form work on ad hoc basis coithout design of formwork or improper design of formwork
- Lack of attention to formwork details
- Unstable shoring foundations
- Improper or inadequate shoring or re-shoring
- Alignment of shoring, non-verticality of supports
- Inadequate strength of formwork materials or poor quality of materials
- Improper Handling, Erection and Dismantling
- On site last minute modifications to formwork due to site conditions without consulting Designer.

- Inadequate bracings, diagonals or X bracings Inadequate inspection, no architectural or engineering inspection
- Lack of control on rate on Concrete placement
- Overloading of the formwork during concrete pouring operations
- Excessive Vibration/shocks
- Uncontrolled acceleration of formwork removal or improper stripping

Majority of failures are due to faulty designs, faulty materials, and not following scheme/drawings etc.

3. Case Studies

3.1. Tropicana Casino Parking Garage in Atlantic City, New Jersey (2003)

- The parking garage was a part of the Tropicana Casino and Resort expansion project
- Collapse resulted in the failure of five levels of an exterior bay

3.1.1. Structural Arrangement

- This ten-story parking garage was designed as a reinforced concrete structure with shear walls and intermediate moment resisting frames to resist lateral loads
- The 3,000 car parking garage was a part of an ongoing project
- The framing generally consisted of a one way slab spanning in the east-west direction, supported by continuous cast in place beams in the north-south direction

3.1.2. Major Causes

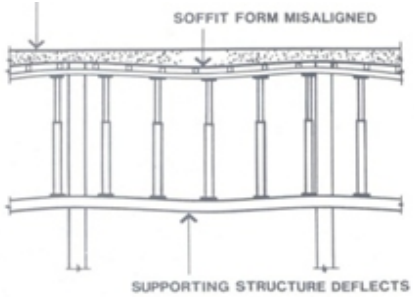
1. Improper placement of reinforcement

At the exterior columns and slab/beam the required embedment length for the welded wire mesh was misplaced. Also found that slab bottom reinforcement placement was not done as per the structural drawing. The omission of this critical reinforcement steel leads to loss of integrity of the structure.

2. Improper or inadequate shoring or re-shoring

Re-shoring of subsequent slabs was not done as per the requirement of structure. Only one level of previous slab was re-shored in place of three levels minimum required. Cracks in the slab were earlier noticed by site crew at and around exterior column. This inadequate re-shoring and lack of strength of subsequent slabs were contributed to the collapse.

Proper Formwork arrangement drawing was not prepared for this particular structure. There was lack of attention in detailing of formwork.



3. Inadequate inspection, No engineering inspection done

Even after workers brought in notice about the cracks around exterior columns, immediate inspection/action was not taken by engineering team. The collapse could have been averted if immediate corrective action was taken.

3.1.3. Lessons learnt

1. Study the structural drawing carefully before commencement of any activity.

2. If any discrepancy found in structural drawing then it should be immediately brought in notice of structural engineer.

3. Follow the Formwork and shoring drawing, if not available then insist for the same

4. Re-shoring design and drawing are must in fast track construction.

5. Strictly prepare construction methodology and follow the same at site.

3.2. Bailey's Crossroads in Virginia (1972)

- 26-stories- apartment building
- Forms were supposed to be supported by floors 7-days old or older as per design
- Successive collapse of slabs in the entire height of the building

3.2.1. Major Causes

1. Uncontrolled acceleration of formwork removal or improper stripping

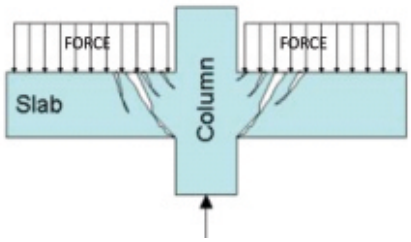
Failure occurred on the 24th floor, where it was shored on to the 5day old 23rd floor. The overloaded 5 days old and premature 23rd floor failed in shear around one or more columns, triggering a collapse that carried through the entire height of the building. Early removal of shores and careless practices in re-shoring caused cascading failures or deficiencies in the complete structure.

It needs to be noted that Formwork shall not be released until the concrete has achieved a strength at least twice the stress to which concrete may be subjected, at the time of removal of the formwork. (Clause 11.3 of IS 456:2000)

2. Punching shear strength of flat slab

Premature 23rd floor was overloaded with the 24th floor slab which lead to punching in slab as shown in picture. Similarly successive slabs encountered the excessive loading due to failure of upper level structure which resulted in collapse in cascading manner.

A typical flat plate punching shear failure is characterized by the slab failing at the intersection point of the column. This results in the column breaking through the portion of the surrounding slab. This type of failure is one of the most critical requirements which need to be considered when determining the thickness of flat plates at the column-slab intersection.



3.2.2. Lessons learnt

1. The time and procedure by which soffit formwork of beams and slabs can be struck should be carefully controlled.

2. The minimum concrete strength at the time of striking the formwork should be specified in the drawings or technical specifications and checked before formwork is stripped.

3. Supports of slabs, beams or girders when it's supported over successive RC members need to be checked for shear capacity of members on which it is being supported.

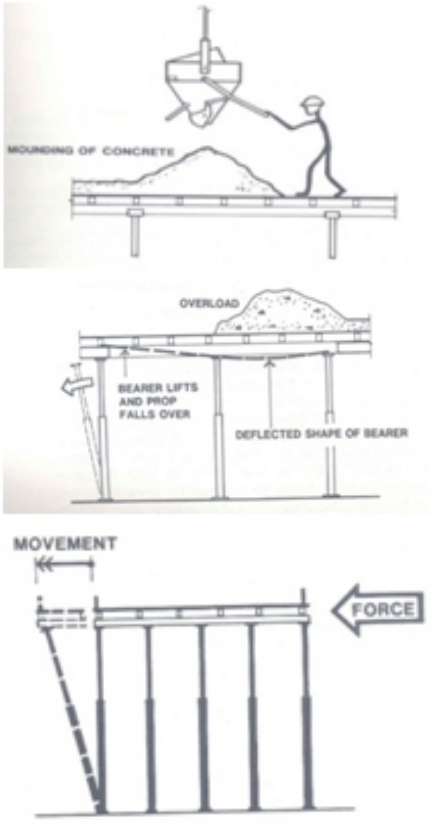
3.3. New York Coliseum (1955)

- A flat plate waffle slab with solid slabs at the column caps
- The floor that collapsed was the first floor above grade supported on two tiers of shores

3.3.1. Major Causes

1. Lack of control on concrete placement

Site team failed to regulate rate of concrete pouring and also the sequence/order of concrete placement on horizontal form which produced unbalanced loadings and consequent failures of the formwork. Power buggies were used which aggrivated the situation.



2. Inadequate bracings

Lateral force on supporting members caused displacement of supporting members and it turns into failure of formwork. Adequate cross bracings, horizontal bracings to vertical supports were not provided which resulted in displacement of supporting members.

3.3.2. Lessons learnt

1.Strictly follow the construction methodology and formwork drawings, if not available then insist for the same.

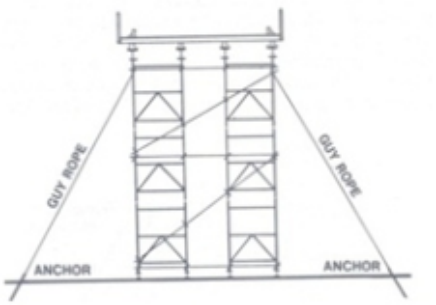
2. Always prepare concrete pour plan giving sequence /order of placement and pouring rate per hour.

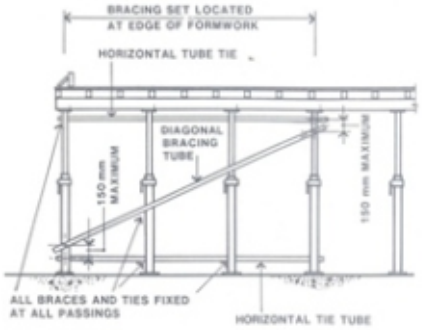
3. Concrete pouring rate shall be controlled. Heap of concrete formed shall not be greater than three times the thickness of slab in an area of 1 sqm.

4. Staging or supporting shall be braced laterally as well diagonally to withstand against lateral forces.

5. Use qualified and trained crew.

6. High shoring must be tied to permanent structures to avoid overturning failure.





3.4. Coal Mill slab

- The area of slab was 15.4 m x 13.3 m x 0.15 m involving 95 Cum concrete
- Collapse of slab during concreting

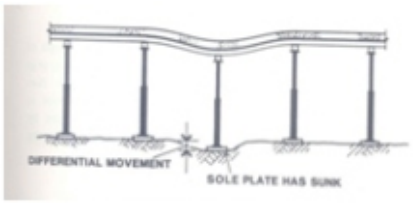
3.4.1. Major Causes

1. Unstable foundation/ soil under mudsills

The collapse of slab was due to settlement of surface on which the entire supporting structure for the slab was erected. The area below the supporting structure was backfilled and no compaction was done prior to erection of staging.

2. Inadequate inspection, No engineering inspection

Knowing that the backfilled area was not compacted fully, the erection of supporting structure carried out without any prior inspection of engineering team.



3.4.2. Lessons Learnt

1. Proper compaction (95% Proctor Density) of the backfilled area shall be ensured.

2. Before the erection of supporting structure, thorough inspection for aspects like ground conditions shall be done by the competent engineer.

3. The staging shall be erected on flat compacted ground surface with suitable base plates depending upon the soil conditions and shall be provided with required cross bracings.

4. Construction method statement shall be prepared for every activity which shall cover all aspects of safety of personnel and structure.

3.5. Slab deflection due to improper supporting

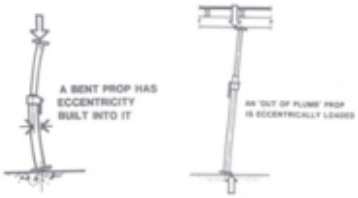
3.5.1. Major Causes

1. Alignment of shoring, non-verticality of supports 150mm slab was supported on 4.5m height of shoring. Verticality of shoring was not checked. During concreting of slab due to loading the vertical support started buckling and deflection formed in soffit.

2. Inadequate bracings

Adequate bracing to vertical support was not provided. Hence load carrying capacity of vertical support reduced and failed in slenderness & buckling. Also lateral forces on supporting members caused displacement of supporting members and it turn into failure of formwork.

3.5.2. Lessons Learnt



1. All vertical supports shall be checked for verticality. In case of out of plumb supports the loads may eccentrically act on the member and bending of member may occur. Eccentrically loaded support may lead to failure of one support and it will go on successive failures of entire system.

2. Height of adjustable jacks at base or top of shoring legs should be maintained as per design.

3. Staging or supporting shall be braced laterally as well diagonally to withstand against lateral forces.

4. Conclusion

Formwork failure can be avoided by following few simple Do's and Don'ts. Everyone in a project must be alert to unsafe conditions and all work must be performed in accordance with safety regulations and the requirements specified in the formwork design/drawings.

Few most important Do's & Don'ts are summarized below:

- Prepare a hazard analysis for a job at site
- Strictly follow the approved drawings if not available, insist for the same
- Strictly follow the specified / approved construction methodology
- Prepare Check list for work
- Take necessary precaution-think in advance and proactively
- Ensure close supervision- Before, During and After
- Use qualified and trained crew
- Do not repeat the mistakes

"Preventable Accidents, if not prevented due to negligence, it's nothing short of a murder".

Dr.S.Radhakrishnan

References

1. Hurd M. K. , "Formwork for concrete", American concrete institute, 1915, 6th edition

2. Wikispaces

3. OSHA accident investigation reports

NEWS FLASH

1. Foundation Stone Laying

Hon'ble Prime Minister of India Shri. Narendra Modiji laid Foundation Stone for the Project of **"Four Laning of National highway Section from Udhampur to Ramban (NH-44)"** in J&K on 7th November 2015. Hon'ble Minister for Road Transport and Highways Shri. Nitin Gadkariji was also present on this occasion. Valued at Rs.1710 Crs, this Project will link Udhampur to Chenani & Nashri to Ramban. Gammon design and execution teams have **swring** in to action and commenced design engineering and site mobilization for fast track execution.

2. Hon'ble Chief Minister of Bihar Dedicated SH 69 Road to Public

With immense pleasure, Gammon is proud to inform that, 154km two lane Road Project of SH69 from Dumaria to Ranitalap, has been dedicated to public of Bihar by Hon. Chief Minister of Bihar Shri Nitish Kumar, on 27th March 2016.

It was one of the most difficult Project in socially affected region having high risk to the lives of staff and workers. In due course of Construction, Gammon faced severe disturbances and Law and Order problems.

It has been proved time and again that despite of all hardships & challenges, we Gammonites complete the project successfully to the entire satisfaction of it's Customer and always work in the interest of the peoples at large.

3. Site Visit By Hon'ble Chief Minister Of Assam

Hon'ble Chief Minister **Sri. Sarbananda Sonowal,** visited Gammon's Bramhaputra Bridge Project, Guwahati to access the progress of the Project and expressed his complete satisfaction towards the same. Mr. V. N. Heggade explained him the Gammon's current and past Contribution in development of Assam.

4. Site Visit By Hon'ble Minister Of Govt. of Delhi

Hon'ble Minister **Sri. Kapilesh Mishra,** visited Gammon's Signature Bridge Project, Delhi to access the progress of the Project and expressed his complete satisfaction towards the same. Mr. V. N. Heggade briefly described technical features of the Signature Bridge to him.

5. Site Visit by Managing Director, KRDCL

Shri. K. S. Krishna Reddy, Managing Director , KRDCL visited Gammon's under construction Sagarkatte Bridge , near Mysore on January 02;2016 and appreciated the progress of the Project. On the date of visit all 36 Girders have already been cast awaiting erection by Crane through Approach Road in the river bed which have since bean erected

6. Anchoring a 16 t. Tower Crane

Gammon's Team at Project of ISCON temple, in West Bengal has successfully done the Ground Anchoring of 16 t capacity Comedil Tower Crane to increase the Height Under Hook (HUH) for the purpose of Dome Erection & Kalash installation. For the first time in Asia, 16 t Capacity Tower Crane has been Anchored with ground to increase the height. The Anchoring arrangement has been developed in House at Taloja Workshop in consultation with H.O. Design team.

7. Erection of Statue in Bramhaputra River.

As a Specialized Job Gammon's Team at Bramhaputra River Bridge, successfully completed the Base structure & erected the statue of Bir Lachit Borphukan in mighty river Brahmputra.

Bir Lachit Borphukan was Commander in Chief for Ahom King who single handedly restricted Mughals from entering in the state of Assam. Govt has installed his statue in mid of the mighty river Brahmaputra over the Well Foundation constructed by Gammon.

8. Commercial Operations of Offshore Container Terminal (OCT) at Mumbai Port Trust.

We take immense pleasure in announcing successful arrival & Berthing Ceremony of the First Vessel Hoeg Seoue on 20th July 2015, for the start of our RORO operations of Gammon's Offshore Container Terminal at Mumbai Port Trust, Mumbai.


Mumbai Port's Offshore Container Terminal berth commences RoRo operations

9. Completion of Building - Runwal Chest-Nut

A 22 storied Building, for which Gammon's team Completed RCC Works has been completed for our Esteemed Customer M/s Runwal Builders, Ltd. at Mulund, Mumbai.

Also Gammon's Team Completed RCC Works, for Four Towers of 42 Storied each for the same Clients at Runwal Greens, Mulund, Mumbai.

10. Erection of Expansion Joint.

Gammon's Brahamputra Bridge Team, has successfully erected Modular Type Expansion Joint weighing 15 t, for 750 mm Expansion Gap at Bramhaputra Bridge, Assam. First Time in India, such a huge Expansion joint has been accurately erected with the help of two Cranes.

11. Completion of Head Race Tunnel Excavation

Gammon's Team for Bajoli Holi Hydro Electric Project, Himachal Pradesh as successfully completed 3 km excavation of Head Race Tunnel with over all tunneling of 5.6 km on February 19;2016.

12. Site Visit by Engineering Students

As a part of the Educational tour, 3rd Semester Students of GIMT Engineering college Tezpur visited Gammon's New Brahmaputra Bridge Project on December 22;2015 to understand the technicalities & method of Construction etc.

13. Commissioning of Intake Well and Tunnel

55m length & 10m high circular cofferdam of Structural Steel was made to facilitate construction by creating water tight working space for construction of Intake Structure. This circular cofferdam has been dismantled successfully and safely by special team of divers using underwater cleaning and cutting method, in highly rough sea condition over the period of one month for commissioning of Intake Well & Tunnel.

14. Kalpakkam Sea Water Intake

Gammon has successfully completed highly challenging work of Sea Water Intake at Kalpakkam. Having capacity of 1,10,000 cum/hr, this structure is an important part of 500 MW PFBR Project. The Intake comprises of Submarine Tunnel, Off-shore Intake structure, Approach Jetty , Seal Pit and Outfall structure.

Upon completion of this structure, M/s BHAVINI could commission condenser cooling water pump and Auxilary Sea Water pump- both of 4900 cum/hr capacity.

Gammon team at site successfully met all the challenges faced during construction while effectively maintaining highest standards of safety and quality. The project involved several uncertainties during tunelling, cassion lowering, under water rebuilding of cofferdam affected during cyclone etc.

Appreciation certificate issued by Dr. P. Chellapandi, Distinguished Scientist, Chairman & Managing Director of M/s BHAVINI speaks a volume about Gammon team's achievements on this challenging Projects.


Dr. P.Chellapandi

Appreciation

15. Gammon's Association with JSW Jaigarh Port

JSW Jaigarh Port, A project dedicated to "Make in India" – a Vision of Shri. Narendra Modi, Hon'ble Prime Minister of India, is the First Port to dock a Cape size vessel (20000 DWT) in India & exibits the International Standard Operational

Efficiency with the accomodatiung capacity of 2.8 Million Tons of Coal.

Gammon is proud to be associated with JSW at this Project since inception.

16. Celebration of Safety Month

Gammon celebrated the month of November- 2015 as Safety month with added enthusiasm and focus on continually developing and enhancing Safety Culture across the Organization. The inaugural Cession was conducted at HO by lighting up the Lamp. Mr. Das, from Safety Department administered Safety pledge to all people gathered. Guidance Safety Speech was given by Dr. N. V. Nayak

Various Programmes like Safety inspection at sites / work stations, Occupational Health Checkup Camps, Traffic Safety initiatives/awareness programs, Various Safety talks & Speeches etc were organized at Various Sites throughout the Month.

17. Safety Day Celebration

Gammon Celebrated National Safety Day on March 4; 2016. The theme for 2016 was declared as "Strengthen Safety Movement to achieve Zero Harm". Various activities, games and events were organized across various sites and offices for the celebrations and spreading awareness across all the working partners.

18. Celebration of WORLD ENVIRONMENT DAY.

Gammon celebrated the World Environment Day on June 05;2016with added enthusiasm.

Various Programmes like Tree plantation and Street rallies for environment awareness, Garbage recycling& Clean up drives in Surrounding areas, Poster competitions, awareness about Oils Storage and handling etc. were organized at various sites.

19. Commissioning of Chimney at Vallur Thermal Power Plant, Enore, Tamilnadu.

Gammon's Team at Vallur Thermal Power Project in Tamilnadu has successfully Completed & Commissioned Chimney for Unit 3 of the Power Plant. The Chimney was inaugurated by Shri.THOMAS JOSEPH, CEO-NTECL, on July 15, 2016.

20. Hajipur Muzafarpur BOT Project Commenced Commercial Operations

The BOT project involving Up gradation of Hajipur-Muzaffarpur section of the existing NH-77 to four lane dual carriageway in the state of Bihar under NHDP phase-lll has commenced Commercial Operations from 1st September, 2016.

Upon determining the Tests to be successful and having been satisfied that the Project Highway can be safely and reliably placed in Commercial service of the Users there off; Independent Engineer declared Project Highway fit for entry into Commercial Operations and issued a Provisional Certificate of Completion with effect from 1st September, 2016 for stretch from km 1+000 to 41+500.

Commercial Operations got delayed inordinately though immediately upon signing the Agreement , the Concessionaire diligently took up field survey work, geotechnical Soil Investigation work, preparation of designs and drawings etc. The Concessionaire also started site mobilization in right earnest for undertaking expeditious and fast track implementation of the Project. Though even one camp at the center of the Site would have sufficed for this 63 km long stretch, the Concessionaire subdivided the Project Highway in three sub-stretches and in order that all the three substretches of the Project Highway are taken up for execution simultaneously and concurrently, the Concessionaire established three Camps. Spreaded in about fifteen to twenty acres each, these camps had full-fledged establishment including field office, mechanical workshops, field laboratories, staff and labour quarters, internet connectivity etc. The Concessionaire also invested huge money for procuring Plant & Equipment and mobilized three independent sets of fleet of Plant and Equipment for accelerated implementation of the Project.

The project was subjected to various hindrances in land acquisition ever since the inception. However barring the hindrance affected locations where delay on account of hindrances was still continuing, the Concessionaire made four lane traffic through in areas where vacant access and Right of Way was provided. The facility, thus constructed by the Concessionaire was put to use for its intended purpose and the four lane traffic on many of these stretches was flowing continuously since August 2012 giving a much needed relief to commuters of this prestigious stretch of National Highway in Bihar as well as to the local residents of this area. In fact the travelling time between these points was drastically reduced to 45

to 60 minutes since August 2012, as against over 3 hours during pre-fourlaning times. However commercial operations were declared only when discontinuities were eliminated, ROB 2 was completed and Authority was in a position to start tolling.

ROB 2 has also been completed now and opened to traffic. This ROB has highest skew (angle of 63 degrees) in the country dictated by availability of ROW posing several challenges in design and execution.

Congratulations to Gammon, NHAI and ICT teams at site who have worked relentlessly amidst all odds and achieved this grand success.

International Road Federation - Indian Chapter is organising 18th World Road Meeting on 14th - 17th November, 2017 at Delhi.

Being organized under able leadership of Mr. K. K. Kapila and Mr. N. K. Sinha, this mega event is expected to be attended by over 3000 international and 1000 Indian delegates.

For the past 60 years the WRM is being organized once every four years. The WRM is a prestigious event and India is proud to host the 18th WRM.

The theme for WRM – 2017 is **"SAFE ROADS and SMART Mobility: The Engines of Economic Growth."** Road transport and mobility are the lifeline of a modern economy and contribute significantly to economic growth and to the overall life of people.

This conference is aimed at identifying and discussing the range of challenges that are faced in delivering safe, sustainable, and smart road transport and mobility at an affordable price: the legal, policy, and regulatory issues, the instruments that are available to policy and decision-makers, new concepts and technologies for delivering transport and mobility, and the possibilities offered by "big data" and technology to reshape the road transport and mobility system to face future challenges.

We invite Gammonites and others to **submit papers for this Meet** on one or more of the themes listed below **for which the Abstract may be submitted by 31st Oct., 2016.:**

Theme 1: Safe Roads for Economic Growth
Theme 2: Safe Mobility
Theme 3: Mobility Challenges
Theme 4: Safe Mobility
Theme 5: Innovative Road Infrastructure
Theme 6: Institutional Framework & Capacity Dev.
Theme 7: Sustainable & Green Transport Infrastructure
Theme 8: Innovative Road Financing and Procurement
Theme 9: Safer Roads
Theme 10: Intelligent Transport Systems

The full Call for Papers and the Form for Submission of Abstracts are available on www.WRM2017.org

COMPANY NEWS

THANKS TO ESTEEMED CUSTOMERS

Goa Bridge & Elevated Road, Goa – Rs. 397 Crs.

Udhampur – Ramban Road Project, J & K – Rs. 1709 Crs.

Gomti Weir Upgradation, U. P. – Rs. 67.20 Crs.

Hospet – Bellary Road Project – Rs. 870 Crs.

Extension of Digha Rail cum Road Bridge, Bihar – 157.14 Crs.

WELCOME TO GAMMON FAMILY

SENIOR GENERAL MANAGER
Devulapalli Venkatarao

GENERAL MANAGER
Sanjiv Kapoor
Jarvis Pereira
Shrikrishna
Amitesh Ranjan

DEPUTY GENERAL MANAGER
Biplob Chakraborty
Atul Roy
Anshul Pathania
Jai Prakash Pandey
Pooja Gupta

SENIOR MANAGER
Sudhikumaran T V

MANAGER
Vinod Rawat
Susant Kanungo
Biplab Som
Sanjoy Bhattacharjee
Shailendra Sharma
Nikhil Malvade
Yash Paul Gupta
Ritesh Kumar
Vinay Kumar Pandey
Ravindra Kumar Srivastava

DEPUTY MANAGER
Mahibub Hanif Biradar
Niwant Jetendra Jani
Suman Kumar Jha
Anil Sharma
Laxmi Nrusingha Mahapatra

AWARDS

1. Dr. N. V. Nayak received Life Time Achievement Award from Indian concrete Institution 24th Sept., 2016.


INDIAN CONCRETE INSTITUTE
ICI-BASF Award for Life Time Achievement
for the year 2016
Awarded to
Dr.Narayan Venkatesh Nayak

2. Dr. N. V. Nayak was appointed as examiner for Ph.D candidates of Civil Engineering Department, by VJTI, Mumbai.

LECTURES DELIVERED

Dr. N. V. Nayak

September 4th, 11th, 13th and 29th 2015

Delivered a Lecture on **"Recent Innovations in Concrete & Foundations Leading to Sustainable Growth"**at Institution of Engineers, Maharastra State Centre, Mumbai

December 17; 2015

Delivered Keynote lecture at IGC 2015 Conference at Pune

January 28 to 30; 2016

Delivered a Lecture on **"Recent Innovations in Concrete & Foundations Leading to Sustainable Growth"** for professionals at Ahamdabad, Rajkot & Bhavnagar, Gujrat.

June 22; 2016

As Chief Guest, Inaugurated the **International Conferenceon "Advances in Concrete Technology, Materials & Construction Practices"** under United Kingdom Education Research Initiatives and delivered the keynote lecture on "Sustainable Concrete".

August 20; 2016

Participated in an Interactive Meet with faculty and students at **National Institute of Technology,** Suratand delivered a lecture on **"Practical Guidelines for Quality Geotechnical Investigations and Analysis"** and also **"Recent Innovations in Pile Foundations"** at the meet.

September 6; 2016

Delivered a lecture on "Practical guidelines for Quality Geo-technical Investigation and recent Innovations in Pile Foundations" at Pune.

M. V. Jatkar

November 03; 2015

Delivered a lecture at MCGM training centre, Mumbai.

Anupam Das

October 31; 2015

On Invitation, delivered Lectures on **"Skills & Qualities in the field of Execution/Construction expected from a Civil Engineer in a Professional Field ahead, based on Construction Company's Perspective" &"Multistage long distance concrete pumping: Engineering solution adopted in Bogibeel Bridge"** at "TechXetra 2015" – a Industry & Academic Professionals & Students interaction of all the branches of Engineering at Tezpur University, Assam.

September 30; 2016

Attended the First Meeting of CII - Confederation of Indian Industry North East Core Committee on Infrastructure and nominated as member of core committee.

GIL PAPER PRESENTATIONS

Dr. N. V. Nayak

Paper on "Some Basic Guidelines in Use of Steel Rebars in High Rise Buildings" published in Structural Engineers Quarterly journal Vol.16-4 by ISSE.

STAFF RECOGNITIONS

Chi. Aastha, (7 Yrs) daughter of our HO-Secretariat staff Mrs. Niki Shingade has participated and skated for 72 hours continuously for the theme of "Save Indian Traditional and Culture" thereby creating a unique world record at Belagavi, Karnataka. Record is registered in Limca and other books of Records.

COMMISSIONING OF FIRST CLUSTER OF CHAKSU WATER SUPPLY PROJECT

First Cluster of Chaksu Water Supply Project has been commissioned on 9th July, 2016.

Upon commissioning of Pump House of this Project located at Kothum, treated Drinking water has reached several thirsty villages of nearby area. The joy on the faces of villagers when the first drop reached their village was something which can not be described in words.

This Project is part of Hon'ble Chief Minister's ambitious dream Project of providing treated Drinking Water to thouands of villages who have been deprived of this basic need. The Project consists of over 65 packages and being executed by several reputed contractors.

The whole Project is driven by Mrs. Kiran Maheshwari, Hon'ble Minister of PHED Rajasthan and Mr. J.C. Mohanty, the Principal Secretary, Government of Rajasthan. Under their able Leadership the whole Project is progressing well.

During the opening ceremony, Mr. ArunShrivatsava, Additional Chief Engineer, PHED Rajasthan remarked:

"Congrats for Kothoon pump house commissioning. May God bless you to achieve many more such laurals. Thanks for inviting for nice ceremony."

Arun Srivastava, Addnl. Ch. Engineer, PHED

We wish to place on record our appreciation to whole team of PHED, especially Mr. Sanjay Agrawal, Executive Engineer, PHED for guidance and support provided without which fast track execution of this project would not have been possible. Congratulations to HG Infra and Gammon teams who have worked relentlessly amidst all odds and achieved this grand success.

Another four clusters covering 114 villages are also ready for commissioning awaiting supply of electrical power.

A CAPITAL EXCELLENCE

- THE Signature Bridge ACROSS YAMUNA RIVER AT DELHI

India's First Cable Stay Bridge with an Inclined Steel Pylon

India's first *"Signature Bridge"* being constructed by Gammon across Yamuna river at Wazirabad, promises to be a great tourist attraction of Delhi, the Capital of India. This cable-stayed bridge will link NH-1 at Wazirabad on Western bank and at Khajuri Khas on eastern bank of the river Yamuna, connecting North Delhi with East Delhi.

With a length of about 575 m (main bridge) +100 m extension and a height of 154 m, with glass facade at top part, the proposed *Signature Bridge* would have a bow-shaped steel pylon in the middle. Two high towers will provide double cable support in the inner periphery of the carriageway. The deck will be composite (steel and concrete) while the pylon will be in steel.

Equipped with four lanes, this engineering masterpiece will have a 1.2 m wide central verge, space for anchoring cables, maintenance walkway and crash barrier on either side of the central verge. Once operational the *Signature Bridge* will dramatically improve access between North and East Delhi reducing present congestion and traffic jams and will become the identity of Capital City – the way Taj Mahal is to Agra

CLIENT: DELHI TOURISM & TRANSPORT DEVELOPMENT CORPORATION

CONTRACTOR: GAMMON INDIA LTD- C. CIDADE - TENSACCIAI JV

DESIGN CONSULTANTS: SCHLAICH BERGERMANN & Partners, Germany

PROOF CONSULTANTS: M/s SYSTRA SA, France

GAMMON INDIA LIMITED

GAMMON HOUSE, V. S. MARG, PRABHADEVI, MUMBAI 400025 INDIA

www.gammonindia.com, www.gammoninfra.com

EPC CIVIL| POWER T&D| POWER MANUFACTURING| PPP|REAL ESTATE