

Integrated Structural and Architectural Facade Level-by-Level Construction System

Field of the Invention

[0001] The present invention relates to building construction and in particular to methods and apparatus for constructing multi-level buildings.

[0002] The invention has been developed more particularly as a method for constructing multi-level residential apartment buildings and will be described predominantly in this context. However, it will be appreciated that the invention is not limited to this particular field of use, being potentially applicable in a wide variety of other building types including commercial or industrial facilities, bridges, towers, schools, hospitals, houses, office blocks and the like. While the invention has been developed particularly for use with multi-level building construction, it may also be adapted for use in construction of single-level buildings.

Background of the Invention

[0003] Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

[0004] Construction of multi-level buildings is typically achieved using methods such as system formwork for level-by-level construction of structural works in respect of columns, beams and slabs. This is followed by a staged system of construction in respect of the architectural works such as insertion of windows, external plastering works, external plumbing works etc. During the first stage the building is erected level-by-level using external scaffolding or other means of hoisting building materials, such as apertures for doors and windows, to the required height. To comply with relevant building regulations, for health and safety reasons, the exterior of the building must be screened with a protective material during this stage to prevent debris falling from the upper levels. This protective material is usually flexible in nature, such as netting.

[0005] The architectural works can only commence following structural completion of the predetermined number of levels. The architectural works are usually performed stage-by-stage involving the installation of internal walls, external windows, door frames

and other architectural requirements. The next stage is completion of concealing and plastering works. Following this, weather proofing of the building is then achieved by installing door and window panels, as well as balcony railings.

[0006] The final stage involves installation of drywall, marble, external trellis, ceiling works and painting, as required.

[0007] This sequential approach to construction results in a slow overall process, as separate trades groups are required for each stage and must be coordinated along a critical planning path. This results in an inherently high risk to project timelines, as any delay in one operation will then postpone subsequent operations.

[0008] It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative. It is an object of the invention in at least one preferred form to provide a method of construction of a multi-level building by integrating construction of architectural works with the construction of structural works thereby completing traditionally sequential construction activities simultaneously on different building levels to improve the process efficiency.

Summary of the Invention

[0009] According to a first aspect of the invention there is provided a method of constructing a multi-level building having a predetermined number of levels, the method including the steps of:

- a) setting and monitoring time periods and work cycles for completion of construction and installation tasks on a level-by-level basis;
- b) selecting sub-contractors and, for each selected contractor, performing the following steps to comply with the time periods and work cycles set in step (a):
 - i. setting and monitoring time periods for obtaining measurements, plans and specifications of deliverables; and
 - ii. setting and monitoring sub-contractor timetables for selecting and sourcing materials, fabrication, delivery and installation;
 - iii. assignment of worker duties to coordinate with the sub-contractor timetables;

- c) installing formwork for a set of two or more levels of the building;
- d) releasably mounting a moveable protection system to the building, thereby to enclose at least part of the periphery of the set of two or more levels;
- e) completion of critical tasks of construction and installation in regard to the external façade of the lowest enclosed level of the set within the time period set in step (a);
- f) thereafter raising the moveable protection system by a height substantially corresponding to one level of the building to enclose the next level above the previous set of levels, thereby defining a new set of enclosed levels.
- g) installing formwork for the next enclosed level above the highest level of the lower set of levels;
- h) repeating steps (e), (f), and (g) until step (g) is completed for the predetermined number of levels;
- i) completing construction and installation tasks in regard to at least the external façade of the remaining enclosed levels.

[0010] Preferably the set of levels in step (c) includes four levels. Preferably the movable protection system encloses the whole of the periphery of the building.

[0011] Preferably, step (e) also includes the completion of all internal and external construction and installation tasks of the lowest enclosed level of the set within the time period set in step (a).

[0012] Preferably step (e) includes one or more of the sub-steps of completing:

- i. external doors and windows;
- ii. balcony railings;
- iii. air-ledge railings;
- iv. external plastering;
- v. external trellis;
- vi. external electrical works;

- vii. external plumbing works; and
- viii. external aluminium formwork.

[0013] Preferably, step (i) also includes the completion of all internal and external construction and installation tasks of the remaining enclosed levels.

[0014] According to a second aspect of the invention there is provided a method of constructing a multi-level building having a pre-determined number of levels, the method including the steps of:

- a) releasably mounting a moveable protection system to the building thereby to enclose at least part of the periphery of two or more levels of the building;
- b) installing formwork on the uppermost enclosed level;
- c) completing a fixed external barrier substantially around the lowest enclosed level, wherein the barrier includes an externally facing facade;
- d) thereafter raising the moveable protection system by a height substantially corresponding to one level of the building; and
- e) repeating steps (b), (c) and (d) until step (b) has been completed for the predetermined number of levels.

[0015] It will be appreciated that construction of the building occurs on a level-by-level basis rather than the conventional stage-by-stage construction method.

[0016] According to third aspect of the present invention there is provided a moveable protection system for use in constructing a multi-level building, the moveable protection system including:

- means for releasably mounting the protection system to the building;
- at least one protective screen for enclosing at least part of the periphery of two or more levels of the building;
- means for raising the protection system with respect to the building.

[0017] In at least one embodiment, the building is a multi-level residential apartment building. However, it should be understood that the term "building" and the like are intended to be inclusive of alternative forms of civil engineering structures, other

embodiments including commercial or industrial facilities, bridges, towers, schools, hospitals, houses or office blocks whether in single or multi-level configuration.

[0018] In some embodiments, the protection system is custom-made for each building. In other embodiments the protection system may be modular and adaptable to various building types and shapes.

[0019] In some embodiments, the moveable protection system includes at least one protective screen for enclosing at least part of the periphery of the building levels. Preferably, a plurality of screens are connected together to form a substantially gap-free enclosure. Preferably the screen height is at least equal to the floor-to-ceiling height of an enclosed level.

[0020] Preferably, the protective screens are multi-perforate. In other embodiments, the screens may be solid, wire-frame, mesh or netting. In some embodiments, the screens are made from aluminium sheet, however, it should be appreciated that alternative materials may be used including sheets, panels or wire of metals, polymers, mesh, wood or composite materials, which may be translucent or opaque. Preferably the screens are substantially impermeable to wind.

[0021] In embodiments employing perforated panel protective screens, an additional layer of netting screening is optionally attachable to the protection system. Preferably the netting screening is attachable external to the perforated panels.

[0022] In some embodiments, the protection system includes shoes for substantially closing a gap between the protective screen and the building. Preferably the shoes are in the form of flip-down panels.

[0023] Preferably the method includes an additional step after step (a) of accessing a materials delivery system from an enclosed level of the building through the movable protection system. Preferably the materials delivery system is a materials platform.

[0024] Preferably, the materials delivery system is separated from the protection system prior to step (c) to facilitate raising of the protection system. In other embodiments, the protection system may be moveable with the materials delivery

system attached. In such embodiments, the materials delivery system may be repositioned after raising or lowering of the protection system.

[0025] Preferably the means for raising and lowering the protection system is a hydraulic system. In other embodiments, the protection system is raised or lowered using a crane.

[0026] Preferably, the protection system includes at least one openable section for facilitating access to a materials delivery system. Preferably, the materials delivery system is inserted through the openable section. Advantageously, this allows the delivery of building material specific to the stage of construction being carried out on each level.

[0027] In one embodiment the openable section is preferably a hinged screen. However, it should be appreciated that the section may be in a different form and open in various other ways including sliding rolling or retracting.

[0028] In some embodiments, at least one materials delivery systems is connectable to the protection system. Advantageously, this allows a materials delivery system to be attached at any location along the side of the building. In other embodiments the materials delivery system may be connectable to the building. In still further embodiments, the materials may be delivered by crane or other lifting apparatus.

[0029] In some embodiments, the method includes the use of at least one crane. Preferably, a crane is positioned on the top level of the building. The crane preferably has a moveable arm. The arm preferably has sufficient length to reach all sides of the building. Advantageously, this allows construction materials to be lifted from the ground to the level currently being worked on from any side of the building. In other embodiments, one or more cranes may be operated from any one or more of ground level, from an intermediate building level, from adjacent buildings or from specially constructed scaffolding or crane towers.

[0030] Preferably, in step (c) of the method according to the second aspect, the fixed external barrier may take the form of any desired external wall system or part thereof, such as an infill wall, curtain wall, external façade, or the like. The presence of the fixed external barrier provides a safety barrier allowing the construction of further structural

and architectural features to continue on a level without the moveable protection system enclosing that level.

[0031] In some embodiments, the protection system includes a supporting surface for bearing the weight of a worker. Preferably, the supporting surface is configured to support at least three workers. Preferably the supporting surface is in the form of weight-bearing flooring. In other embodiments, supporting surfaces may be attached to the protection system or to the building structure. In other embodiments, workers may gain access to the building levels using an elevated work platform.

[0032] In some embodiments, the protection system includes an aperture for accommodating passage of a passenger lift.

[0033] It will be understood that the protection system may be mounted to the building to enclose more than two levels. In one preferred embodiment, there is provided a system enclosing four adjacent levels. In this embodiment, step (b) of the method is conducted on the uppermost level, step (c) is conducted on the lowest level, and intermediate construction steps are carried out on the levels in between. It should be appreciated, however, that the invention is not limited to this particular embodiment and construction may, for example, be carried out on two, three, four, five or more levels simultaneously. In other embodiments, multiple adjacent levels may be completed simultaneously, and the protection system may accordingly be raised as set out in step (d) by a height substantially corresponding to the number of completed building levels.

[0034] According to one embodiment, the cycle time for achieving completion of each level is within the range of 8 to 15 days. However, it will be appreciated that the cycle time is not limited to this range, and may include shorter or longer time periods.

[0035] According to a fourth aspect of the invention there is provided a method of constructing a multi-level building having a pre-determined number of levels, the method including the steps of:

- a) releasably mounting a moveable protection system according to any one of claims 16 to 26 to the building thereby to enclose at least part of the periphery of two or more levels of the building;
- b) installing formwork on the uppermost enclosed level;

- c) completing a fixed external barrier substantially around the lowest enclosed level, wherein the barrier includes an externally facing facade;
- d) thereafter raising the moveable protection system by a height substantially corresponding to one level of the building; and
- e) repeating steps (b), (c) and (d) until step (b) has been completed for the predetermined number of levels.

[0036] According to a fifth aspect of the invention, there is provided a construction planning method, including the steps of setting dates associated with:

- a) selecting sub-contractors, including:
 - i. setting time periods for obtaining measurements, plans and specifications of deliverables; and
 - ii. setting sub-contractor timetables for selecting and sourcing materials, fabrication, delivery and installation;
- b) starting and completing each cycle of construction;
- c) assignment of worker duties to coordinate with the sub-contractor timetables;
- d) sequencing construction steps to coordinate sub-contractor activities; and
- e) carrying out the method according to the second aspect of the invention.

[0037] In a preferred embodiment, the dates are set in a project task schedule. Preferably the project task schedule includes substantially all tasks required for project completion. Preferably, the tasks are grouped within the project task schedule into categories according to trade discipline. In some embodiments, the categories may include but are not limited to main building works, architectural works, mechanical and/or electrical works and external works.

[0038] Preferably, a core project team is established prior to creating the project task schedule. Preferably, the core project team includes the roles of project engineer, project architect, mechanical engineer, electrical engineer and draughtsman.

[0039] Preferably, selection of sub-contractors in step (a) includes award of sub-contracts. Preferably award of sub-contracts occurs within a predetermined period of time from a main building contract award date. Preferably the predetermined period is 3

months. Preferably the project task schedule is communicated to substantially all sub-contractors.

[0040] Preferably, terms of the awarded contracts include clauses stipulating strict adherence to the dates set in steps (a)(i) and (a)(ii). Preferably the contract terms include penalties for failure to meet the set dates.

[0041] Preferably the length of each stage of construction in step (b) corresponds to the cycle time for achieving completion of each level. Preferably the cycle time is within the range of 8 to 15 days. More preferably, the cycle time is 10 days.

[0042] Preferably, materials are delivered in sets. Preferably, each set includes all materials required for construction of one floor. Preferably, the materials delivery dates are set in advance of each construction stage by at least the cycle time. Preferably the materials are delivered with shielding to protect the materials from damage for the duration of construction.

[0043] In some embodiments, the project task schedule includes a critical task schedule, including substantially all tasks requiring access to the building facade via the movable protection system. Preferably completion of each stage of construction in step (b) includes completion of all critical tasks for the lowest enclosed level. The critical tasks may include, but are not limited to, completion of: external doors and windows, balcony railings, air-ledge railings, plastering, external trellis, external electrical works, external plumbing works and aluminium formwork.

[0044] Preferably the movable protection system is the only means of external access to the building facade for the duration of the project. Advantageously, this substantially eliminates the need for staging or scaffolding, thereby reducing safety hazards.

[0045] Preferably step (d) includes setting milestones for each construction step in the project task schedule. Preferably each construction step is allocated to at least one worker or sub-contractor. Preferably, the construction steps are sequenced according to an order of dependency of execution.

[0046] Preferably, the start of steps allocated to internal architectural, mechanical and electrical sub-contractors substantially coincide with commencement of structural works on the fourth level of the building.

[0047] Preferably sample demonstrations are carried out substantially in advance of construction activities.

[0048] According to a sixth aspect of the present invention there is provided a moveable protection system according to the third aspect of the invention for use in the method according to the first, second, fourth or fifth aspects of the invention.

[0049] It will be appreciated by those skilled in the art that use of the level-by-level construction and planning method and moveable protection system advantageously results in improvements to safety, a cleaner working environment, reduced health hazards, increased efficiencies and faster completion of the building construction project.

Brief Description of the Drawings

[0050] A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawing in which:

[0051] Figure 1 is a schematic representation of a multi-level building under construction according to the invention.

Preferred Embodiment of the Invention

[0052] Referring to Figure 1, a multi-level building having a pre-determined number of levels is under construction using a level-by-level construction method. At the stage of construction illustrated, the building includes a first level 1, a second level 2, a third level 3, a fourth level 4, a fifth level 5 and a sixth level 6. The first and second levels have been completed. Construction activities are taking place on the third, fourth, fifth and sixth levels.

[0053] As shown, a moveable protection system 7 has been mounted to the exterior of the building, thereby to enclose at least part of the periphery of the four levels 3, 4, 5, 6 of the building on which construction is taking place. The protection system 7 includes

a connected plurality of perforated aluminium protective screens 8, and supporting surfaces 9 aligned with each level of the building for supporting the weight of two to three men 10 simultaneously. The protection system also includes an aperture for accommodating passage of a passenger lift.

[0054] A materials delivery platform 11 can be inserted through the protection system 7 through an openable panel. The platform may be connected to the protection system or, alternatively, to the building. Construction materials 12 are delivered to the materials platform 11, via a crane on the building site or via another suitable method. One option may be to use a crane mounted on the building which has a moveable arm having sufficient length to reach all sides of the building. This allows construction materials 12 to be lifted from the ground to the level currently being worked on from any side of the building.

[0055] With the protection system in place to enclose levels three to six inclusive, formwork 13 is installed on the uppermost enclosed level, level six 6. Simultaneously, a fixed external barrier forming an external wall system is installed around the lowest enclosed level, level three 3. Dependent upon the construction method followed, this external wall system may include an infill wall, curtain wall, external façade or the like. It may also be in the form of a window frame 14, balcony railing 15, air-conditioning ledge and screens. This external wall provides a sufficient safety barrier to allow work to continue on the level without the protection system 7 enclosing that level.

[0056] Intermediate construction activities, such as housekeeping 16 in preparation for finishing activities and installing support props 17 are simultaneously carried out on levels four 4 and five 5, respectively.

[0057] Once all activities requiring external access to the facade of the lowest enclosed level 3 are completed, the materials platform 11 may be withdrawn from the protection system 7 to facilitate raising of the protection system. Where the material platform is connected to the protection system, it may not be necessary to detach the platform. The moveable protection system 7 is raised by a height corresponding to one level of the building using an hydraulic system. Level four 4 then becomes the lowest level. A new uppermost level is defined on which construction of formwork can now begin.

[0058] The construction steps above are then repeated until formwork 13 has been installed for the pre-determined number of levels. All levels are then brought to completion in order to finish construction of the building.

[0059] The building construction is planned using a project task schedule. An example project task schedule is shown in the table below, in which "W" refers to project week and "M" refers to project month.

Project: XYZ

SITE POSSESSION = dd.mm.yyyy

W1=DD.MM.YYYYY

Title: Project Task Schedule

QS's reply

Item	Description	Action By		Target Award Date (QS)	Date Awarded	Remarks
		Office	Site			
A	PRELIMINARIES					
1.1	Project Signboard	QS		W1		LETTER OF AWARD TO BE ISSUED
1.2	Insurance	QS		W2		WITHIN 2 WEEKS FROM LETTER OF
1.3	Performance Bond	QS		W2		WITHIN 2 WEEKS FROM LETTER OF
1.4	Pre & Post Condition Survey/Loss Adjuster	QS		W1		
1.5	Land Survey & Setting-out	QS		W4		
1.6	Cable Detection	QS		W1		
1.7	Registered Technical Officer	QS		W6		
1.8	Noise Meter	PURCHASER		W6		
1.9	Electrical Works and Temporary Power Supply Connection	QS		W3		
2.0	Plumbing & sanitary Works and Temporary Water Supply Connection	QS		W3		
2.1	Design & Temporary Work PE Services	QS		W3		
2.2	Portable Toilet	Purchaser		W1		
2.3				W1		
2.4	Ground Instrumentation And Monitoring Works	QS		W6		
2.5	Pest Control	QS		W1		
2.6	Material Testing	QS		W8		
2.7	Scaffolding	PM/QS		M5		
2.8	Tower Crane Rental	Purchaser		M3		
2.9	CCTV Monitoring System for Construction Activities	QS		M3		
3.0	Pre & Post Con CCTV Survey on Existing Sewer	QS		W3		
3.1	Safety Audit/ConSASS	Safety		M3		
3.2	Site Hoarding & Gate & Sticker	Purchaser		W1		
3.3						
3.4	Noise Barrier Hoarding	Safety/Purchaser/QS		W2		
3.5	Site Office (2 sty containers)	PM/Purchaser		W2		FROM PEC49
3.6	Workers Dormitory	PM/Purchaser		W4		
3.7	ERSS Temporary Works					
3.8	Continuous bored pile	PM/QS		W4		
3.9	Earth Retaining Soil System Sheet Piling & Strutting	PM/QS		W4		
4.0						
4.1	Earth Control Measure					
4.2	Earth Control Measure Tank (QCEP to design to suit site requirement)	Safety		W2		
4.3	TSS & CCTV Monitoring System	QS		W2		
B	CRITICAL TASK SCHEDULE					
1.0	Perimeter Moving Screen	QS		W10		
2.0	Prefabricates Bathroom Unit	QS		W10		
3.0	Design/Supply and delivery Alum Formwork	QS		W10		
4.0	Wet Trade - Labour - Masonry, Plastering, Tiling	QS		W10		
5.0	Curtain wall	QS		W3		
6.0	Alum Door/ Window glazings	QS		W3		
7.0	Glass Railing	QS		W3		
8.0	Alum Railing	QS		W3		
9.0	Steel galvanised Railing	QS		W3		
10.0	Structural form works system	QS		W6		
11.0	Air-con legde	QS		W5		
C	MAIN BUILDING WORKS					
2	Anti-termite / Soil Treatment	QS		W8		
3.0	Earth Works					
	Structural Works	QS		W10		ISSUED DRAWINGS PRIOR TO BUILDING
0.1	Perimeter Moving Screen	QS		W10		SUBMISSION (TARGET ISSUED-
0.2	Prefabricated bathroom unit	QS		W8		
0.3	Bored Pile works			W8		
0.4	Precast Concrete Components	In-house		W8		
0.5	3 in 1 Structural Works - Labour	In-house		W8		
0.6	Design/Supply and delivery Alum Formwork	In-house		W8		
0.7	Power Float	Purchaser		W9		
0.8	Material supply - Reinforcement Bar/mesh	Purchaser		W9		
0.9	Material supply - Reinforcement Bar (Backup)	Purchaser		W9		
1.0	Material supply - Concrete	Purchaser		W9		
1.1	Material supply - Concrete (Backup)	Purchaser		W9		
1.2	Material supply - Aluminium Formwork	Purchaser		W9		

Project: XYZ

SITE POSSESSION = dd.mm.yyyy

W1=DD.MM.YYYYY

Title: Project Task Schedule

OS's reply

Item	Description	Action By		Target Award Date (QS)	Date Awarded	Remarks
		Office	Site			
1.3	Material supply - Metal Formwork	Purchaser		W9		
1.4	Material supply -ordinary portland cement	OS		W10		
1.5	Concrete Waterproofing Additive & ADMIXTURE	OS		W10		
1.6	Waterproofing Membrane & for Basement, E-Deck					
D	ARCHITECTURAL WORKS					
1.0	Wet Trade - Labour - Masonry, Plastering, Tiling	Purchaser		W2		
1.1	Wet Trade - Material Supply - Mansonry	Purchaser		W2		
1.2	Wet Trade - Material Supply - Prepacked	OS		W2		
1.3	Wet Trade - Material Supply - Tiling	OS		W2		
1.4	Wet Trade - Material Supply - Granite	OS		W2		
2.0	Wet Trade - Material Supply - Lightweight Concrete	OS		W3		
2.1	Kitchen Cabinets, Distribution Board Cabinet	OS		W3		
2.2	Wardrobes	OS		M8		
2.3	Fitting-out Works to Clubhouse and Main Lift Lobbies	OS		M8		
2.4	Softscape Works	OS		M8		
2.5	Playslide Equipment	OS		M8		
2.6	Gymnasium Equipment	OS		M8		
2.7	Outdoor Furniture	OS		M9		
2.8	Letter Box, Blast door, Hopper	OS		M9		
2.9	Cabinet & install vanity top	OS		M9		
3.0	Fire Doors, Metal, Timber Doors	OS		M9		
3.1	Pocket Door System	OS		M9		
3.2	Bicycle Rack	OS		W11		
3.3	Shower Screen	OS		W11		
3.4	Mirror	OS		W11		
3.5	Painting/Road Marking	OS		W11		
3.6	False Ceiling Work & Drywall Partition	OS		M10		
3.7	Signages	OS		M8		
3.8	Timber Works (timber deck & timber flooring)	OS		M8		
3.9	Roller Shutter	OS		M10		
4.0	Lightweight panel	OS		M10		
4.1	Wrought Iron	OS		M11		
4.2	Column Guard & Speed Breaker Hump	OS		M11		
4.3	Metal works	OS		M11		
4.4	Jacuzzi					
E	MECHANICAL AND ELECTRICAL WORKS					
1.0	Gas, Plumbing & Sanitary, Fire Hose reel, Dry Riser	OS		M3		
2.0	Minor Sewer & Diversion Works	OS		M3		
3.0	Electrical, Telephone & CATV Works	OS		M3		
4.0	Automatic Fire Sprinkler & Alarm System	OS		M3		
5.0	AIR Conditioning and Mechical Ventilation System	OS		M3		
6.0	Swimming Pool	OS		M3		
7.0	Lift Installation System			M3		
F	EXTERNAL WORKS					
1.0	Drainage & Culvert Work	OS		M12		
1.1	External Road - Premix, Road Marking, Traffic	OS		M10		
1.2	Structural Steel for Precinct (Linkway, Drop-off Porch,	OS		M10		
1.3	Metal Roofing/Trellis	OS		M10		
1.4	Landscape Works	OS		M12		
	Playground, Adult & Elderly Equipment and EDPM					

CLAIMS

1. A method of constructing a multi-level building having a predetermined number of levels, the method including the steps of:

5 a) setting and monitoring time periods and work cycles for completion of construction and installation tasks on a level-by-level basis;

b) selecting sub-contractors and, for each selected contractor, performing the following steps to comply with the time periods and work cycles set in step (a):

10 i. setting and monitoring time periods for obtaining measurements, plans and specifications of deliverables; and

ii. setting and monitoring sub-contractor timetables for selecting and sourcing materials, fabrication, delivery and installation;

iii. assignment of worker duties to coordinate with the sub-contractor timetables;

15 c) installing formwork for a set of two or more levels of the building;

d) releasably mounting a moveable protection system to the building, thereby to enclose at least part of the periphery of the set of two or more levels;

e) completing all critical internal and external construction and installation tasks of the lowest enclosed level of the set within the time period set in step (a);

20 f) thereafter raising the moveable protection system by a height substantially corresponding to one level of the building to enclose the next level above the previous set of levels, thereby defining a new set of enclosed levels;

g) installing formwork for the next enclosed level above the highest level of the lower set of levels;

25 h) repeating steps (e), (f), and (g) until step (g) is completed for the predetermined number of levels;

i) completing construction and installation tasks in regard to at least the external façade of the remaining enclosed levels.

30 2. A method according to claim 1 wherein the set of two or more levels in step (c) includes four levels.

3. A method according to claim 1 or claim 2 wherein the movable protection system encloses the whole of the periphery of the building.

35 4. A method of construction according to any one of claims 1 to 3 wherein step (e) includes one or more the sub-steps of completing:

i. external doors and windows;

ii. balcony railings;

- iii. air-ledge railings;
- iv. external plastering;
- v. external trellis;
- vi. external electrical works;
- vii. external plumbing works; and
- viii. aluminium formwork.

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5. A method according to any one of claims 1 to 4 wherein step (i) includes the completion of all internal and external construction and installation tasks of the remaining enclosed levels.

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6. A method of constructing a multi-level building having a predetermined number of levels, the method including the steps of:

a) releasably mounting a moveable protection system to the building thereby to enclose at least part of the periphery of two or more levels of the building and then accessing a materials delivery system from an enclosed level of the building through the movable protection system;

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b) installing formwork on the uppermost enclosed level;

c) completing a fixed external barrier substantially around the lowest enclosed level, wherein the barrier includes an externally facing facade;

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d) thereafter raising the moveable protection system by a height substantially corresponding to one level of the building; and

e) repeating steps (b), (c) and (d) until step (b) has been completed for the predetermined number of levels.

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7. A method according to claim 6 wherein the materials delivery system is isolated from the protection system prior to step (c) to facilitate raising of the protection system.

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8. A method according to claim 6 wherein step (a) includes connecting the materials delivery system to the moveable protection system.

9. A method according to claim 8 wherein step (d) includes raising the moveable protection system with the materials delivery system connected thereto.

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10. A method according to any one of claims 6 to 9 wherein the materials delivery system is a materials platform.

11. A method according to any one of claims 6 to 10 wherein step (d) utilises a crane or a hydraulic device for raising the moveable protection system.

5 12. A method according to any one of claims 6 to 11, wherein step (a) includes enclosing three or more levels of the building, and wherein the method includes an additional step (c1) performed between steps (a) and (d), step (c1) including performing intermediate construction activities on the at least one middle level of the at least three levels.

10 13. A method according to any one of claims 6 to 12, wherein the time required to installing formwork to completion of a level is within the range of 8 to 15 days.

14. A moveable protection system for use in constructing a multi-level building including:

means for releasably mounting the protection system to the building;

15 at least one protective screen for enclosing at least part of the periphery of two or more levels of the building that are under construction;

a supporting surface for bearing the weight of at least one worker;

20 shoes operable to rest on a level of the building that is under construction in order to substantially close a gap between the protective screen and the building at an access location between the supporting surface and the level of the building that is under construction;

means for raising the protection system with respect to the building; and

at least one openable section for facilitating access to a materials delivery system from an enclosed level of the building.

25 15. A moveable protection system according to claim 14 wherein the materials delivery system is insertable through the openable section.

16. A moveable protection system according to claim 14 or claim 15 wherein the materials delivery system is connectable to the moveable protection system.

30 17. A moveable protection system according to any one of claims 14 to 16 wherein the openable section is a hinged screen.

35 18. A moveable protection system according to any one of claims 14 to 17 wherein the means for raising the protection system is a hydraulic device.

19. A moveable protection system according to any one of claims 14 to 18 wherein the at least one protective screen is multi-perforate.

20. A moveable protection system according to any one of claims 14 to 19 including a plurality of screens connected together to form a safety barrier.

5 21. A moveable protection system according to any one of claims 14 to 20 including an aperture for accommodating a passenger lift.

22. A moveable protection system according to any one of claims 14 to 21 wherein the shoes are in the form of flip-down panels.

10 23. A method of constructing a multi-level building having a pre-determined number of levels, the method including the steps of:

a) releasably mounting a moveable protection system according to any one of claims 14 to 22 to the building thereby to enclose at least part of the periphery of two or more levels of the building;

15 b) installing formwork on the uppermost enclosed level;

c) completing a fixed external barrier substantially around the lowest enclosed level, wherein the barrier includes an externally facing facade;

d) thereafter raising the moveable protection system by a height substantially corresponding to one level of the building; and

20 e) repeating steps (b), (c) and (d) until step (b) has been completed for the predetermined number of levels.

24. A construction planning method, including the steps of setting dates associated with:

25 a) selecting sub-contractors including:

i. setting time periods for obtaining measurements, plans and specifications of deliverables; and

ii. setting sub-contractor timetables for selecting and sourcing materials, fabrication, delivery and installation;

30 b) starting and completing each cycle of construction;

c) assignment of worker duties to coordinate with the sub-contractor timetables;

d) sequencing construction steps to coordinate sub-contractor activities; and

e) carrying out the method according to any one of claims 1 to 13 or 23.

35 25. A moveable protection system according to any one of claims 14 to 22 for use in the method according to any one of claims 1 to 13 or 23 or 24.