Modern formwork systems
Preface

Formwork which holds and supports wet concrete till such time it cures, is a very vital element in concrete construction. It has become foremost to have speedy construction and timely completion of projects. Now days, modern formwork systems for superstructure construction are commonly adopted. Formwork system affects on the cost, time and quality of project delivery. But still modern formwork systems are not much used in India and most of the contractors do not like to shift to the latest technology as they have the doubt of facing losses in the project and they are very much familiar with the existing formwork type, the conventional type. At the same time they believe that these formwork systems are bit expensive. This report aims to provide knowledge and techniques on modern formwork systems.
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1. Introduction:

Modern formwork systems are designed for speedy and efficient construction. This report describes generic types of modern formwork system that are widely available globally and considers their applications, advantages and main features related to HSE (Health, Safety & Environment) parameters and sustainability performance. These systems are pre-engineered to provide increased accuracy and minimize waste in construction and most have health and safety features built-in.

![Image of formwork system]

Better quality buildings at faster speed of construction rate, cost effective and environment friendly manner can be achieved by using advance formwork systems. The rapid advancements in the field of formwork, along with the innovations in concrete as a material has led to a revolutionary change where safer, quicker, sustainable and more efficient construction is possible these days.

2. Formwork Scenario in India:

- Low technology
- Labour intensive
- Labour-unskilled, migratory, traditional and family oriented
- Absence of monitoring body generally for quality construction.
3. Requirements of a Good Formwork System:

- Formwork is to be strong enough to withstand the dead and live loads, forces caused by ramming and vibration of concrete and other incidental loads imposed upon it during and after casting of concrete.
- Suitable arrangements should be there to avoid any settlement in the formwork either before or during the placing of concrete.
- Formwork should be of sufficient stiffness to avoid excessive deflection and joints should be tightly butted to avoid leakage of cement slurry.
- Formwork must be accurately set out so that the resulting concrete product is in the right place and is of correct shape and dimensions.
- Formwork surface is to be coated with suitable mould oil so that good concrete quality and surface finish can be achieved.
- Form panels and units should be so designed that their maximum size does not exceed and can be easily handled by hand or mechanical means. In addition, all formwork must also be designed and constructed to include facilities for adjustments, leveling, easing and striking without damage to the formwork or concrete.
- Ensure optimum stock of formwork for the size of work force, the specified time schedule and flow of materials.

3.1 Components of Formwork:

- propping and centering
- shuttering
- provision of camber
- cleaning & surface treatment

Propping and centering:

The props used for centering may be of steel, timber post or ballies.

Shuttering:

Shuttering can be made up of timber planks or it may be in the form of panel unit made either by fixing ply wood to timber frames or by welding steel plates to angle framing.
Provision of camber:

Certain amount of deflection in structure is unavoidable. It is therefore desirable to give an upward camber in the horizontal member of concrete structure to counteract the effect of deflection.

Surface treatment:

- Formwork should be cleaned of all rubbish particularly the dust & chippings etc.
- Before laying concrete the face of formwork in contact with concrete shall be cleaned & treated with release agent like raw linseed oil or soft soap solution as to prevent the concrete getting stuck to the formwork.

Order and method of removing formwork:

- Shuttering forming vertical faces of walls, beams & column sides should be removed first. Shuttering forming sofit to slab should be removed next.
- Shuttering forming soffit to beams, girders or other heavily loaded member should be removed in the end.

3.2 Duration taken for removal of formwork (As per IS 456):

In normal circumstances where ambient temperature does not fall below 15 degree Celsius and where ordinary Portland cement is used and adequate curing is done, following removal period of formwork may deem to satisfy -

<table>
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<th>S.No.</th>
<th>Type of Formwork</th>
<th>Minimum Period before removal of Formwork</th>
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<td>1.</td>
<td>Vertical formwork to columns, walls, beams</td>
<td>16 - 24 hours</td>
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<td>2.</td>
<td>Soffit formwork to slabs (Props to be re-fixed immediately after removal of formwork)</td>
<td>3 days</td>
</tr>
<tr>
<td>3.</td>
<td>Soffit formwork to beams (Props to be re-fixed immediately after removal of formwork)</td>
<td>7 days</td>
</tr>
<tr>
<td>4.</td>
<td>Props to slabs:</td>
<td></td>
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<tr>
<td></td>
<td>a) Slab spanning up to 4.5 m</td>
<td>7 days</td>
</tr>
<tr>
<td></td>
<td>b) Slab spanning over 4.5 m</td>
<td>14 days</td>
</tr>
<tr>
<td>5.</td>
<td>Props to beams and arches</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Spanning up to 6 m</td>
<td>14 days</td>
</tr>
<tr>
<td></td>
<td>b) Spanning over 6 m</td>
<td>21 days</td>
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4. Design and layout of formwork:

The design and construction of formwork shall take account of safety and of the surface finish required. The formwork shall be sufficiently rigid and tight to prevent loss of cement slurry from the fresh concrete or the formation of fins and honeycombing on surface. For further details regarding design, detailing, etc. reference may be made to IS 14687.

Formwork and its supports maintain their correct shapes and profile so that the final concrete structure is within the limits of the specified dimensional tolerances. They shall be designed to withstand the combination of self-weight, reinforcement weight, wet weight of concrete, concrete pressure, construction and weather loads, together with all incidental dynamic effects caused by placing, vibrating and compacting the concrete. Formwork shall never be tied to or supported by the reinforcement steel.

All horizontal and vertical formwork joints on exposed surface shall be so arranged that joint lines are staggered. Where the contractor proposes to make up the formwork from standard sized manufactured formwork panels, the size of such panels shall be approved by the Engineer in charge before they are used in the construction of the works. The finished appearance of the entire elevation of the structure and adjoining structures shall be considered when planning the pattern of joint lines caused by formwork and by construction joints to ensure continuity of horizontal and vertical lines.

5. Types of Formwork:

There are different types of formwork available for different purposes. The various types of formwork are discussed in detail.

5.1 Conventional Formwork: [As per IRUSS 2010 Para 4.2.3.2, timber shuttering should be discouraged and should be permitted only with the specific approval of the Engineer]

This is the most traditional type of formwork and this uses timber, bamboo, masonry and carpentry to complete construction. Low initial cost, low experience factor and low weight are some of the advantages while high floor cycle, poor finish, and high labor requirement are the disadvantages of this formwork type. This formwork type is still in practice in two – three storey building construction projects.

5.2 MS Formwork:

This consists of panels fabricated out of thin steel plates stiffened along the edges by small steel angles. The panel units can be held together through the use of
suitable clamps or bolts and nuts. The panels can be fabricated in large number in any desired modular shape or size. Steel forms are largely used in large projects or in situation where large number reuses of the shuttering is possible. This type of shuttering is considered most suitable for circular or curved structures.

5.3 Need for Modern Formwork Systems:

The earliest formwork systems made use of wooden scantlings and timber runners as it enabled easy forming and making at site. But these wooden scantlings and timber runners tend to loose their structural and dimensional properties over a period of time and after repeated usage thus posing safety problems. Many of the accidents take place in Reinforced Cement Concrete (RCC) construction because of inferior formwork and scaffolding.
6. Modern Formwork Systems:
The modern formwork systems are designed for speedy and efficient construction. They are designed to provide increased accuracy and minimize waste in construction and most have enhanced health and safety features built-in.

Main type of Modern Formwork Systems in world – wide use are:

1) Table or Flying Formwork
2) Column Formwork
3) Horizontal panel Formwork
4) Vertical Panel Formwork
5) Jump Formwork
6) Slip formwork
7) Tunnel Formwork

6.1 Table or Flying Formwork Systems:

These systems consist of slab formwork “tables” that are reused on multiple stories of a building without being fully dismantled. The assembled sections are either lifted per elevation or using cranes from one storey to another. 'Fillers' are used to fill gaps between the tables and walls. The mobility factor, along with the relatively easy installation means that these systems are widely used in construction projects where repetitive structures, where flat slab and slab layouts are involved.

![Table formwork systems](image)

(Table formwork systems are typically used in large floor layouts)

Some of the application areas include residential apartment units and commercial buildings. Since the assembled units can be moved easily, it ensures speedy construction, apart from the high quality surface finish.
Moreover, the wastage generated is negligible as compared to the traditional formwork systems that were earlier used. Another key factor that should be noted is that with the table formwork system time is also saved, which in turn leads to cost savings, particularly in the case with structures with flat slabs. Moreover, the engineered nature of the formwork and the repetitive process ensures that there is almost negligible wastage.

6.2 Column Formwork System:

Column formwork has gained in popularity due to the shortage of labour in recent times. Modular in nature and allowing for quick installation on site, column formwork systems are now available in a variety of materials depending on the concrete finish requirement.
(The highly engineered nature of a column formwork system ensure greater construction efficiency)

Different formwork systems for different column sizes can be easily assembled on site. Their entire working process is also simple. Once the concrete is poured and hardened, the formwork is then stripped and moved to the next position. In certain cases the formwork systems may be left for a longer period of time for added curing.

One of the major advantages with column formwork systems is the highly engineered nature of the formwork. They ensure greater control over the construction operations. This automatically means reduction in wastage, time and labour costs.

6.3 Horizontal Panel Systems:

Smaller, lightweight modular systems have now a days become the requirement. These systems are being made from a variety of materials such as fiber glass, aluminum and steel, apart from other customized options. These easy-to handle systems enable quicker erection, saving precious time and money. Suppliers have also been concentrating on reducing the number of different components in formwork systems, which in turn allows for a quicker installation process. Horizontal panel systems usually consist of a series of interconnected false work bays and pre-formed decking panels and are typically used for slab construction.
The lightweight nature of the components is perhaps the biggest advantage with horizontal panel systems. They can be moved around the site with relative ease, as compared to traditional formwork. Adding to it is the engineered nature of the formwork which ensures reduced wastage. Another major advantage with lightweight formwork systems is safety, since working from height is not necessary, as erection work can be carried out from below.

6.4 Vertical Panel Systems:

Vertical panel systems are used in the construction of standard columns, concrete walls or perimeter basement walls due to their flexible nature. It can either be smaller modular components or larger crane-lifted systems. This can be used for forming vertical elements and are usually modular in nature. Consisting of a steel frame, they are easier to assemble, in turn leads to reduced labour costs, making them a more cost effective option than traditional formwork systems.
(Vertical panel systems are adaptable to various structural geometries)

Vertical panel systems is popular due to their adaptability to varying wall heights, structural geometries and a less labour intensive. The easier erection process expedites the construction process, apart from the fact that the engineered nature allows for precision and superior control of operations for the on-site team. This can be used repeatedly, after an easy cleaning process.

6.5 Jump /Climbing Formwork Systems:

Jump form systems are becoming popular globally. Jump form, also referred to as climbing form, comprises of formwork systems complete with working platforms that supports itself on the concrete that has been cast earlier. It therefore does not rely on support from the building. They are typically used in construction of multi-storied vertical concrete elements. Some of the concrete elements that are constructed using jump form systems include, core walls, shear walls, bridge pylons and lift shafts. The use of jump form systems helps in cutting down on labour costs, while increasing construction efficiency.
(Use of for climbing formwork systems in high-rise construction)

The jump formwork modules can be joined together to suit different construction geometries. Latest advancement in the field has been the advent of self-climbing formwork systems, that do not require the help of a crane to be relocated to the next construction level and climbs on rails by means of hydraulic mechanism.
Climbing formwork is usually used in the construction of buildings over five storey. Self-climbing, automated systems are generally used in the construction of buildings with more than 20-25 floors. Based on the site conditions, there are also instances when a combination of self-climbing and crane-handled jump form systems is used. The engineered nature of the formwork means that jump form systems allows for better control of the construction process. Repetitive use is possible adding to the cost-effectiveness of the construction process. Apart from offering enhanced safety, the use of jump form systems also ensures minimal concrete wastage and helps to stick to tight project deadlines.

6.6 Slip Formwork System:

Similar to jump formwork systems, this type of formwork rises continuously, supporting itself on the core. Slip form systems are typically used for the construction of core walls in skyscraper projects. Since very little crane time is required, they are used for the construction of stair shafts and lift shafts in high-rise structures. Slip form systems rely on the quick setting properties of concrete and require balance between quick setting capacity and workability of the concrete.
While the concrete needs to be workable enough to be placed into the form and packed, it should also be quick setting so that it emerges from the form with strength. Moreover, the freshly set concrete should, apart from its strength, also allow the form to 'slip' to the next level above, apart from supporting the freshly poured concrete above it. Typically slip form systems rise at a rate of about 300 mm per hour and with prudent planning, high rates of production are possible.

This also leads to reduced concrete wastage. The integration of work platforms in the formwork systems is another advantage that apart from ensuring safety also makes optimum utilization of work space available in a construction site. This slip form systems is being preferred in core wall construction.
6.7 Tunnel Formwork System:

A tunnel formwork system is the latest innovations in the formwork industry. The use of repetitive cellular structures to construct both horizontal and vertical elements together is something that has got the potential to revolutionize the construction industry in countries like India. They enable construction of walls and floors together which make the process ideally suited for both high and low raise housing.

Easy to clean and reuse, the use of tunnel form systems also enables high quality surface finishes. Engineers are also assured of high dimensional accuracy of structures. The repetitive nature of the construction work is another plus point with this type of formwork system, adding to its other advantage of requirement of a very small team on site.
Tunnel form can accommodate room widths from 2.4 to 6.6m. When rooms are wider (up to 11m), a mid-span table is incorporated between the tunnels. The main component of the system is the half tunnel. Manufactured entirely from steel, including the face of the form, the half tunnel provides the rigidity and smooth face necessary to produce a consistently high quality finish to the concrete.
When two half tunnels are put together this creates a tunnel. These are fixed together to produce a tunnel length that suits either the building dimensions. The tunnel is tailored to the room width and height by the inclusion of infill sections. These are not loose fittings but are an integral part of the tunnel.

(Tunnel form structure)
(Construction cycles can be as low as 24 hours with tunnel form systems)

### 7. Comparison – Field application of various formwork systems in IR.

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<th>Application in Railway</th>
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<tbody>
<tr>
<td>1.</td>
<td>Table or Flying Formwork</td>
<td>Multi – storey Flat slab and slab layouts i.e. MFCs, station buildings</td>
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<tr>
<td>2.</td>
<td>Column Formwork</td>
<td>Different columnar sizes for station buildings, multistory construction etc.</td>
</tr>
<tr>
<td>3.</td>
<td>Horizontal panel Formwork</td>
<td>Light-weight formwork for slab construction for station buildings, multistory construction etc.</td>
</tr>
<tr>
<td>4.</td>
<td>Vertical Panel Formwork</td>
<td>Flexible and adaptable to varying wall heights &amp; structural geometries for bridges structures like curved deck slabs etc.</td>
</tr>
<tr>
<td>5.</td>
<td>Jump Formwork</td>
<td>For construction of vertical concrete elements in high rise buildings i.e. more than (G +5) for stations &amp; multistoried buildings in railways.</td>
</tr>
<tr>
<td>6.</td>
<td>Slip formwork</td>
<td>for stair shafts &amp; lift shafts in high rise structures or OHTs in Railways.</td>
</tr>
<tr>
<td>7.</td>
<td>Tunnel Formwork</td>
<td>for construction of horizontal &amp; vertical elements together in station &amp; multistoried buildings.</td>
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8. Main consideration during selection of formwork:

8.1 Safety:

Safety in formwork is major concern today especially in high-rise construction and large infrastructure projects like metros, flyovers, bridges etc. It is a known fact that safety levels are so lower the International Standards. Safety cannot be treated as a separate entity; rather it should be an integral part of the formwork system. Formwork & scaffolding being the major contributors to the safety in construction sites as they are used for the rebar and concreting works. The various areas of safety that need to focus and integrate with formwork are:

- Access (both Vertical & Horizontal)
- Working platforms –
- Lifelines and Safety Catch Nets
- Erection & Dismantling of Formwork
- Storage & Maintenance of Formwork
- Simple Tools & Tackles
- Design and Engineering

During selection of formwork system above aspects shall be considered.
8.2 Standardisation:

Standardisation of the various formwork systems is also an aspect to introspect because we cannot afford to have too many systems at sites which leads to lot of complications in terms of usage as well as accountability. The formwork systems should be standardized such that a single system is adaptable to various structural elements and also across various projects. Though it has its own limitations, still standardization can be done to an extent which reduces the number of components involved in a system, increase efficiency of the components involved and the flexibility in usage of these (in terms of sizing and detailing).

8.3 Green Formwork:

Rapid industrialization, growth in population and urbanization have consumed non-renewable natural resources of the planet but also caused unprecedented rise in global warming. Most leading business houses and industries across the world have adopted Corporate Social Responsibility (CSR) as the roadmap of their current and future business ethics and principles. Currently no importance is being given to this aspect of Green Concept and Sustainability. In future, our approach should be “Greener Formwork Systems” to do our part for the betterment of environment. Achievement of a sustainable formwork system could lead for more sustainable construction and enhance the construction industry sector to uphold sustainability for future generations.

8.4 Costing of formwork:

A modern formwork system is essential to meet the construction on well in time and at competitive rates. However the modern formwork system requires more price than conventional system. Hence costing of formwork for a particular project is very critical for the engineers. Considering the factors like the efficiency of formwork being linked to the succeeding & preceding activities, idling at sites and poor planning; the time-bound costing method ends up with higher formwork costs especially on materials for no fault of formwork.

9. Basic Safety Requirements:

9.1 Hazards in Formwork -

‘Hazards’ are potential dangers. Hazardous activities in formwork design, erection, use and dismantling are as follows:

-Incorrect or incomplete formwork design
- Erecting frames and bracing
- Erecting bearers and joists
- Placing deck and beam formwork
- Moving around on formwork during rebar placement, concreting, and curing
- Dismantling formwork

In erection, use and dismantling phases, most activities involve following common hazards:

- Climbing up to or down from formwork, usually by ladders
- Working at height with unprotected edges on platforms
- Tripping and falling at level
- Falling through gaps and holes in formwork
- Falling from incomplete or badly designed formwork
- Hit by formwork components
- Carrying heavy loads - Struggling with awkward shapes
- Fitting damaged connections and components
- Handling sharp objects and corrosive materials
- Working in harsh (sunny, cold, wet, windy, dusty, noisy etc.) environments
- Uneven, sloping and cramped work surfaces
- Overloading of formwork

In addition to these, dangers may also arise from inadequate supervision, material flaws etc. To cover all these in a paper would be an onerous task. The report will therefore focus only on the following factors in this report:

a) Some design considerations,
b) Working safely at height and
c) Manual handling of heavy loads.

9.2 Working Safely at Height:
Working at height has been the most hazardous activity from and attract the maximum number of accidents and the maximum number of fatalities. There are many ways in which safety may be ensured while working at height, as follows:

- Guardrail and toe board (Fig. 1A)
- Work restraint, attachment to lifeline (Fig. 1B)
- Retractable lifeline (Fig. 1C)
- Auxiliary scaffolding (Fig. 1D)
- Safety net below (Fig. 1E)
- Safety harness (Fig. 1F)
Fig. 1 Safeguards for working at height

In providing risk control against falling from height, collective control for all workers (A, D, or E) is better than individual control (B, C, or F); fall prevention (A, B, C, or D) is better than ‘fall arrest’ (meaning termination of a fall before hitting the base) to reduce the effects of fall impact after one has fallen (E or F).

In terms of hierarchy of safety then, A or D is the best and F is the worst. The full-body harness (E) also comes with a number of other auxiliary requirements for effective deployment, including proper fit, sufficient fall distance, strong anchorage and prompt rescue.

10. Form Work Management Based On Ubiquitous Computing:

Form work significantly influences successful project completion in high-rise / mid-rise building construction with reinforced concrete structures. One of the effective ways for reducing the form work duration is to strip the forms without delay when concrete placed in the form is sufficiently cured to stand by itself. In order to strip the forms at the appropriate time, it is important to estimate the concrete strength development at the early stage of the curing process. The concrete maturity method
can determine the concrete strength more accurately and consistently than other conventional methods such as using test cylinders or a Schmidt hammer. A ubiquitous computing environment can facilitate the application of the concrete maturity method on the construction site and a wireless temperature monitoring system has been recently developed in Korea. The system is discussed below.

10.1 Wireless Temperature Monitoring System:

Figure 2) shows the constitution of the wireless temperature monitoring system developed in Korea. The system transmits the temperature data measured from the sensors wirelessly in real-time into the personal computer in the site office and estimates the maturity and concrete strength. The data are also stored in the computer server and information is shared with related experts for technical support. However, there are some limitations on the application for form work management in a structural frame work in high rise building projects as follows:

1) Time for installing the sensors and connecting wires with recording devices,
2) Identification of the data into the PC in the site office and
3) Gap between the time when the estimated strength of concrete reaches the required standard and form stripping time due to a planned schedule in structural frame work.

However research have been carried out and the above bottlenecks were overcomes. The research proposes a method which integrates a sensor and recording device with a form and the sensor and recording device can be separated from the form in the case of a problem such as failure in the sensor or discharge in the recording device. The installing time may then be reduced considerably. Next, the construction manager can identify acquired data and estimated strength on the PC in the site office. However, this could cause proper and timely actions to be delayed according to the changes in the site condition, even though the system has the function of sending the warning message to the managers.

Mobile devices, such as smart phones and web pads, can be offered as useful tools for timely management. Form stripping work could be delayed at the time when the required concrete strength is gained. This is because the time of resources input needs to be adjusted if the time taken to reach the required strength for form stripping is inconsistent with the time planned in advance. Thus, daily work management needs to be managed effectively through predicting the concrete strength development and form stripping time.
11. Removal of formwork:

Formwork shall be so designed as to permit easy removal without resorting to hammering or levering against the surface of the concrete.

The periods of time elapsing between the placing of the concrete and the striking of the formwork shall have regard to the following factors:

- concrete strength;
- stresses in the concrete during construction including for precast units any disturbance and handling stresses;
- curing;
- subsequent surface treatment requirements:
- the presence of re-entrant angles requiring early removal of formwork to avoid thermal cracking.

The time shall be as approved by the Engineer-in-Charge after consideration of the loads likely to be imposed on the concrete and shall in any case be not less than the periods specified in the Code.

Notwithstanding the foregoing the Contractor shall be held responsible for any damage arising from removal of formwork before the structure is capable of carrying its own weight and any incidental loading.
12. Conclusion:

Different formwork systems provide a wide range of concrete construction solutions that can be chosen to suit the needs of a particular development. Traditional formwork for concrete construction normally consisted of bespoke solutions requiring skilled craftsmen. This type of formwork often had poor safety features and gave slow rates of construction on-site and huge levels of waste – inefficient and unsustainable. Modern formwork systems, which are mostly modular, are designed for speed and efficiency. They are engineered to provide increased accuracy and minimize waste in construction and most have enhanced health and safety features built-in.

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(iv) Formwork - Wikipedia, the free encyclopedia
(v) Information on http://www.mivan.com
(vi) Swapnali M. Karke, M.B. Kumathekar, Civil Department, Government College of Engineering, Karad, Maharashtra-415124

14. Modern formwork manufacturers/ Suppliers:

1. Doka India Pvt. Ltd. (The Formwork Experts)
2. GCI Wall Forms Private Ltd. (Mass Customizer of Concrete Forming Systems)
3. Indigo Multitrade Pvt. Ltd. (Composite Fiberglass Formwork System)
4. Kumkang Kind India (The Total Formwork Solutions Provider for Gang-Formwork, Aluminum Formwork, System Formwork)
5. MFE Formwork Technology (I) Pvt. Ltd. (JUST GOT BETTER We lead… Others follow)
6. Nav Nirman Beam Technics (Formwork H-Beam for Column Formwork, Circular Formwork, Wall Formwork, Slab Formwork)
7. Nova Plasmold P. Limited India’s (First Modular Plastic Formwork System)
8. Paschal Formwork India Pvt. Ltd. (Paschal - The German Formwork for Modular Panel System for Vertical Structures, Paschal Deck System and e-deck System for Horizontal Structures)
9. Peri (india) Pvt. Ltd. (Formwork Scaffolding Engineering The light weight Panel formwork for crane independent Forming)
10. Sparkonix (India) Pvt. Ltd. (Largest ABS Plastic Formwork Manufacturer)
11. Ulma Formwork Systems India Pvt. Ltd.  (Self Climbing and Crane Climbing System Formwork)

**Detailed address of manufacturers/ Suppliers:**

(1) Doka India Pvt. Ltd.
Plot No. 26 A, Sector -7,
Kharghar, Mahavir Landmark Bldg.,
601 to 606, 6th Floor, Navi Mumbai- 410210
Tel: +912227746452
Fax: +91 2227746451
india@doka.com

(2) GCI Wall Forms Private Ltd.
98 B & C,
2nd Phase Jigani Industrial Area,
Anekal Taluk,
Bangalore -562 106. INDIA
Tel : +91-80-42114327
Mob :+91-98450 70670
+91-97408 50670
Fax : +91-80-27825636
Technical Support - support@gciwallforms.com
Corporate inquiries - pgiri@gciwallforms.com

(3) INDIGO MULTITRADE PVT. Ltd.
416 & 408, Bhaveshwar
Complex, Vidyavihar West,
Mumbai, Maharashtra 400086
TEL: +91.22.25021144
Fax: +91.22.25025994
Email: info@indigo.in

(4) Kumkang Kind India Pvt. Ltd.
101/102 Wagh Manor,
Plot No. 222, 27th Road,
Bandra (W) Mumbai – 400 050
Email: dykim@kumkangkind.com

(5) MFE Formwork Technology (I) Pvt. Ltd.
302, 3rd floor, Satellite Silver,
Andheri Kurla Road, Andheri (East),
Mumbai, India
Phone: +91-22-67108207
Mob. + 98-2066 2333
Fax: +91-22-6725 0171
Email: ketan@mfeformwork.com

(6) Nav Nirman Beam Technics
Plot No-6, Road No 07, Ida Nacharam,
Ida Nacharam, Hyderabad, Telangana 500040
Phone: 040 2715 0119
http://www.navnirman.in/

(7) Nova Plasmold Private Limited
103, Hargovind Enclave, Laxmi Nagar,
Laxmi Nagar, New Delhi, Delhi 110092
Phone: 098450 55440

(8) PASCHAL Form Work (India) Pvt.Ltd
Plot No.901,
Road No.46, Jubilee Hills
Hyderabad - 500033
Phone: +91 40 6658 0505
Fax: +91 40 6658 0506
www.paschalindia.com
service@paschalindia.com

PASCHAL Form Work (India) Pvt. Ltd.
Bayyavaram (Village)
Kasimkota (Mandal), Anakapalli
Vishakhapatnam Dist. 531031
INDIA
Phone: +91 89 24 244 053
Fax: +91 89 24 244 055
www.paschalindia.com
service@paschalindia.com

(9) PERI India Pvt Ltd
1406, DLH Park, S.V. Road,
Goregaon (W) Mumbai - 400 062
Phone: +91 (22) 3371 7400
+91 (22) 2876 7400
Fax: +91 (22) 2879 2991
info@peri.in
www.peri.com

(10) Sparkonix (India) Pvt Ltd
B-4, H Block, MIDC, Pimpri,
Pune – 411 018.
Phone: +91 20 2747 0643 / +91 20 2747 6452
Fax: +91 20 27464736
Email: sparkedm@vsnl.net

(11) ULMA FORMWORK SYSTEMS INDIA PVT. LTD
206, Inizio, Cardinal Gracious Road,
Chakala, Andheri (East)
MUMBAI 400099, Maharashtra
India
Phone: + 91 22 28253676 / +91 22 66713899
Fax: + 91 22 28253676
Web: www.ulmaconstruction.in

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