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# Advance Technology of MYVAN Shuttering for High Rise Buildings

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***Abstract:*** ***MYVAN/Mivan aluminium formwork is a repetitive construction technology used for high-rise and mass-housing projects where rapid floor cycles, dimensional consistency and a controlled concrete finish are important. The supplied project material describes a system based on lightweight, high-strength aluminium panels that can be assembled and reused for repeated floor construction. The technology supports monolithic casting of walls and slabs and is associated with smooth concrete surfaces that can reduce the need for extensive plastering. The present project review examines the technology, its objectives, scope, construction methodology, case-study observations, quality implications, cost and efficiency considerations, advantages and limitations, and future applicability. The supplied case study concerns a 23+ storey residential project using aluminium formwork for walls and slabs. A 6–8 day floor cycle is reported for the case study, while the project introduction gives a broader typical range of 7–10 days per floor. Panel reuse of up to 200–300 times is reported. These figures are retained as source-supported observations and are not treated as a controlled experimental comparison. The report expands the supplied project information into a structured engineering document with process diagrams, three-dimensional conceptual models, graphs, technical tables and illustrative calculations. Calculations that require unavailable project-specific inputs are explicitly identified as illustrative methods rather than measured results. The overall discussion shows how repetitive aluminium formwork can support faster construction, consistent finish, reduced finishing dependency and repeated use of formwork panels when the project has suitable repetition and adequate planning.***

***Keywords: MYVAN/Mivan shuttering, aluminium formwork, monolithic construction, high-rise buildings, floor cycle, panel reuse.***

## I. INTRODUCTION

### *A. Background*

High-rise construction requires a coordinated sequence of reinforcement, formwork, concrete placement, curing and de-shuttering. When many floors have similar layouts, the productivity of the formwork system becomes a major part of the construction cycle. A formwork system that can be repeatedly assembled with predictable geometry can therefore support faster and more consistent floor construction.

The supplied project identifies MYVAN/Mivan aluminium formwork as a modern construction technology developed by the Mivan Company in Malaysia. The system uses lightweight, high-strength aluminium panels that can be handled and assembled for repetitive wall and slab construction. The source material emphasizes monolithic construction, smooth concrete finish, dimensional accuracy and suitability for high-rise and mass-housing projects.

### *B. High-Rise Construction*

In a high-rise building, every floor is connected to the sequence of the floors above and below. Delays in one cycle can influence reinforcement, services, finishing and follow-on activities. Repetitive formwork therefore has value not only as a temporary mould but as part of the production system for the building. The project case study describes a 23+ storey residential building and reports a 6–8 day floor cycle using Mivan aluminium formwork for walls and slabs.

### *C. Conventional Formwork*

Formwork temporarily defines the shape, dimensions and surface of fresh concrete until the concrete gains sufficient strength for the next stage. Conventional formwork systems are generally assembled from separate temporary components and are commonly erected, adjusted and dismantled for each casting operation. This section is general engineering background; the supplied project does not provide a measured study of conventional formwork and no project-specific figures are attributed to it.

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Because conventional arrangements involve repeated manual assembly, their productivity, accuracy and surface quality depend strongly on workmanship and on the condition of the components in each cycle. These characteristics explain why a more standardized and reusable system attracts interest for large repetitive projects.

### *D. Need for Advanced Formwork*

- Reduction of repetitive manual formwork operations can support a shorter construction cycle when the floor plan is repetitive.
- Precision-engineered panels can help maintain consistent dimensions and alignment when installed and inspected correctly.
- Monolithic casting of structural elements can reduce construction interfaces and contribute to a continuous building system.
- A smooth concrete finish can reduce the amount of subsequent plastering and associated finishing work.
- Reusable aluminium panels are particularly relevant to large projects in which the same formwork geometry occurs repeatedly.

### *E. Introduction to MYVAN/Mivan Shuttering*

The supplied project describes MYVAN shuttering through the following characteristics, which are used throughout this report as the technical basis of the study:

- It is a modern construction technology developed by the Mivan Company (Malaysia).
- The system allows monolithic construction of walls, slabs, beams and columns in one pour.
- It is made of lightweight, high-strength aluminium panels that are easy to handle and assemble.
- It is intended to ensure a high-quality surface finish, reducing the need for plastering.
- It provides uniform and accurate dimensions because of precision-engineered components.
- It is suitable for mass housing and high-rise buildings where speed is critical.
- It enables faster construction cycles, typically 7–10 days per floor.
- Panels are reusable up to 200–300 times, making the system cost-effective for large projects.
- It is stated to improve structural strength and durability through monolithic RCC construction.

The last statement is reported here as the supplied project's stated benefit. The project material contains no strength or durability test data, and none is introduced in this report.

Table 1.1 Key terms used in the study

| Term | Meaning in this report |
|---|---|
| MYVAN / Mivan | Aluminium formwork system used for repetitive construction |
| Monolithic casting | Casting interconnected structural elements in a coordinated pour |
| Floor cycle | Sequence from preparation of one floor formwork to readiness for the next cycle |
| De-shuttering | Removal of formwork after the required concrete condition is achieved |
| Panel reuse | Repeated use of engineered formwork panels across construction cycles |

### *F. Aluminium Formwork*

Aluminium formwork panels are lightweight relative to many traditional formwork components and can be handled and assembled into wall and slab moulds. In the MYVAN system the panels are joined and supported to form a stable mould whose geometry is repeated from floor to floor. The panel material and its reuse capability are the basis of the technology's economic argument, while the panel accuracy is the basis of its finish and dimensional-control argument.

The following conceptual arrangement illustrates the way wall panels, slab or deck forms and temporary supports work together. It is a technical explanatory diagram and is not a project-specific structural drawing.

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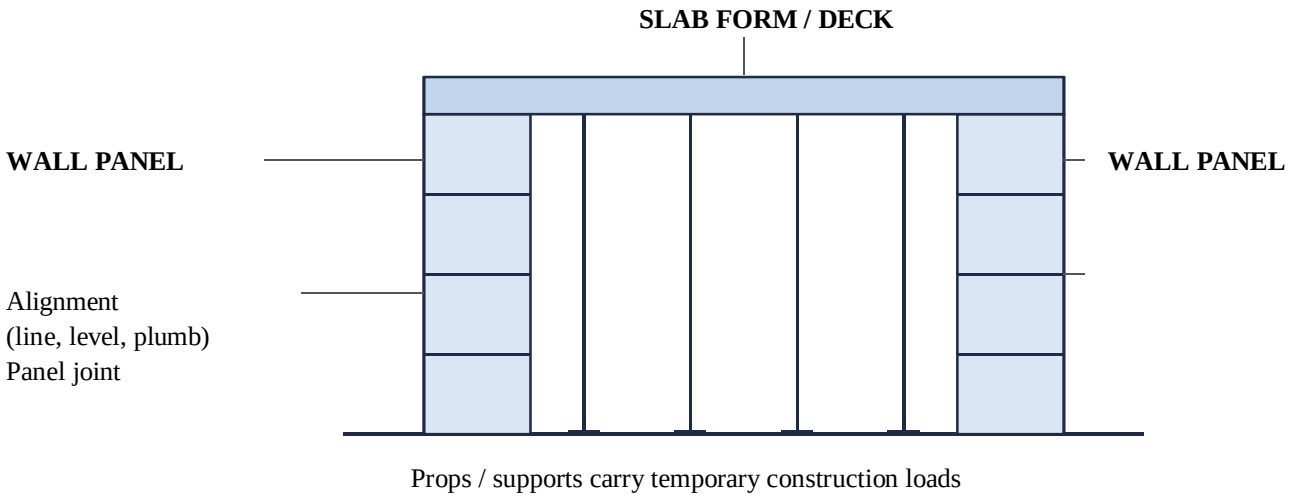



Fig. 1.1 Conceptual illustration: MYVAN aluminium formwork arrangement (not a project photograph)

*G. Relevance to High-Rise Construction*

Formwork temporarily defines the shape, dimensions and surface of fresh concrete. In high-rise work, the formwork system also influences the rate at which one floor can be completed and the ease with which the same configuration can be repeated. Good formwork practice requires accurate positioning, adequate support, controlled joints, clean contact surfaces and a planned sequence for stripping and reuse. The engineering value of MYVAN technology is closely connected with repetition. A one-off building with irregular geometry may not obtain the same productivity benefits as a large repetitive development. The suitability of the system must therefore be considered in relation to building geometry, production volume, site organization and the ability of the project team to maintain the cycle.

*H. Project Motivation*

The project focuses on a practical construction problem: how to achieve rapid and repeatable high-rise construction without compromising finish and dimensional consistency. The source material presents MYVAN shuttering as a response to this requirement. This report develops that information into a structured review so that the relationship between technology, process, quality and efficiency can be understood clearly.

*I. Organization of the Report*

The report is organized into six chapters. Chapter 1 presents the background, objectives and scope. Chapter 2 reviews the literature and describes the MYVAN/Mivan technology. Chapter 3 covers the methodology, case study and construction process. Chapter 4 presents the results and calculations on quality, cost, advantages, limitations and observations. Chapter 5 gives the future scope and conclusion, and Chapter 6 lists the references. Annexures provide inspection, reuse and quality record formats, a site workflow and a glossary. Tables and diagrams are placed near the sections they explain.

*J. Objectives of the Study*

*1) Primary Objectives*

The objectives of the study are taken from the supplied project material:

- To achieve fast construction speed by enabling rapid and repetitive casting of walls and slabs in a single cycle.
- To ensure a high-quality and smooth concrete finish, reducing the need for plastering.
- To provide uniform structural strength and monolithic construction, improving durability and seismic performance.
- To reduce overall project cost and labour dependency through reusable aluminium formwork systems.

Each objective is explained below in terms of its engineering significance, using only what the source material supports.

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*2) Technical Significance*

Table 1.2 Objectives and technical significance

| Objective | Expanded engineering significance |
|---|---|
| Fast construction speed | Enables rapid and repetitive casting of walls and slabs in a coordinated cycle. In repetitive high-rise construction, a predictable floor cycle allows reinforcement, services, formwork and concrete activities to be planned as a repeating sequence rather than as one-off operations. |
| High-quality concrete finish | Achieves a smooth and consistent concrete surface through precision formwork, thereby reducing dependence on plastering. Accurate panel geometry, tight joints and clean form faces influence surface quality, and a better surface can reduce finishing work and rework. |
| Uniform structural construction | Supports accurate geometry and monolithic construction so that repeated structural elements can be formed consistently. The source associates monolithic construction with improved durability and seismic performance; this report records that as a stated intent and presents no test or analysis data. |
| Reduced labour and project cost | Uses reusable aluminium formwork and a planned repetitive workflow to reduce labour dependency and overall cost. A higher initial investment is expected to be offset over repeated cycles, but the source gives no cost figures, so the effect is discussed qualitatively. |

*3) Objective 1 — Construction Speed*

The first objective is to achieve faster construction through a repeatable cycle. The project introduction reports a typical range of 7–10 days per floor, while the case study reports 6–8 days per floor. The difference should not be interpreted as a controlled experimental improvement; rather, the values demonstrate that the project material associates the technology with rapid repetitive construction.

*4) Objective 2 — Surface Finish*

The second objective is to obtain a high-quality and smooth concrete finish. A precision formwork system can reduce surface irregularity when panel joints, alignment and release procedures are properly controlled. The resulting reduction in plastering can affect both labour requirements and the duration of finishing activities.

*5) Objective 3 — Monolithic Construction*

The third objective is to support monolithic construction. The supplied project describes casting of walls, slabs, beams and columns in one pour and identifies the resulting construction as monolithic. In practical terms, this requires careful coordination of reinforcement, embedded items, formwork closure, inspection and concrete placement. The source states the intended benefit as improved durability and seismic performance; verifying that benefit would require structural analysis or test data that are outside the supplied material.

*6) Objective 4 — Cost and Labour Efficiency*

The fourth objective is to reduce overall cost and labour dependency through reusable aluminium formwork. The source case study explicitly notes a higher initial cost but reports overall savings associated with reduced labour, faster completion and less material wastage. The economic result is therefore a lifecycle and productivity consideration rather than simply a comparison of purchase price.

*K. Scope of the Study*

*1) Scope and Applicability*

The supplied project identifies MYVAN shuttering as particularly suitable for mass housing and high-rise buildings with repetitive floor plans.

The scope of this report is therefore centered on applications in which similar walls and slabs are constructed repeatedly and the formwork can be reused across cycles. The source lists the following aspects of the scope: simultaneous casting of walls and slabs in a single operation; residential apartments, commercial towers and infrastructure projects; high-speed construction with consistent quality and accuracy; smooth concrete finish with minimal plastering; and support for large-scale projects with tight timelines.

Table 1.3 Scope and applicability

| Application area | Relevance of MYVAN formwork |
|---|---|
| Mass housing | Repeated floor layouts can support systematic formwork cycles. |
| High-rise residential | Rapid floor-to-floor repetition can support shorter construction cycles. |
| Commercial towers | Suitable where structural geometry and repetition permit efficient panel reuse. |
| Infrastructure / large projects | Potentially useful where repeated concrete elements and controlled geometry are present. |
| Monolithic wall and slab construction | Supports coordinated casting when reinforcement, embeds and formwork are prepared together. |

*2) In-Scope Technical Topics*

- Aluminium formwork concept and components.
- Panel arrangement, alignment, support and de-shuttering.
- Repetitive floor construction and cycle planning.
- Concrete finish, dimensional consistency and rework considerations.
- Panel reuse and maintenance.
- Case-study observations from the supplied 23+ storey residential project.
- Qualitative cost and labour-efficiency considerations.

*3) Limitations of the Scope*

The source material does not provide a full structural design, detailed bill of quantities, measured labour productivity study, concrete test data, panel dimensions, reinforcement schedule or project financial records. Those items are therefore not presented as measured project results. Where calculations are included later in the report, they are labelled as illustrative calculations or calculation frameworks using only the source-supported inputs.

*4) Suitability Conditions*

The technology is most naturally associated with projects where geometry repeats and the number of cycles is sufficiently large to justify the initial investment and planning effort. Projects with highly irregular geometry, frequent design changes or very limited repetition may require a different formwork strategy. This suitability assessment is a technical consideration rather than a project-specific measured conclusion.

*5) Repetitive Floor Construction*

The concept underlying the scope is that the same formwork geometry is applied to successive floors. The diagram below illustrates this repetition conceptually; the labels n, n + 1, n + 2 and n + 3 denote successive floor cycles and carry no project-specific numerical meaning.

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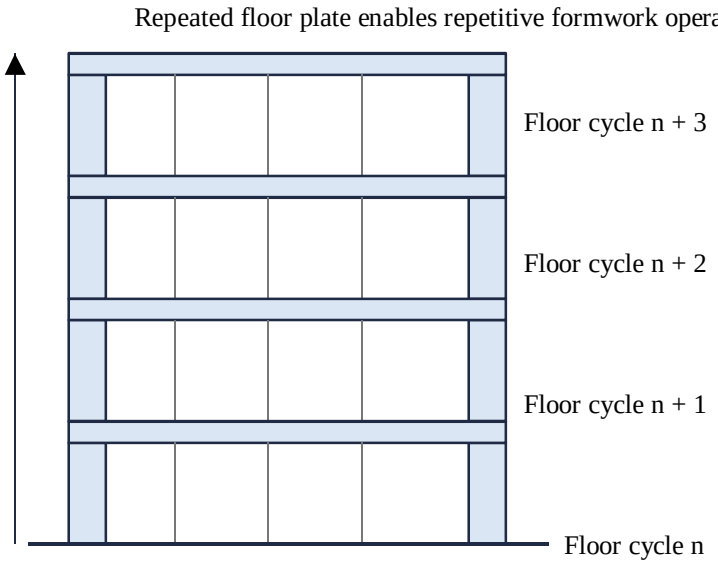



Fig. 1.2 Conceptual illustration: repetitive high-rise floor construction

## II. LITERATURE REVIEW

### A. *Introduction*

This chapter reviews the body of knowledge on which the present project review is based. Formwork is widely recognised as a principal determinant of the speed, cost and quality of reinforced concrete construction, and a considerable body of standards, guidance and project-based reporting addresses its design, erection and reuse [4]–[6]. Because the supplied project material is itself a project-based description of MYVAN/Mivan aluminium formwork [1]–[3], the review is organised by theme rather than by individual author, and the discussion is limited to what is generally reported about each theme. The technical description of the MYVAN system follows in Section 2.4.

### B. *Review of Earlier Studies and Practice*

#### 1) *Evolution of Formwork Systems*

Conventional timber and plywood formwork supported on props is flexible and inexpensive in material terms, but it is labour-intensive, is assembled afresh for each pour and has a limited reuse life. Standards and guides such as IS 14687 and ACI 347R therefore treat formwork as a temporary engineered structure whose planning, bracing, stripping and reuse must be managed as carefully as the permanent works [5], [6]. Modular systems made of steel, aluminium or plastic were developed to reduce the repeated assembly effort and to improve geometric consistency where many identical units are cast.

#### 2) *Aluminium Formwork and Monolithic Construction*

Descriptions of aluminium formwork emphasise lightweight panels that can be handled manually, a kit of parts that is erected in a defined sequence, and the ability to cast walls, slabs and beams together as a monolithic RCC structure [1]. Monolithic casting is associated with fewer construction joints and with a continuous wall–slab load path, but it requires early coordination of reinforcement, openings, services and embedded items because changes after casting are difficult.

#### 3) *Productivity and Floor-Cycle Time*

Reports on repetitive housing and high-rise projects commonly associate aluminium formwork with short, regular floor cycles. The supplied project states a general range of 7–10 days per floor and reports 6–8 days per floor for its case study [1]. The general understanding in construction management is that such gains arise largely from repetition: the same layout, panel positions and crew routine recur on every floor, so the sequence becomes predictable and is carried out with fewer interruptions.

#### 4) *Surface Finish and Dimensional Accuracy*

Because the panels are precision-made, concrete cast against them is described as having a smooth, true surface and consistent dimensions, which reduces plastering and rework [1]. The finish obtained still depends on panel condition, release-agent practice, alignment and concrete workability, which is why panel maintenance and pre-pour inspection appear in practical formwork guidance [5], [6].

*5) Cost and Reuse*

Aluminium panels involve a high initial investment, and the economic argument rests on a large number of reuses (the supplied material reports 200–300) together with savings in labour, finishing and time. The system is generally regarded as less attractive for small, irregular or non-repetitive buildings. A simple planning relationship divides the initial system cost by the number of cycles actually achieved (Section 4.5.2).

*6) Loads, Safety and Control*

Formwork guidance identifies self-weight, fresh-concrete pressure, construction live load, impact and wind as the principal actions on formwork, and links stripping times to the strength gained by the concrete [4]–[6]. Lightweight panels reduce manual-handling effort, but accurate alignment, secure panel connections, safe working platforms and controlled de-shuttering remain essential.

### *C. Need for the Present Study*

The material reviewed shows broad agreement on the main characteristics of aluminium formwork, but the supplied project material does not provide measured, project-level data on floor cycle, labour, wastage and reuse for a single building. The present report therefore consolidates the supplied information, separates source-supported observations from illustrative calculations, and identifies the measurements that future project records should capture.

### *D. MIVAN/MYVAN Shuttering Technology*

*1) Concept of the System*

MYVAN/Mivan shuttering is described in the supplied project as an aluminium formwork system designed for repetitive construction. Lightweight, high-strength panels are assembled to create the mould for concrete walls and slabs. The system is intended to provide accurate geometry and a smooth surface while allowing the panels to be reused through many construction cycles.

### *E. Aluminium Formwork System and Main Components*

The system can be understood as an assembly of wall panels, slab or deck panels, connectors, supports and control elements. The figure below shows how these parts relate to one another; it is a conceptual block diagram, not a manufacturer's drawing.

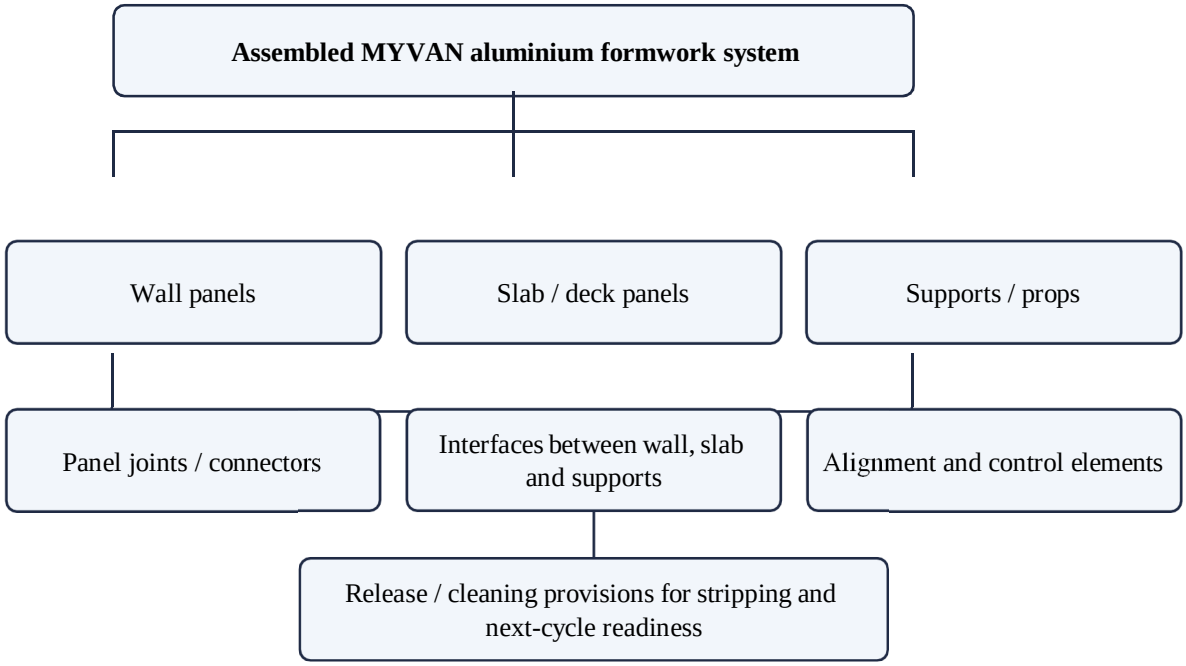



Fig. 2.1 Conceptual illustration: main components and interfaces of the MYVAN system

Table 2.1 Major MYVAN system components

| Component | Function |
|---|---|
| Wall panel | Forms the vertical concrete surface and establishes wall geometry. |
| Slab/deck panel | Forms the horizontal slab soffit and supports the casting geometry. |
| Panel joints / connectors | Join adjacent panels and maintain the intended arrangement. |
| Supports / props | Provide temporary support and stability during construction. |
| Alignment and control elements | Help maintain position, level and dimensional accuracy. |
| Release/cleaning provisions | Support safe stripping and preparation for the next cycle. |

*2) Wall, Slab, Beam and Column Formwork*

The source states that the system allows walls, slabs, beams and columns to be cast in one pour. Wall panels form the vertical faces, slab or deck panels form the soffit, and the beam- and column-related components must be integrated with these so that the complete floor is enclosed by the formwork before casting. The three-dimensional module in Section 3.8 shows wall panels with openings, slab or deck panels and props as a conceptual arrangement.

*3) Functions of the Formwork System*

The formwork performs several functions simultaneously: it defines the geometry of the concrete, supports fresh concrete and construction loads until the required condition is achieved, establishes the surface finish, and provides a repeatable template for the next floor. These functions explain why formwork quality has a direct relationship with both productivity and finish quality.

Table 2.2 Formwork functions

| Function | Technical requirement |
|---|---|
| Geometry control | Panels must be positioned, levelled and aligned before concrete placement. |
| Surface formation | Contact surfaces should be clean and properly prepared. |
| Load support | Temporary supports must be correctly positioned and maintained during the pour. |
| Repeatability | Panel identification and planned sequence reduce unnecessary rework. |
| Safe de-shuttering | Removal should follow the planned sequence and concrete condition requirements. |

*4) Monolithic Casting*

A key feature highlighted by the project is the ability to cast walls, slabs, beams and columns together in one coordinated operation. This reduces the number of separate formwork stages and creates a repetitive production sequence. The advantage depends on accurate reinforcement coordination, correct panel closure, controlled concrete placement and appropriate inspection before the pour.

*5) Installation and Alignment*

Installation begins with preparation of the work area and identification of the panels required for the floor. Panels are positioned according to the planned layout, joined and supported, and then checked for line, level and plumb. The inspection stage is critical because formwork errors can become concrete geometry errors after the pour.

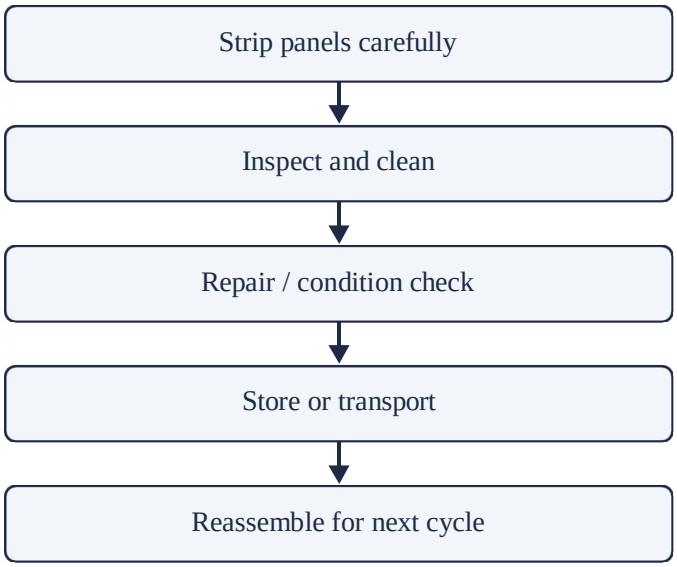
*6) De-shuttering*

De-shuttering is the controlled removal of panels after the concrete has reached the required condition for the planned operation. The exact stripping sequence depends on the construction system and project procedures. The panels should be removed without damaging concrete edges or the panel surfaces, then cleaned and inspected for the next cycle.

*7) Reusability*

The supplied project states that panels can be reused up to 200–300 times. Reuse is not automatic: panels must be stripped carefully, cleaned, inspected and stored or moved in a way that avoids damage. A disciplined reuse cycle is therefore an important part of the technology.

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*Reported panel reuse: up to 200–300 times (supplied project material)*
Fig. 2.2 Conceptual illustration: panel reuse and maintenance cycle

*8) Component Relationship*

The technology should be viewed as a coordinated system rather than a collection of individual panels. Wall forms, slab forms, supports, joints, reinforcement and embedded items must be considered together. The following summary connects the principal functions.

Table 2.3 System sequence summary

| Stage | Panel-related requirement | Expected output |
|---|---|---|
| Planning | Identify repeatable panel arrangement | Clear cycle plan |
| Assembly | Join and support panels | Stable formwork |
| Inspection | Check line, level, plumb and interfaces | Ready-to-pour formwork |
| Concrete placement | Control pour and avoid displacement | Accurate concrete geometry |
| Stripping | Remove without damage | Reusable panels |
| Cleaning | Inspect and prepare | Next-cycle readiness |

*9) Load Considerations on the Formwork*

Formwork is a temporary structure and must carry the loads imposed during casting until the concrete gains sufficient strength. The principal actions are the weight of the formwork itself, the weight of fresh concrete and reinforcement acting vertically on the slab or deck panels, construction live loads from workers and equipment, and the lateral pressure of fresh concrete acting on the wall panels. The props transfer the vertical actions to the previously cast floor below. Fig. 2.3 shows this load path schematically.

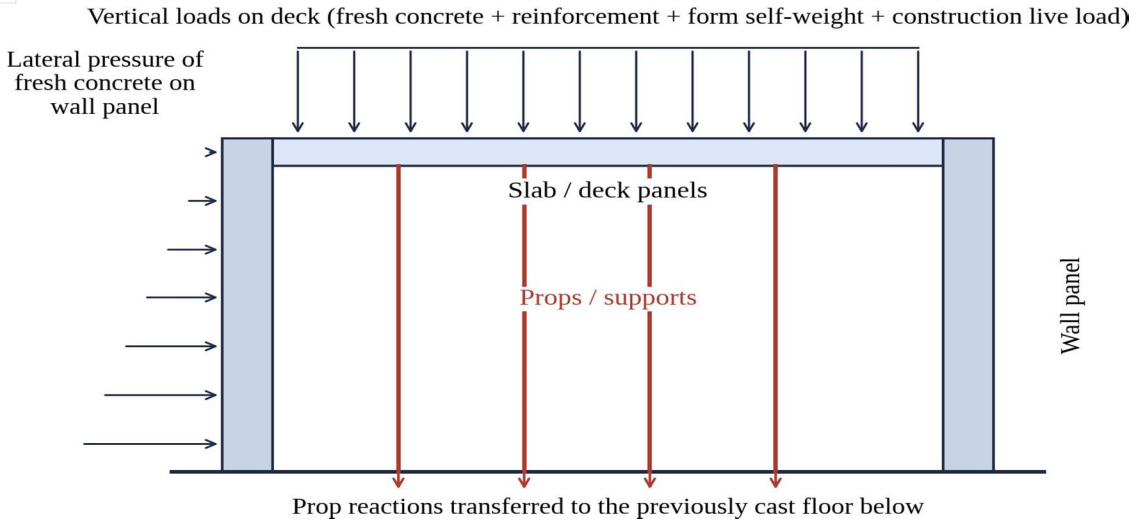



Fig. 2.3 Schematic load-path diagram for wall and slab formwork (qualitative; no load intensities are implied)

The supplied project material does not state any dead-load or live-load intensity, concrete placement rate, or formwork design load. The table below therefore identifies the load types and the elements they act on, and marks every numerical value as not supplied. Numerical intensities would have to be taken from the approved formwork design and the applicable Indian Standard load codes (for example IS 875 for dead and imposed loads); they are not introduced in this report.

Table 2.4 Load types acting on MYVAN formwork (values not supplied in the project material)

| Load type | Description | Acts on | Value / unit |
|---|---|---|---|
| Dead load | Self-weight of aluminium panels, connectors and props | Slab/deck panels, props | Not supplied |
| Dead load | Weight of fresh concrete and reinforcement | Slab/deck panels, props | Not supplied |
| Live load | Workers, equipment and placement effects during casting | Slab/deck panels | Not supplied |
| Lateral pressure | Pressure of fresh concrete on vertical faces | Wall panels, connectors | Not supplied |
| Prop reaction | Transfer of vertical actions to the floor below | Props, cast slab below | Not supplied |

*10) Load-Related Pre-Pour Checks (General Practice)*

Because the loads listed above act on a temporary structure, the pre-pour inspection described in Section 3.9 should include checks that relate directly to load transfer. The checks below are general formwork practice and are not project-specific data; the acceptance criteria for each must be taken from the approved formwork design and site method statement.

Table 2.5 Load-related pre-pour checks (general practice; criteria not supplied)

| Check | Purpose | Criterion |
|---|---|---|
| Prop positions and verticality | Ensure vertical actions reach the floor below as designed | Per approved design |
| Bearing of props on the cast slab below | Avoid local overload or slip of prop bases | Per approved design |
| Connector and clamp completeness | Keep wall panels tied against lateral pressure | Per approved design |
| Panel closure at joints | Prevent leakage and local movement during the pour | Per site method statement |
| Access and placement sequence | Avoid uncontrolled build-up of load on the deck | Per site method statement |

## III. METHODOLOGY

### A. *Methodology Overview*

The methodology adopted for this project review is based on the supplied project information. The process begins with selecting the construction problem and reviewing the source material, continues with a study of the MYVAN technology and the case study, and then analyses the construction process, quality and efficiency before recording observations and conclusions. The report also uses illustrative calculations where the available inputs permit transparent calculation.

### B. *Project Methodology Flow*

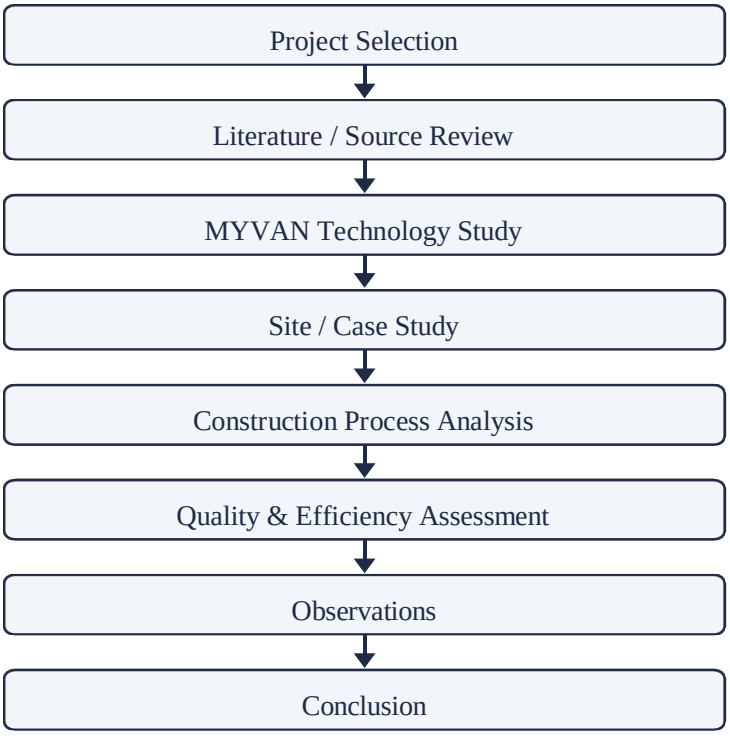



Fig. 3.1 Project methodology flow

### C. *Methodology Stages*

Table 3.1 Methodology stages

| Stage | Activity | Output |
|---|---|---|
| 1 | Project selection: identify repetitive high-rise construction and formwork as the study problem | Study problem and title |
| 2 | Literature / source review: review the supplied project material and photographs | Project facts and images |
| 3 | MYVAN technology study: define objectives, scope and system components | Technical description |
| 4 | Site / case study: organize the 23+ storey residential project information | Case-study parameters |
| 5 | Construction process analysis: map the repetitive floor-cycle sequence | Floor-cycle workflow |
| 6 | Quality and efficiency assessment: examine finish, cost and productivity implications | Structured observations |
| 7 | Observations: separate source-supported facts from illustrative calculations | Observation tables |
| 8 | Conclusion: summarize findings and identify future scope | Project review findings |

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*D. Site Methodology of MYVAN Shuttering*

The supplied project also presents a nine-stage site methodology for MYVAN shuttering. The stages and the activities listed in the source are summarized below. The source identifies safety, quality, productivity, timely execution and cost efficiency as the focus areas of this methodology.

Table 3.2 Site methodology of MYVAN shuttering (as presented in the project material)

| Stage | Activities listed in the source |
|---|---|
| 1. Project study and planning | Study drawings and specifications; plan MYVAN system application; prepare shuttering drawings; plan cycle, manpower and logistics. |
| 2. Material procurement | Procure MYVAN panels, accessories and consumables; inspect material for quality; plan inventory for smooth execution. |
| 3. Transportation to site | Transport material to site as required; ensure safe loading and unloading; store material at designated locations. |
| 4. Pre-erection checks | Verify setting out, levels and dimensions; ensure the base is clean and coordinated with other trades; check availability of tools and equipment. |
| Stage | Activities listed in the source |
| 5. Shuttering erection | Erect panels as per drawings; fix corners, walers, clamps and alignment; ensure plumb, level and tight joints; apply release agent to formwork. |
| 6. Concrete pouring | Check shuttering stability before pouring; pour concrete as per specification; ensure proper compaction and finish; monitor formwork during pouring. |
| 7. De-shuttering (stripping) | De-shutter as per the specified cycle; carefully remove panels and accessories; inspect concrete finish; rectify minor defects if any. |
| 8. Cleaning and maintenance | Clean panels and accessories after use; remove concrete residue; check and maintain components; apply suitable shuttering oil. |
| 9. Stacking, storage and next cycle | Stack panels and accessories systematically; store safely to prevent damage; plan and prepare for the next cycle; ensure a continuous cycle for productivity. |

*E. Method Statement Logic*

*1)* Confirm the floor layout and required panel set.
*2)* Prepare and inspect panels, supports and accessories.
*3)* Position panels and establish preliminary alignment.
*4)* Coordinate reinforcement and embedded items with formwork closure.
*5)* Carry out pre-pour inspection and correct identified deviations.
*6)* Place concrete using the approved site procedure.
*7)* Monitor the concrete and temporary support condition.
*8)* Strip panels in the planned sequence when permitted.
*9)* Clean, inspect and transfer panels to the next cycle.

*F. Repetitive Floor Cycle*

A repetitive floor cycle is central to the productivity of MYVAN formwork. The sequence below is conceptual and should be adapted to the actual site method statement, reinforcement sequence, concrete specifications and safety procedures.

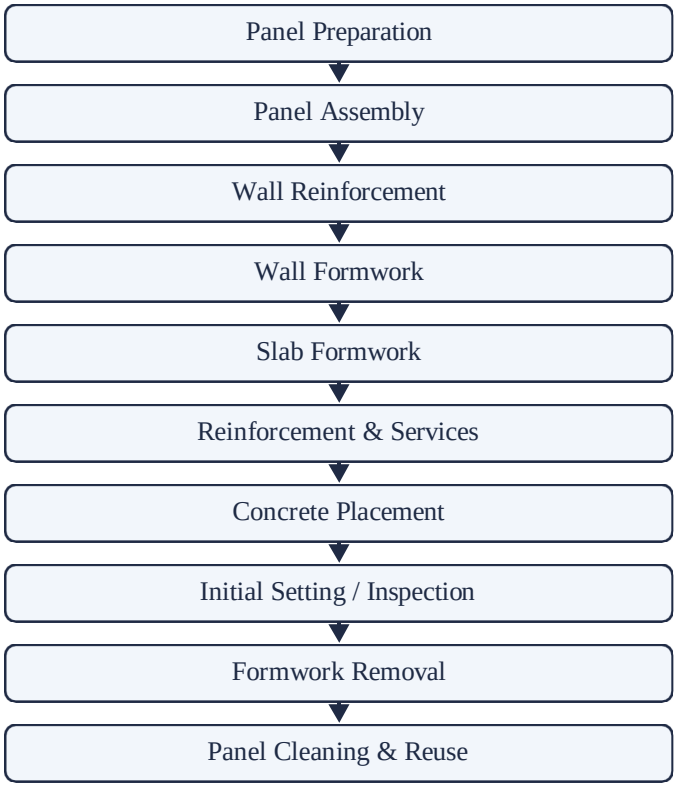



Fig. 3.2 Typical repetitive floor cycle (conceptual)

*G. Information Limitations*

Because the supplied project is a review/presentation document rather than a complete construction method statement, this report does not claim project-specific reinforcement quantities, concrete grades, panel dimensions, stripping times, lifting arrangements or measured labour productivity. Such values would need to be obtained from approved drawings, specifications, method statements and site records.

*H. Case Study*

*1) Case Study Description*

The supplied project presents a high-rise residential case study in which Mivan aluminium formwork is used for walls and slabs. The project is described as a 23+ storey residential building, and the supplied project material titles the site as a high-rise building at Panvel, Mumbai. The formwork system enables wall and slab casting together in a monolithic construction approach.

Table 3.3 Case-study parameters

| S. No. | Parameter | Case-study detail |
|---|---|---|
| 1 | Project description | 23+ storey residential building using Mivan aluminium formwork for walls and slabs (monolithic construction). |
| 2 | System used | Mivan shuttering system (aluminium panels) enabling wall and slab casting together in one pour. |
| 3 | Cycle time achieved | 6–8 days per floor cycle due to repetitive formwork and quick assembly/dismantling. |
| 4 | Quality & finish | Smooth concrete finish with minimal plastering required, ensuring uniformity and reduced rework. |
| 5 | Cost & efficiency | Higher initial cost but overall savings through reduced labour, faster completion and less material wastage. |

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*2) Case Study Model — Repetitive High-Rise Tower*

The supplied case study is a 23+ storey residential building. Because the supplied material does not include structural drawings, the figure below is a schematic three-dimensional representation of the repetition principle: each floor has the same wall and slab layout, the lower floors are already cast monolithically, and the upper floors are in the current casting cycle. The plan shape, proportions and wall layout are conceptual and do not represent the actual building geometry.

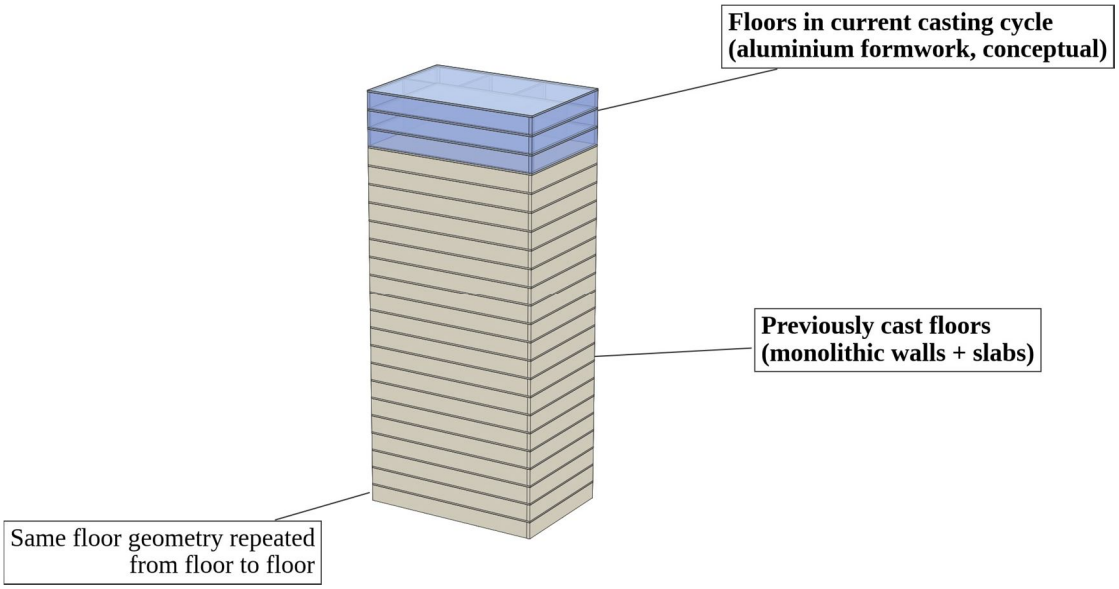



Fig. 3.3 Conceptual 3D model: repetitive floor construction of a 23-storey tower (schematic, not to scale, not a photograph)

*3) Interpretation*

The case study illustrates the practical context in which repetitive aluminium formwork can be used. The important point is not only the number of storeys but the repetition of similar floor construction. The reported 6–8 day cycle indicates the production-oriented nature of the method, while the quality and finish observations indicate the expected benefit of controlled formwork surfaces.

The reported case-study cycle and the general range given in the project introduction are compared in Fig. 3.4. The two ranges overlap between 7 and 8 days per floor, so the comparison shows that the case study lies at the faster end of the general range but does not by itself establish a measured improvement.

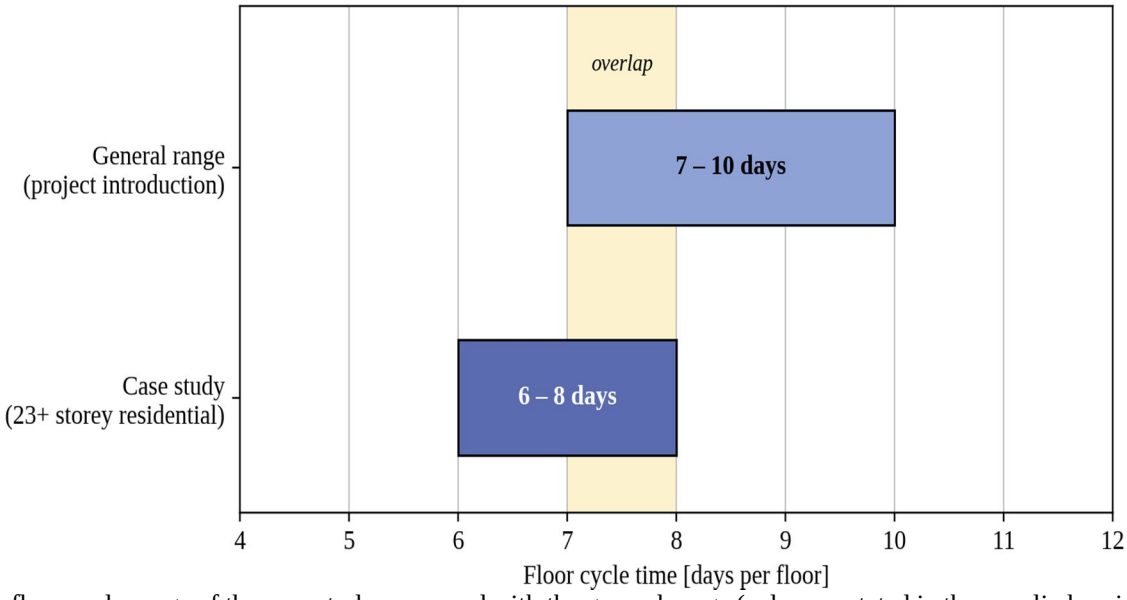



Fig. 3.4 Graph: floor cycle range of the case study compared with the general range (values as stated in the supplied project material)

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*4) Slab, Wall and Column Formwork — Three-Dimensional Arrangement*

The supplied case-study photographs show reinforcement and formwork operations occurring together on a high-rise floor, with slab panels carried on props and column formwork within a propped floor. In the present report these observations are represented by the conceptual three-dimensional module below, in which wall panels, a slab or deck panel grid and props form a room-size mould. Such a work environment requires careful coordination because the formwork geometry, reinforcement placement and access for concrete placement must all remain compatible. The number, size and position of panels in the figure are illustrative only.

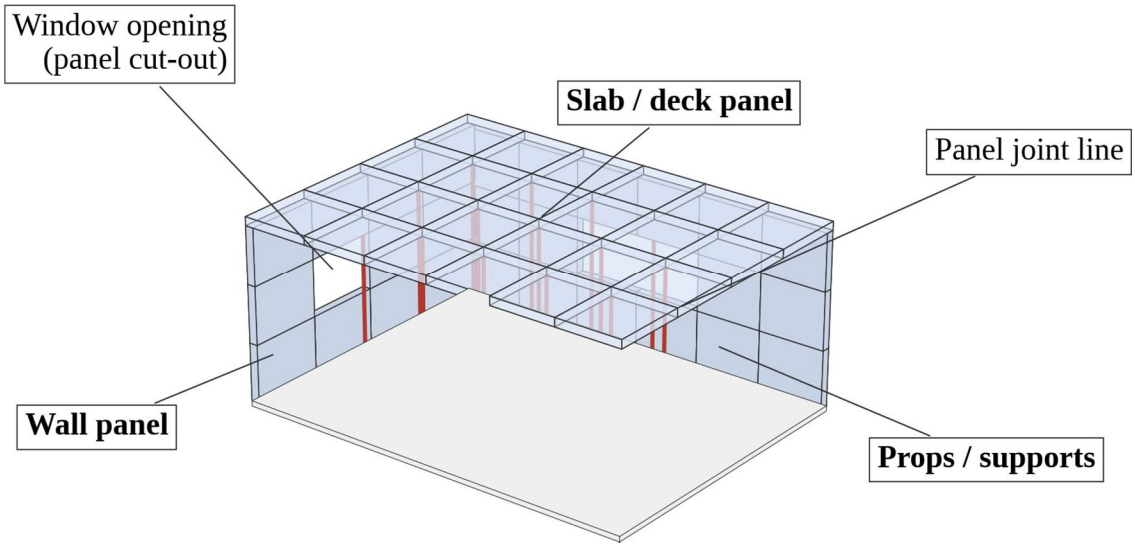



Fig. 3.5 Conceptual 3D model: wall panels, slab/deck panels and props of a room-size formwork module (cut-away, not to scale)

*5) Mock-Up and Assembly of Components*

Mock-up activities are useful because they allow the construction team to verify panel arrangement, joints, access, sequence and handling before the repetitive cycle is established at full scale. The project material includes mock-up visuals but does not provide a mock-up measurement record. The exploded view below therefore shows, qualitatively, how the principal components are brought together: the wall panel with its stiffening ribs, connectors or pins, a corner or joint element, the slab or deck panel and the prop.

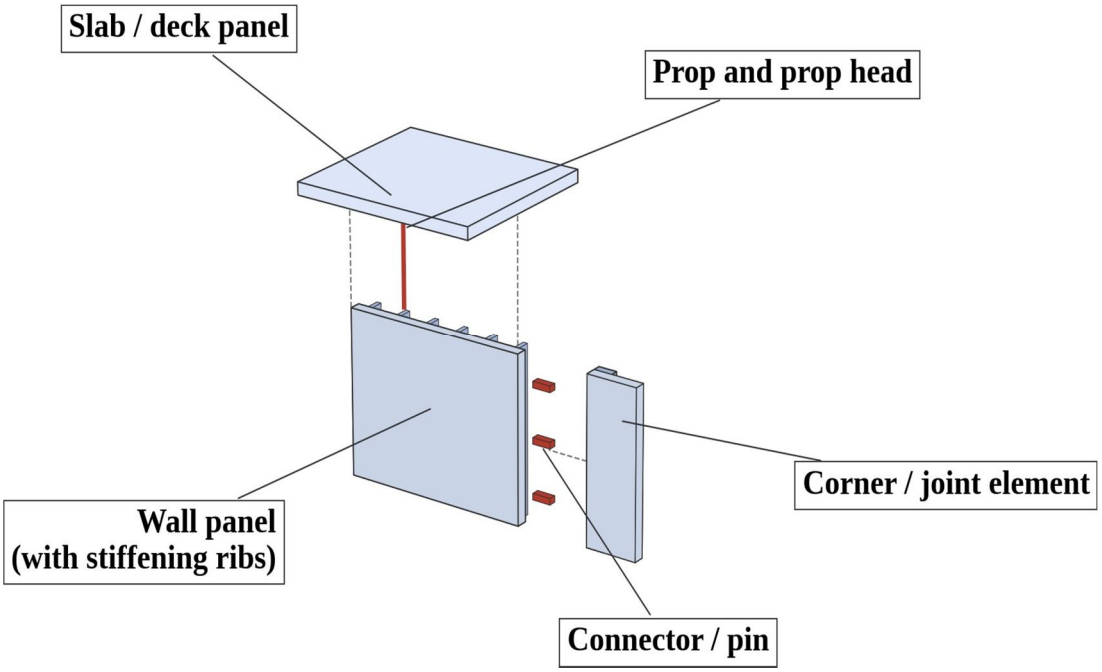



Fig. 3.6 Conceptual exploded 3D view of the principal formwork components (schematic, not to scale)

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*6) Cumulative Cycle Time over the Number of Floors*

Using only the reported 6 and 8 day cycle limits and the 23 floors of the case study, the cumulative sequential formwork-cycle time is plotted in Fig. 3.7. The shaded band between the two lines is the range of the illustrative calculation in Section 3.9.7; it is not a measured completion record and it excludes overlapping activities, mobilization and other project constraints.

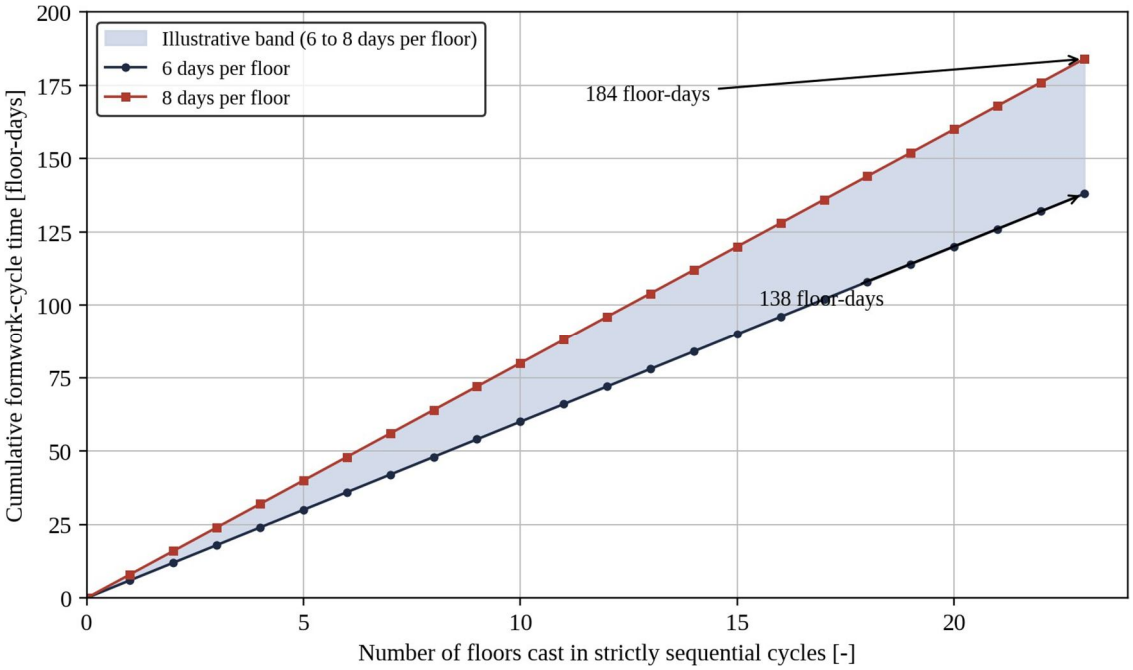



Fig. 3.7 Graph: cumulative sequential floor-cycle time for 6 and 8 days per floor over 23 floors (illustrative, computed from stated values)

*7) Case-Study Data Not Supplied*

For completeness, the table below records the case-study information that is normally required for a full structural or cost assessment but is not contained in the supplied material. No value has been assumed for any of these items.

Table 3.4 Case-study information not contained in the supplied material

| Item | Status in supplied material |
|---|---|
| Building plan dimensions and storey height | Not supplied |
| Structural system and member sizes | Not supplied |
| Concrete grade and reinforcement details | Not supplied |
| Panel sizes and number of panel sets | Not supplied |
| Project cost and formwork cost | Not supplied; only a qualitative statement of higher initial cost |
| Measured labour-hours and material wastage | Not supplied; only qualitative savings are stated |

*I. Construction Process*

*1) Construction Cycle*

The construction process can be understood as a repeated sequence in which formwork preparation, positioning, reinforcement coordination, concrete placement, de-shuttering and panel transfer occur in a controlled order.

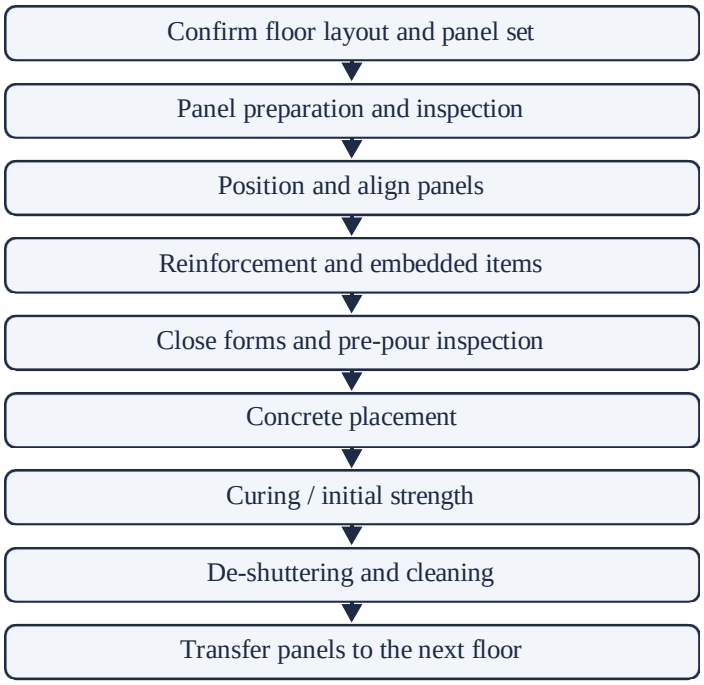



Fig. 3.8 Floor-by-floor construction workflow

*2) Planning and Panel Preparation*

Panels should be identified, cleaned and checked before installation. Damaged or distorted components can affect alignment and finish. Accessories, supports and joining elements should also be available at the work location.

*3) Positioning and Alignment*

Wall panels are positioned according to the planned floor layout. Alignment checks establish the intended line and level, while supports provide temporary stability. The slab/deck system is then coordinated with the wall arrangement so that the completed formwork represents the intended concrete geometry.

*4) Reinforcement and Embedded Items*

Reinforcement and embedded services must be coordinated with formwork closure. The formwork should not be closed in a way that prevents required reinforcement, sleeves or inserts from being installed and inspected.

*5) Concrete Placement and Curing*

Concrete placement should follow the approved site sequence. Excessive or uncontrolled placement can create temporary pressure and displacement risks. The formwork should be observed during the pour so that abnormal movement or leakage is addressed promptly. The source does not specify curing procedures or durations, and none are introduced here.

*6) De-shuttering and Transfer*

After the required condition is achieved, panels are stripped according to the planned sequence. Panels are cleaned, inspected and transferred for the next cycle.

Table 3.5 Construction-cycle activities

| Activity | Primary check | Reason |
|---|---|---|
| Panel preparation | Cleanliness and condition | Protect finish and repeatability |
| Alignment | Line, level and plumb | Maintain geometry |
| Pre-pour inspection | Reinforcement, embeds and joints | Avoid omissions and rework |
| Concrete placement | Formwork stability and leakage | Protect concrete geometry |
| De-shuttering | Concrete condition and safe sequence | Avoid damage |
| Panel transfer | Cleaning and identification | Prepare next cycle |

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*7) Construction Cycle Calculation — Illustrative*

The project provides a case-study cycle of 6–8 days per floor for a 23+ storey building. A simple sequential-cycle calculation can be used to illustrate the scale of the repetition. This is not a measured project duration because real construction involves overlapping activities and other constraints.

Table 3.6 Calculation 3.1 — Sequential floor-cycle range (illustrative)

| Step | Presentation |
|---|---|
| Given | Number of floors n = 23 (case study, 23+ storeys, lower bound used); cycle time t = 6 days/floor (minimum) and 8 days/floor (maximum). |
| Formula | Sequential cycle time T = n × t |
| Substitution | T_min = 23 × 6; T_max = 23 × 8 |
| Steps | 23 × 6 = 138; 23 × 8 = 184; range width = 184 − 138 = 46 |
| Units | [floors] × [days/floor] = [floor-days] |
| Final result | T = 138 to 184 floor-days (width 46 floor-days) |
| Interpretation | Illustrative scale of the formwork-cycle component only. Not a measured project duration: overlap of activities, mobilization and other constraints are excluded (see Fig. 3.7). |

*8) General Range Comparison — Illustrative*

The project introduction gives a typical range of 7–10 days per floor, whereas the case study reports 6–8 days per floor. The ranges overlap, so they are not proof of a measured productivity improvement. At the lower end, 6 days compared with 7 days represents a simple 14.3% shorter cycle; at the upper end, 8 days compared with 10 days represents a 20% shorter cycle.

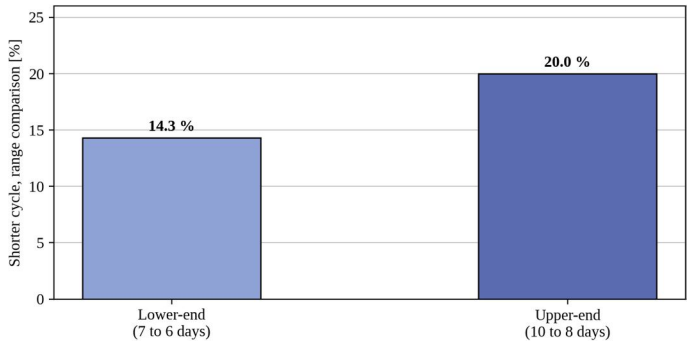



Fig. 3.9 Graph: range-comparison percentages from Calculation 3.2 (illustrative)

Table 3.7 Calculation 3.2 — Range comparison (illustrative)

| Step | Presentation |
|---|---|
| Given | General range 7 to 10 days/floor; case-study range 6 to 8 days/floor. |
| Formula | Shorter cycle [%] = (t_general − t_case) ÷ t_general × 100 |
| Substitution | Lower end: (7 − 6) ÷ 7 × 100; upper end: (10 − 8) ÷ 10 × 100 |
| Steps | 1 ÷ 7 = 0.1429; 2 ÷ 10 = 0.2000 |
| Units | Days cancel; result dimensionless, expressed in % |
| Final result | Lower end 14.3 %; upper end 20.0 % |
| Interpretation | Range-comparison figures only. The two ranges overlap, so they do not prove a measured productivity improvement. |

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## IV. RESULTS AND CALCULATIONS

### *A. Quality and Finish*

#### *1) Surface Finish*

One of the principal quality benefits identified in the project is a smooth concrete finish that can reduce the need for plastering. The finish depends on the condition of the form face, joint treatment, alignment, release procedure, concrete placement and stripping practice. A high-quality surface is therefore the outcome of both the formwork system and the construction discipline applied to it.

The engineering significance of the smooth finish lies in the consistency of the panel faces. When precision-engineered panels are assembled with tight joints and clean contact surfaces, the concrete takes the geometry of the form with limited irregularity. This links panel accuracy, consistent formwork geometry and surface quality directly to the amount of finishing and rework needed afterwards.

#### *2) Dimensional Accuracy*

Precision-engineered panels provide a repeatable geometry, but the final concrete dimensions still depend on correct installation. Line, level and plumb checks are required before the pour. Repeated use also makes maintenance important because damaged components can affect the fit of the assembly.

#### *3) Uniformity Across Floors*

When the same panel configuration is reused correctly, repeated floor geometry can be more consistent. Uniformity can simplify follow-on work such as finishing, openings and coordination of services. However, consistency still depends on surveying, inspection and proper handling of panels.

#### *4) Reduced Plastering and Rework*

The project material associates the smooth finish with reduced plastering. Reduced finishing work can save time and labour, but the magnitude of the saving depends on actual surface quality and the finishing specification of the project. The report therefore treats reduced plastering as a source-supported expected benefit rather than a quantified measured saving.

Table 4.1 Quality observations from the project material

| Quality aspect | Source-supported observation | Engineering explanation |
|---|---|---|
| Surface finish | Smooth concrete finish is reported. | Depends on form-face condition, joints, release procedure and stripping practice. |
| Dimensions | Uniform and accurate dimensions from precision-engineered components. | Final geometry still depends on line, level and plumb checks before the pour. |
| Plastering | Minimal plastering is required in the case study. | A smoother surface can reduce finishing activities; the saving is not quantified. |
| Rework | Uniformity and reduced rework are reported. | Consistent panel geometry can reduce correction of repeated elements. |

#### *5) Quality-Control Checkpoints*

Table 4.2 Quality-control checkpoints

| Checkpoint | Inspection item | Expected outcome |
|---|---|---|
| Before assembly | Panel condition, accessories and cleanliness | Ready components |
| During assembly | Joint closure, supports and alignment | Stable formwork |
| Before pour | Dimensions, reinforcement and embeds | Approved pour setup |
| During pour | Movement, leakage and surface condition | Controlled placement |
| After stripping | Concrete surface and panel condition | Quality record and reuse readiness |

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*6) Quality-Control Workflow*

Quality control is most effective when it is built into the repeated cycle rather than applied only after stripping. The workflow below arranges the principal checks in the order in which they occur on a repetitive floor.

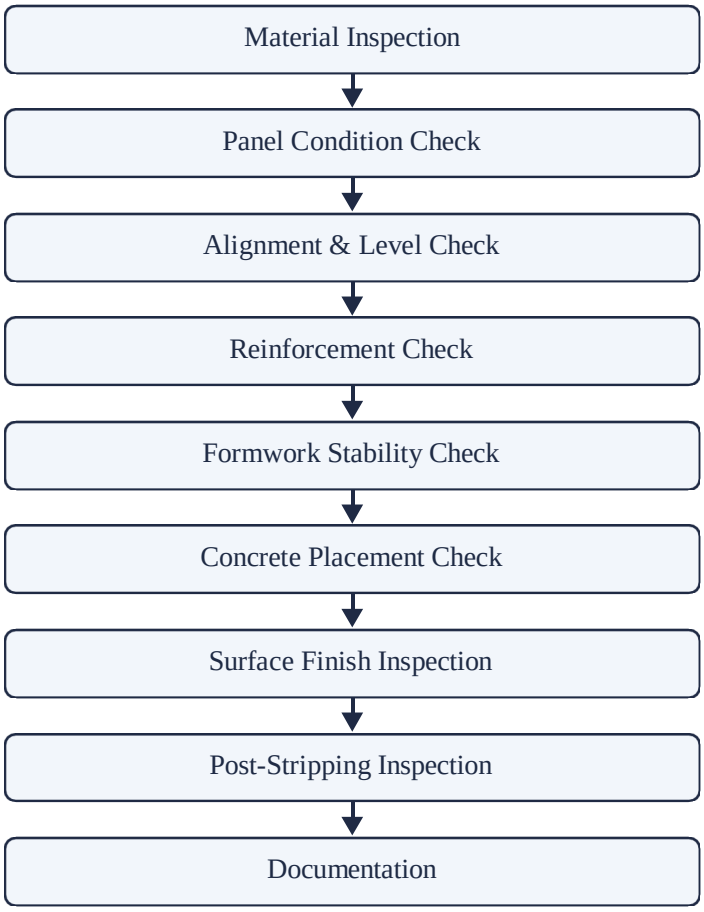



Fig. 4.1 Quality-control workflow

*B. Cost and Efficiency*

*1) Cost Perspective*

The case study explicitly identifies a higher initial cost for the MYVAN system but reports overall savings through reduced labour, faster completion and less material wastage. This means that cost should be evaluated across the construction process rather than through initial formwork purchase alone. The source contains no cost figures, so the discussion is qualitative.

Table 4.3 Cost and efficiency considerations

| Factor | Initial / direct effect | Potential efficiency implication |
|---|---|---|
| Aluminium formwork investment | Higher initial investment | Can be distributed over repeated cycles |
| Labour | Organized repetitive operations | Potential reduction in labour dependency |
| Construction time | Shorter cycle can be achieved | Earlier progress of repetitive floors |
| Material wastage | Controlled reusable system | Potential reduction compared with less reusable methods |
| Finish | Smooth concrete surface | Potential reduction in plastering and rework |

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*2) Initial Investment versus Overall Efficiency*

The source distinguishes between the initial cost of the system, which is higher, and the overall efficiency of the project, which is reported to improve through reduced labour, faster completion and less material wastage. These are different quantities: the first is incurred at the start, whereas the second accumulates over the repeated cycles of the project.

Table 4.4 Initial investment and overall project efficiency

| Initial investment | Overall project efficiency |
|---|---|
| Higher initial cost of the aluminium formwork system (source-stated). | Overall savings attributed to reduced labour, faster completion and less material wastage (source-stated). |
| Incurred once at the start of the project. | Accumulates over repeated floor cycles and panel reuse. |
| Not quantified in the supplied project material. | Not quantified in the supplied project material; requires site records. |

*3) Reuse as an Economic Mechanism*

The supplied project reports panel reuse of up to 200–300 times. Reuse changes the economic relationship between initial investment and the number of construction cycles. A simple lifecycle framework is:

Table 4.5 Calculation 4.1 — Initial investment charged per reuse cycle (illustrative)

| Step | Presentation |
|---|---|
| Given | Reported panel reuse N = 200 and 300 cycles (project introduction). ASSUMPTION: every panel achieves N cycles and other costs (transport, repair, labour) are excluded. Initial cost is taken as 100 % because no cost value is supplied. |
| Formula | Charge per cycle [% of initial cost] = 100 ÷ N |
| Substitution | N = 200: 100 ÷ 200; N = 300: 100 ÷ 300 |
| Steps | 100 ÷ 200 = 0.50; 100 ÷ 300 = 0.333 |
| Units | [% of initial cost] per [cycle] |
| Final result | 0.50 % (N = 200) and 0.33 % (N = 300) of the initial cost per cycle |
| Interpretation | Shows why repetition matters to the economics: the same initial investment is spread over many cycles. Actual cost per cycle needs verified site records. |

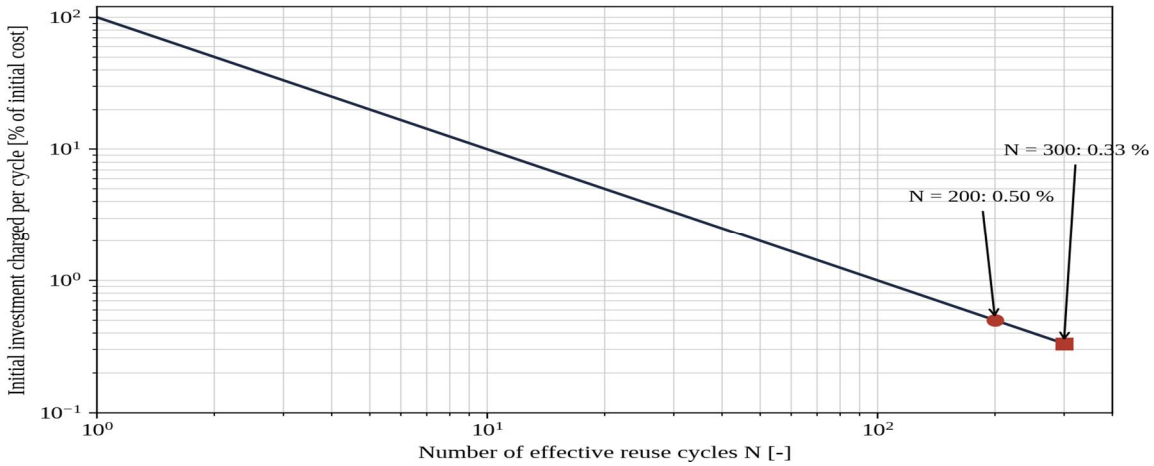



Fig. 4.2 Graph: initial investment charged per cycle against number of reuse cycles (illustrative relationship, log axes)

*4) Cycle-Time Efficiency*

If the same floor arrangement is repeated, reducing the cycle time by even one day can create a cumulative effect over many floors. For the case-study range, the difference between a 6-day and an 8-day cycle is 2 days per floor.

Table 4.6 Calculation 4.2 — Cumulative difference between cycle limits (illustrative)

| Step | Presentation |
|---|---|
| Given | n = 23 floors; t_max = 8 days/floor; t_min = 6 days/floor. |
| Formula | $\Delta T = (t_{max} - t_{min}) \times n$ |
| Substitution | $\Delta T = (8 - 6) \times 23$ |
| Steps | $8 - 6 = 2$; $2 \times 23 = 46$ |
| Units | [days/floor] × [floors] = [floor-days] |
| Final result | $\Delta T = 46$ floor-days |
| Interpretation | Arithmetic difference between two hypothetical extremes; it is not a statement that the project actually saved 46 days. |

*5) Labour Efficiency*

A repetitive system can make work more predictable because crews repeatedly perform similar operations. Predictability can support training, task allocation and logistics planning. The project material identifies reduced labour dependency as an objective, but no measured man-hours are provided; therefore, the report does not claim a numerical labour saving.

*6) Material Wastage*

Reusable aluminium panels can reduce the need for single-use temporary formwork materials. The actual material-wastage reduction would require project records such as quantities purchased, damaged components, replacements and disposal. Those records are not provided, so the benefit is described qualitatively.

*C. Advantages and Limitations*

*1) Advantages*

- Fast and repetitive floor construction when the building geometry is suitable.
- Smooth concrete finish with reduced plastering requirement.
- Uniform and accurate dimensions through precision-engineered panels.
- Monolithic casting of walls, slabs, beams and columns in a coordinated cycle.
- Reusable aluminium panels suitable for large repetitive projects.
- Potential reduction in labour dependency and material wastage.
- Strong applicability to high-rise and mass-housing projects.

*2) Limitations and Practical Considerations*

- Higher initial investment compared with simpler temporary formwork approaches.
- Benefits depend strongly on repetition and stable design geometry.
- Panel handling, storage, cleaning and maintenance require planning.
- Design changes can affect panel compatibility and cycle efficiency.
- The system requires disciplined alignment, inspection and safe de-shuttering procedures.
- The supplied project does not provide enough data to quantify every economic or productivity benefit.

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*3) Summary of Advantages and Limitations*

Table 4.7 Advantages and limitations

| Aspect | Advantage | Limitation / condition |
|---|---|---|
| Speed | Repetitive floor cycle | Requires organized sequence and repetition |
| Finish | Smooth concrete surface | Depends on panel condition and workmanship |
| Accuracy | Engineered panel geometry | Requires alignment and inspection |
| Cost | Potential overall savings | Higher initial investment |
| Reuse | High reported reuse capability | Requires cleaning and maintenance |
| Application | High-rise and mass housing | Less suitable where geometry changes frequently |

*4) Conventional Formwork and MYVAN — Qualitative Comparison*

The comparison below is a general qualitative engineering comparison. The MYVAN entries reflect the supplied project material; the conventional entries are general background and are not measured project data.

Table 4.8 Qualitative comparison of conventional formwork and MYVAN shuttering

| Aspect | Conventional formwork (general) | MYVAN aluminium formwork (source) |
|---|---|---|
| Formwork components | Assembled from separate temporary components | Lightweight, high-strength aluminium panels |
| Casting approach | Elements often formed in separate stages | Walls, slabs, beams and columns in one pour |
| Repetition | Each cycle largely re-assembled | Panels reused across repetitive floors |
| Surface finish | More dependent on component condition and workmanship | Smooth finish with minimal plastering reported |
| Initial investment | Generally lower | Higher initial cost (source-stated) |

*5) Risk and Control Considerations*

The following control logic helps convert the limitations into manageable site actions. It is a general engineering planning framework, not a project-specific risk register.

Table 4.9 Practical risk-control framework

| Potential issue | Control approach |
|---|---|
| Panel damage | Inspect after stripping; repair or segregate damaged panels. |
| Misalignment | Carry out line, level and plumb checks before pouring. |
| Missing embeds / reinforcement conflict | Use a pre-pour inspection checklist. |
| Cycle delay | Plan panel movement and next-floor logistics in advance. |
| Surface defects | Control panel cleanliness, joints and concrete placement. |
| Unsafe de-shuttering | Follow approved sequence and concrete-condition requirements. |

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*D. Results and Observations*

*1) Source-Supported Observations*

Table 4.10 Source-supported observations

| Observation | Evidence basis |
|---|---|
| Rapid repetitive construction | Project introduction reports a typical 7–10 day floor range. |
| Case-study floor cycle | Case study reports 6–8 days per floor. |
| High-rise application | Case study describes a 23+ storey residential project. |
| Smooth finish | Project material reports smooth concrete finish and minimal plastering. |
| Reuse | Project introduction reports panel reuse up to 200–300 times. |
| Economic mechanism | Case study reports higher initial cost but overall savings from labour, speed and reduced wastage. |

*2) Interpretation of the Case Study*

The evidence provided by the project supports the view that MYVAN formwork is intended for production-oriented construction. The combination of repetitive aluminium panels, monolithic wall-and-slab casting and rapid floor cycles addresses the principal construction constraints identified in the project: speed, finish quality, labour dependency and material reuse.

*3) What the Report Does Not Claim*

The report does not claim a measured percentage reduction in cost, labour hours, concrete wastage or construction duration because the supplied project does not contain those records. It also does not claim structural performance results such as strength values, seismic response or numerical test results. These distinctions keep the review within the evidence available in the project material.

*4) Illustrative Performance Relationships*

Several relationships can be used for future project measurement once site data become available.

*Cycle efficiency = Planned standard cycle duration ÷ Actual cycle duration × 100 Labour productivity = Quantity of completed formwork ÷ Labour-hours*

*Reuse rate = Number of successful cycles completed by a panel set ÷ Target reuse cycles Material wastage (%) = Wasted quantity ÷ Purchased quantity × 100*

These equations are measurement frameworks. They should only be populated with verified project records. The flow below shows how site records would be converted into the four indicators.

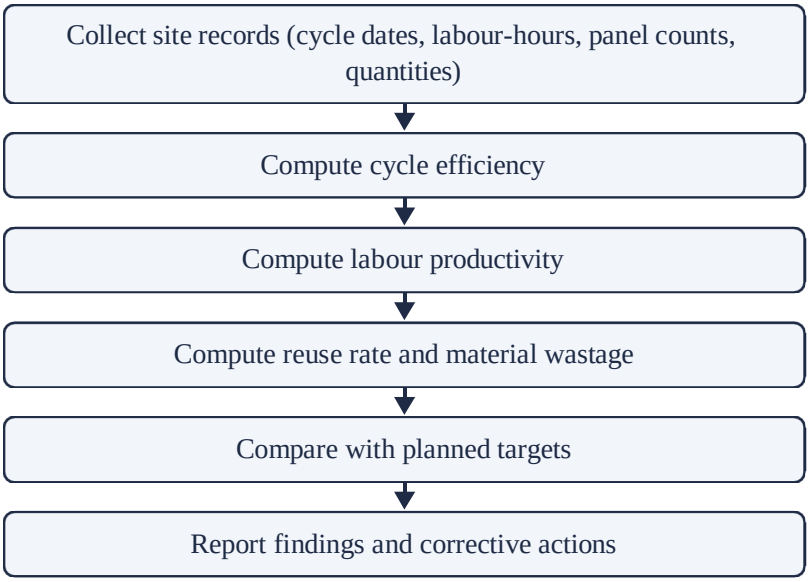



Fig. 4.3 Measurement framework flow for converting site records into performance indicators (conceptual)

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*5) Structural and Seismic Parameters — Status in the Supplied Material*

The supplied objectives state that monolithic construction is intended to improve durability and seismic performance. The material, however, contains no structural model, seismic analysis or load data. The table below lists the parameters that a seismic assessment would require, the symbol normally used for each, and the code framework under which it would be defined (IS 1893 (Part 1) for earthquake-resistant design). Every value is recorded as not supplied; no value is assumed, and no seismic result from any other document has been transferred into this report.

Table 4.11 Seismic and structural parameters — not supplied in the project material

| Parameter | Symbol | Value / unit | Code basis |
|---|---|---|---|
| Seismic zone factor | Z | Not supplied | IS 1893 (Part 1) |
| Importance factor | I | Not supplied | IS 1893 (Part 1) |
| Response reduction factor | R | Not supplied | IS 1893 (Part 1) |
| Soil / site classification | – | Not supplied | IS 1893 (Part 1) |
| Fundamental natural period | T | Not supplied [s] | IS 1893 (Part 1) |
| Design base shear | V_B | Not supplied [kN] | IS 1893 (Part 1) |
| Load combinations | – | Not supplied | IS 875 / IS 1893 |

Consequently, the report treats the seismic benefit of monolithic construction as a stated intent of the project, and lists structural analysis of a monolithic wall-slab building as a future measurement and study area.

*E. Illustrative Engineering Calculations*

*1) Floor-Cycle Range*

The supplied case study reports 6–8 days per floor for a 23+ storey residential project. The following calculation is an illustrative sequential-cycle range and is not the total project duration.

$$\textit{Minimum} = 23 \times 6 = 138 \textit{ floor-days}$$

$$\textit{Maximum} = 23 \times 8 = 184 \textit{ floor-days}$$

$$\textit{Range width} = 184 - 138 = 46 \textit{ floor-days}$$

The calculation demonstrates the importance of cycle control across a repetitive high-rise project. Actual project duration would include overlapping activities and non-formwork work packages.

*2) Reuse-Cycle Relationship*

The project introduction reports panel reuse up to 200–300 times. A simple planning relationship is:

$$\textit{Effective cost per reuse cycle} \approx \textit{Initial system cost} \div \textit{Effective number of cycles}$$

The effective number of cycles should be based on verified site records rather than the theoretical maximum.

## V. CONCLUSION

*A. Future Scope*

*1) Future Development Opportunities*

The future potential of MYVAN technology is closely related to better planning, digital coordination and systematic quality management. Because the system depends on repetitive geometry, digital tools can be used to improve panel identification, sequence planning, progress monitoring and documentation.

Table 5.1 Future opportunities

| Opportunity | Potential application |
|---|---|
| Digital panel tracking | Record panel location, condition, cycle count and maintenance history. |
| 3D/BIM coordination | Coordinate formwork, reinforcement, openings and services before site assembly. |
| Cycle dashboards | Track planned versus actual floor-cycle duration. |
| Quality records | Capture alignment, inspection and surface-finish observations digitally. |
| Reuse analytics | Use panel-cycle data to plan repair and replacement. |
| Site logistics planning | Coordinate movement of panels and materials between floors. |

*2) Digital Construction Workflow*

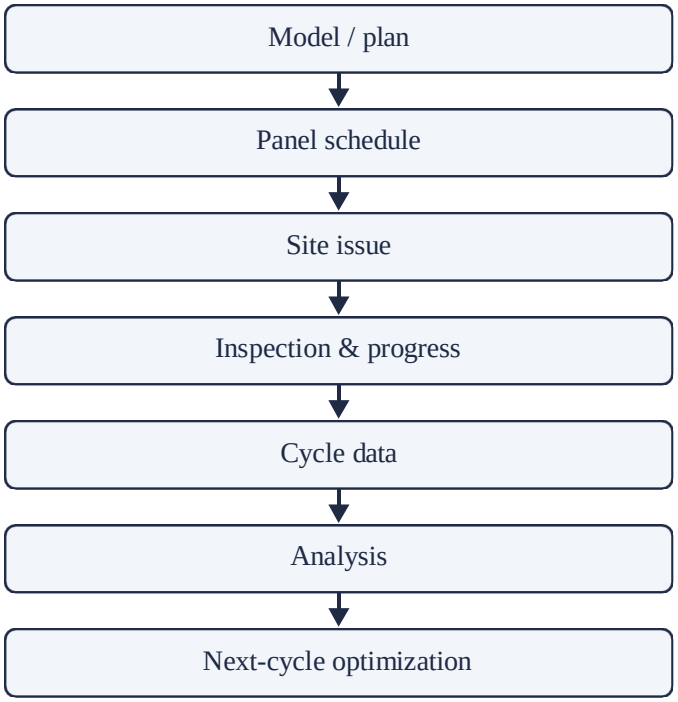



Fig. 5.1 Future digital workflow for repetitive formwork management (conceptual)

*3) Research and Measurement Scope*

- Collect actual cycle-time records for every floor and compare planned versus achieved duration.
- Measure labour-hours for formwork activities and compare them across repeated cycles.
- Record panel repairs, replacements and cycle counts to establish actual reuse performance.
- Measure concrete surface quality and plastering quantities to quantify finishing benefits.
- Develop a lifecycle cost model including purchase, accessories, labour, transport, maintenance and replacement.
- Study the suitability of the system for different floor-plan repetition levels.

*4) Sustainability Considerations*

Repeated reuse of aluminium formwork has the potential to reduce dependence on temporary single-use formwork materials. A rigorous sustainability assessment would need actual material quantities, reuse counts, transport distances, repair records and end-of-life information. The present report therefore identifies sustainability as a future measurement area rather than assigning a numerical environmental benefit.

### *B. Conclusion*

#### *1) Conclusion*

The project review establishes MYVAN/Mivan aluminium formwork as a construction technology suited to repetitive high-rise and mass-housing work. The supplied project identifies its main characteristics as lightweight aluminium panels, monolithic construction, smooth concrete finish, dimensional consistency, rapid floor cycles and high panel reusability.

The case study of a 23+ storey residential project reports a 6–8 day floor cycle, smooth finish with minimal plastering, and overall savings associated with reduced labour, faster completion and less material wastage despite a higher initial investment. These observations are presented as information from the supplied project rather than as independently measured experimental results.

From an engineering-process perspective, the main value of the technology lies in repetition. When floor geometry is suitable, the same panel system can be prepared, aligned, inspected, poured, stripped, cleaned and reused in a controlled sequence. This can create a predictable production rhythm and support consistent concrete geometry and finish.

The report also identifies the conditions required for successful use: careful planning, accurate alignment, reinforcement coordination, pre-pour inspection, controlled concrete placement, safe de-shuttering, panel maintenance and organized site logistics. The initial investment and dependence on repetition are important limitations that should be considered during project planning.

Overall, the supplied evidence supports further application and measurement of MYVAN formwork in repetitive high-rise construction. Future project records should quantify cycle time, labour, material wastage, finishing work, panel reuse and lifecycle cost so that the qualitative benefits identified in this project can be evaluated with measured data.

#### *2) Key Takeaways*

- MYVAN formwork is particularly relevant to repetitive high-rise construction.
- The project case study reports 6–8 days per floor.
- Smooth finish can reduce the need for extensive plastering.
- Reported panel reuse of up to 200–300 times makes repetition important to economic value.
- Higher initial investment should be assessed against repeated use and project productivity.
- Verified project records are required for numerical cost and labour conclusions.

## VI. ACKNOWLEDGEMENT

While bringing out this dissertation to its final form, I came across a number of people whose contribution in various ways and they deserve special thanks. It is pleasure to convey my gratitude to all of them.

First and foremost, I would like to express my deepest gratitude to my project guide to Dr. MADHURI MALPURU, M. Tech, Ph. D, Head of the Dept & Associate Professor, Department of civil engineering collage for her guidance and support. Her extreme energy and excellent skills have always been a constant source of motivation for me. The perfection that she brings to each and every piece of work that she does always inspire me to do things right at first time. She is great person and one of the best mentors, I always be thankful to her for the encouragement, suggestions and support from an early stage of this dissertation.

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[1] C. Sivamanicame, “Advance Technology of MYVAN Shuttering for High Rise Buildings”, project report material (presentation format), Department of Civil Engineering, Sanketika Vidya Parishad Engineering College.

[2] Project-source observations on MYVAN/Mivan aluminium formwork, construction methodology, case study, quality, cost and reuse, as contained in the supplied project material.

[3] Case-study description (23+ storey residential building, Panvel, Mumbai) and site views described in the supplied project material.

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General engineering concepts of formwork planning, alignment, concrete placement, de-shuttering and repetitive construction are presented as explanatory background and are not claimed as project-specific measurements. References 4–6 are cited as general guidance in Chapter 2; no other published papers or external sources have been cited.

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## ANNEXURE – A
## FORMWORK INSPECTION CHECKLIST

The following checklist can be used as a structured site-control format. It is a general project-management aid and should be aligned with the approved method statement and safety procedures. The checklist is intentionally generic because the supplied project does not provide a project-specific inspection form; the Status and Remarks cells are left blank for site entries.

Table A.1 MYVAN formwork inspection checklist

| S.No. | Inspection item | Status (OK / Not OK / N.A.) | Remarks |
|---|---|---|---|
| 1 | Panel identification and condition | OK | Panels checked against layout drawing; no distortion found. |
| 2 | Clean contact surface | OK | Form release agent (shuttering oil) applied evenly. |
| 3 | Joints and connectors complete | OK | All wedge pins and wall ties securely locked. |
| 4 | Wall line and plumb checked | OK | Plumb verified within permissible structural tolerance. |
| 5 | Slab level checked | OK | Slab level verified against approved reference level. |
| 6 | Supports / props correctly positioned | OK | Props positioned as per approved formwork layout and securely fixed. |
| 7 | Reinforcement coordination verified | OK | Reinforcement spacing and cover checked before closing the formwork. |
| 8 | Embedded items / openings verified | OK | Embedded items and openings checked against the approved drawings. |
| 9 | Pre-pour inspection completed | OK | Formwork, reinforcement, embedded items and cleanliness checked before pouring. |
| 10 | Concrete placement monitoring | OK | Concrete placement monitored; formwork remained stable during the pour. |
| 11 | De-shuttering sequence confirmed | OK | De-shuttering carried out after the required concrete strength was achieved. |
| 12 | Panels cleaned and transferred | OK | Panels cleaned, inspected and transferred for the next construction cycle. |

## ANNEXURE – B
## PANEL REUSE TRACKING FORMAT

Because reusability is a major feature of the technology, tracking the condition and cycle count of panels can help the project team manage maintenance and replacement. The supplied project reports reuse of up to 200–300 times. The format below is a practical record format for determining actual cycles rather than assuming that the maximum reuse is achieved by every panel. The cells are left blank for site entries.

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Table B.1 Suggested panel reuse tracking format

| Panel / set ID | Cycle count | Condition (Good / Fair / Poor) | Repair required (Yes / No) | Next use |
|---|---|---|---|---|
| W-P101 (Wall Panel Set 1) | 15 | Good | No | Floor 16 - Wing A |
| W-P102 (Wall Panel Set 2) | 14 | Good | No | Floor 16 - Wing B |
| W-P103 (Wall Panel Set 3) | 16 | Good | No | Floor 17 - Wing A |
| W-P104 (Wall Panel Set 4) | 12 | Good | No | Floor 17 - Wing B |
| W-P105 (Wall Panel Set 5) | 18 | Fair | Yes - Minor repair | Floor 18 - Wing A |
| W-P106 (Wall Panel Set 6) | 17 | Good | No | Floor 18 - Wing B |

## ANNEXURE – C
## QUALITY RECORD FORMAT

Quality control should be documented at the same time as the repetitive construction cycle. A simple record can connect inspection findings with the floor number and cycle date; the cells are left blank for site entries.

Table C.1 Suggested quality record format

| Floor | Cycle date | Alignment (Pass / Correct) | Surface / joints (Pass / Correct) | Pre-pour check (Pass / Correct) | Remarks |
|---|---|---|---|---|---|
| Floor 15 | 12/05/2025 | Pass | Pass | Pass | Monolithic pour completed without concrete leakage or joint displacement. |
| Floor 16 | 19/05/2025 | Pass | Pass | Pass | Formwork alignment and joints verified; concrete pour completed satisfactorily. |
| Floor 17 | 26/05/2025 | Pass | Pass | Pass | Panel connections checked and surface condition found acceptable before pouring. |
| Floor 18 | 02/06/2025 | Pass | Pass | Pass | Pre-pour inspection completed; no significant alignment or joint issues observed. |
| Floor 19 | 09/06/2025 | Pass | Pass | Pass | Concrete placement completed with stable formwork and no visible leakage. |

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Why the Record Matters

Repeated construction makes trend information valuable. If alignment corrections or surface defects repeatedly occur at the same stage, the team can identify the process step responsible and improve the next cycle. This creates a feedback loop between construction quality and productivity.

## ANNEXURE – D
## DETAILED SITE WORKFLOW

The following table expands the principal construction sequence into a practical set of coordinated activities.

Table D.1 Detailed repetitive site workflow

| Phase | Key activities |
|---|---|
| 1. Planning | Review drawings, identify panel set, plan movement and sequence. |
| 2. Preparation | Clean panels, check accessories and prepare work area. |
| 3. Assembly | Position wall and slab forms, join panels and install supports. |
| 4. Coordination | Verify reinforcement, openings, embeds and service interfaces. |
| 5. Inspection | Check line, level, plumb, joints, supports and pre-pour requirements. |
| 6. Concrete | Place concrete using the approved sequence and monitor formwork. |
| 7. Early post-pour | Maintain required controls and monitor condition. |
| 8. De-shuttering | Strip panels according to the approved sequence. |
| 9. Reuse preparation | Clean, inspect, repair if necessary and transfer to next floor. |

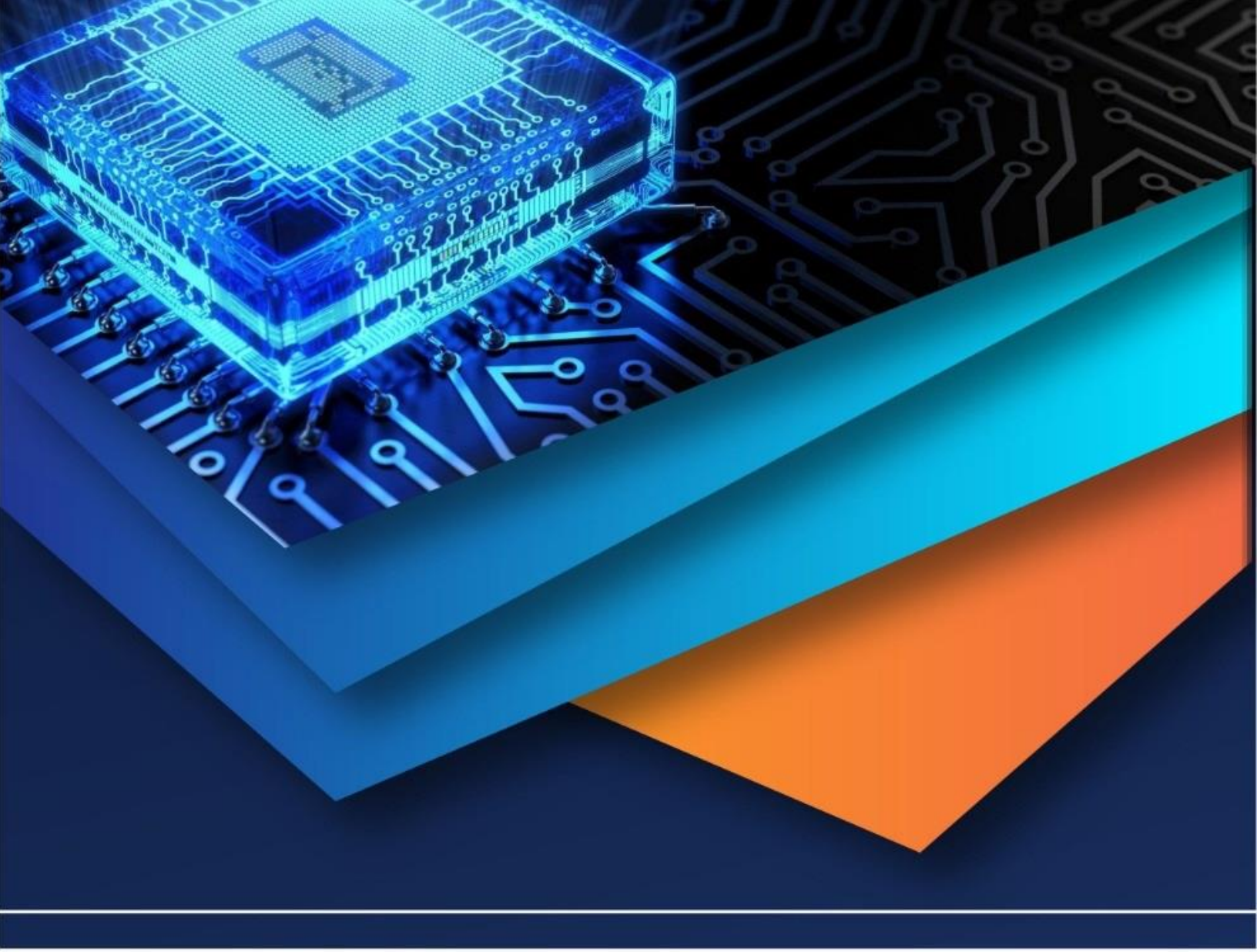
## ANNEXURE – E
## TECHNICAL GLOSSARY

Table E.1 Technical glossary

| Term | Explanation |
|---|---|
| Aluminium formwork | Reusable formwork panels manufactured from aluminium for repetitive concrete construction. |
| Monolithic construction | Coordinated casting of interconnected structural elements in a single planned operation. |
| Panel cycle | Sequence in which a panel set is prepared, installed, stripped, cleaned and reused. |
| De-shuttering | Controlled removal of formwork after the required concrete condition is achieved. |
| Floor cycle | Time and activities required to progress from one repetitive floor operation to the next. |
| Formwork alignment | Positioning control for line, level and plumb of the temporary mould. |
| Panel reuse | Repeated application of the same formwork components across construction cycles. |
| Surface finish | Appearance and smoothness of the hardened concrete face formed against the panel. |
| Rework | Additional work required to correct an undesired construction result. |
| Cycle planning | Sequencing of activities so that the repetitive floor operation progresses predictably. |

This glossary is included to make the report easier to use as an academic and site-oriented reference.

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