



Successful construction with PERI



10 years PERI UAE
Page 2

The Dubai Marina Mall project
Page 3

The Sky Tower project
Page 4

The right tie solution for all wall formwork:
waterproof, gasproof, ...
Page 6

Phase 1 – Plot 1 Zone C – Al Reem island
Page 8



10 years PERI UAE

Dear customers, dear colleagues, dear friends and family,

when we realized beginning of the year that PERI L.L.C. will fulfill it's 10 year's anniversary in November we couldn't believe how fast time has passed.

A lot has changed by now. Dubai, the United Arab Emirates and especially it's capital Abu Dhabi have gone through an economical boom and actually there is no end of it in sight.

The construction sector is growing and we with all the

growth in the country PERI L.L.C. has grown a lot as well.

PERI L.L.C. started 1997 with a team of three and staff tripled within one year. We moved offices and we moved our stockyard to Al Quoz after five years. Now, in the 10th year we are a team of more than 85 people working together.

The first massive project that PERI was confronted with were the Emirates Towers on Sheikh Zayed Road. The Emirates Towers are a landmark in Dubai that is known all over the world

and was the first outstanding PERI project in the UAE. It was the first but it was definitely not the last one.

A lot of amazing and impressing projects followed: Dubai Festival City, Dubai Marina Number One, Palm Jumeirah truck tunnel, Almas tower, just to name a few.

Last year we opened our branch office in Abu Dhabi due to the increasing demand in the UAE capital and already now it is hard to imagine how we have done without it.

All in all PERI L.L.C. has had successful first 10 years and I cannot wait to start into the next 10 years.

I want to thank everybody who was and is involved in the PERI L.L.C. success and wish us all the best!

Hans-Joachim Rau
Managing Director

New gateway in Abu Dhabi 1,400 villas with MULTIFLEX and VARIO

Al Raha Gardens, Abu Dhabi



Jihad H. Khaled, Managing director, Al Jaber:
"Working on a prestigious and fast track project with the scope of constructing and handing over 1380 villas within a limited time frame, PERI formwork was our safest bet for a speedy and manageable system to achieve a high quality product. In addition, their technical advice and training to our tradesmen are second to none."



Occupying an area of 6.8 million square metres, Al Raha Gardens will be across from the beautiful beachfront on the Abu Dhabi to Dubai highway poised to become the spectacular new

gateway to the city of Abu Dhabi. It comprises a range of residential accommodation ranging from spacious 3-bedroom townhouses to luxurious 5-bedroom villas, open parks and landscaped



PERI systems in use:

- MULTIFLEX with GT 24 girders
- PEP 20 props for slab formwork

environment. The development will provide convenient retail amenities plus a supporting infrastructure of prestigious schools, offering an international curriculum as well as a kindergarten.

A 48 m high PD 8 support for the shopping mall that is surrounded by water

Dubai Marina Mall, Dubai

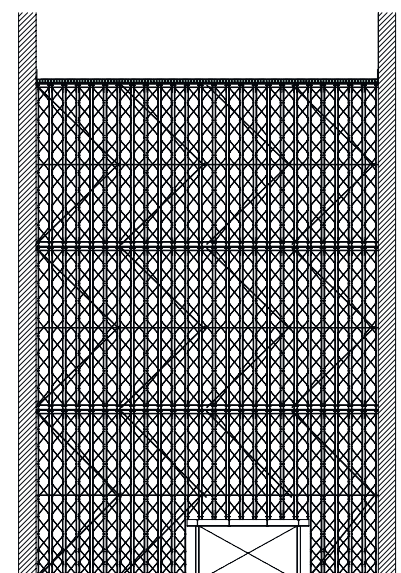


**Wayne Randall, Commercial Manager
Al Jaber L.E.G.T. Engineering
& Contracting (ALEC) L.L.C.:**

"We chose PERI because of their efficient service and high level of technical support, moreover the tried and tested relationship that has been established between ALEC and PERI over the years has made the project deliverables easier to achieve on the commercial and technical challenges of this project which is large in scale and complex in construction."

Alec was chosen by Emaar to build the Dubai Marina Mall complex which will consist of an extensive shopping and entertainment centre. The Mall, located along the waterfront, is scheduled to open in the second half of 2008. It extends over an area of 42,000 m² and will have 40,000 m² of net leasable space. The construction will take about 823 days in total and should be

finished by June 2008. The total floor area is 367,070 m². The core wall height is 178 m and the wall thickness adds up to 1,925 mm. The total height of the building will approximately be 192 m. Out of the 43 floors there will be a two-level basement and a five-storey parking lot which is expected to accommodate more than 3,000 vehicles.



Systems in use:

- TRIO 330 with CB 240 Working Platforms and Internal BR Platforms – for Lift and Stair Core
- PD 8 Tableform for beam support
- PD 8 Shoring and GT 24 as bearers – Beam and Slab Support
- VARIO with CB 240 Working Platforms – for Lift and Stair Core

The 7-storey Gourmet Tower is a key attraction of the Dubai Marina Mall – dedicated to world-class cuisine and only accessible by a bridge via the mall.

Special requirements and significant parts of project demanded by the contractor:

Transfer Girder Beam at 6th Level – 9th Level (Soffit height at 48 m from ground level), double height slabs (Max. height up to 21 m), Splay Beams (Curved Beams), Slab Drops, Smooth Soffits

Reaching for the sky with VARIO and MULTIFLEX Highest tower in Abu Dhabi

Sky Tower, Abu Dhabi



Mohamed Faten

**Senior Construction Manager
Arabian Construction Co. L.L.C:**

“PERI systems are fast and flexible accurate formwork, which allows us to ensure that construction is done per our tight schedule and required cycle time. The systems also fulfill the quality and high safety standard of the project in the best possible way. It is cost and time efficient. We are really achieving fantastic concrete finishings, wall aligned & vertical. I am confident with PERI, vertical and slabs system could comfortably meet this fast track project schedule and the tough dead lines.”



Peri Formwork systems in use Basement and Podium floors

- Basement retaining walls: VARIO GT 24, SB1 and SKS
- Basement/Podium Columns, Shear walls and Core walls: VARIO GT 24
- Basement & Podium Slabs: MULTIFLEX and PD 8 systems

This eight tower project forms the land entrance to the Al Reem Island Shams Abu Dhabi Project. The Gate project will feature the, 'Sky Tower' as its signature property.

The iconic 75-storey (299.40 m) elliptical tower will be the highest tower ever to be built in Abu Dhabi and the fifteenth tallest residential and commercial tower according to the current

world ranking. The Tower 2 will have 65 floors (244 m) and there is the podium with 3 floors + 5 basement floors. The Sky tower aspires to be the first building in the UAE to achieve Certification under the US Green Building Council's Tower Leadership in Energy and Environmental Design (LEED) rating by using a number of Energy Conservation Measures.

Project consists Tower 1, Tower 2 and Podium floors

- Podium: Three levels of Basement each floor area ~ 37,000 m² (Parking)
- Five levels of Podium floors each consists ~15,000 m² (Parking and Retail)
- Tower 1: ~ 75 floors each area = 2,680 m²
- Tower 2: ~ 65 floors each area = 1,700 m²



Tower 1

- Typ. Floors level 1 to level 40 (floor ht. = 3.75 m)
- Precast slab support: PD 8 table system
Typ. Floors level 40 to level 85 (floor ht. = 3.30m)
- Columns and shear walls: VARIO GT 24 with climbing CB 240
- Cast in-situ slab: PD 8 Tables on Periphery and TK head Tables internal areas

- Tech. floors level 20 and level 40 and level 73 (floor ht. = 8.25 m)
- Walls: VARIO GT 24
- Slab: PD 8 system

Tower 2

- Typ. Floors level 1 to level 65 (floor ht. = 3.30 m)
- Cast in-situ slab: TK head Tables
- Columns and shear walls: VARIO GT 24 with climbing CB 240
- Tech. floors level 36 and level 63 (floor t. = 8.25 m)
- Walls: VARIO GT 24
- Slab: PD 8 system

TRIO is climbing with the ACS P system for the new landmark in the Dubai International Financial Center

Liberty house, Dubai



Shiv Kumar V Rao
Project Manager, ASCON:

“Our experience using PERI systems in our earlier projects and the fast cycle time required in this current project made us choose PERI systems again.”

PERI systems in use:

- VARIO for columns
- ACS R with VARIO for core 1
- ACS P with TRIO for core 1A
- PERI UP Rosett Shoring for non-typical floors

Liberty House is located on Gate Drive of the Dubai International Financial Center district. The DIFC is located at Sheikh Zayed Road – behind the Emirates Towers and Dubai World Trade Center. Liberty House is the prominent new architectural landmark in DIFC. Contemporary in design, the tower is a reflection of the modernity of Dubai. Liberty House is a forty-two storey structure with a height of 174 meters that offers eight floors of freehold open plan offices and twenty nine floors of luxurious apartments. The sophisticated and elegant facade of the building uses a mixture of glass with natural and artificial elements.

A special requirement that PERI had to fulfill was to use a climbing system that is 100% crane free. Therefore the PERI ACS P was used – the self-climbing formwork scaffold with integrated working platforms for any building core arrangement. It provides the optimal solution for advancing cores in highrise buildings, and tower-like structures. The platforms (P = platform) form large-sized storage and working areas. With the ACS P system only very few platform beams cross the walls which

has the advantage in that the reinforcement can be partially pre-assembled. The ACS P (P = platform) self-climbing system from PERI is a compact and complete forming machine for cores of highrise buildings and tower-like structures.

The complete enclosure of the platforms, which provides protection against the wind, allows working and climbing to be carried out in all weathers. The comfortably designed platforms ensure safe and efficient working routines as on the ground. A technical solution had to be found for very narrow core. The PERI VARIO system could not be used as there was not enough space for the workers left. The solution was to use PERI TRIO. Wall heights of up to 3.30 m can be formed using TRIO without extensions and with only two ties. TRIO requires only one part for all panel connections: the BFD alignment coupler. This formwork system could be easily used on the cores.

The duration of the project is supposed to be 24 months and therefore the project should be finished in 2008.



The right solution for all wall formwork: waterproof, gasproof, fire resistant, soundproof, radiation-proof

Tie systems

Requirements

PERI's two alternatives are exactly what are needed.

Tie points must always be sealed carefully, whatever the method used. PERI has developed a new way of doing this after construction. There is a much better chance of achieving sound walls with PERI's system rather than conventional solutions. Sealing allows you to influence the end result, whereas lost sealing components are no longer accessible. And the experienced operator knows just how many uncertainties are involved in concreting and curing.

PERI tie systems for wall formwork are:

- Waterproof (DIN 1045)
- Gasproof
- Fire resistant (F 90 to DIN 4102)
- Soundproof (DIN 4109)
- Radiation-proof (DIN 6812, DIN 54113)

And follow the recommendations of the German association for testing vault and strongroom facilities.

Pitfalls

The conventional methods of tying formwork are far from reliable in practice. Curing shrinkage produces cracks running right along the tie point. Difficulties also arise during striking. Construction sequences often make it necessary to strike just one day after concreting. The wing nut counterplate is then loosened with several hammer blows that can jar tie rods and lost components. And when one half of the formwork is released the tie rod's tension force becomes unidirectional. This produces haircracks around the lost components. The inevitable sudden release of the normal extension of the tie rod produced by concreting leads to cracks between rod and concrete.

Mistakes in fixing waterstop centrepiece

One very common error is working with spacer tubes on the two tie rods either side of the lost component. These permeable tubes allow the water to penetrate right into the middle of the wall – making the expensive waterstop centrepiece ineffective.

Mistake in fixing fibre reinforced concrete spacer tube

The biggest disadvantage is that one hammer blow too many, or slight overtightening of the nuts, cracks these tubes.

Consequences

Example:

Circular tank with about 600 tie points

Cost of all tie points with waterstop centrepieces

Materials + labour about € 7,500

When the tank is filled for the first time about 20 of the tie points leak.

Remedial measures:

- Drain tank
- Attempt to remedy using contractor's own resources
- Refill tank
- Remedial measures unsuccessful; even more tie points are leaking
- Drain tank for the second time
- Remedial work carried out by specialist waterproofing subcontractor
- Fill tank for the third time
- Inspect
- Empty for the third time
- Winter protection as appropriate
- Possible penalty payments

Total cost

Settlement tank about € 25,000

Water tank about € 50,000



Formation of shrinkage cracks makes tie rods...



...and cast-in waterstop centrepieces likely to leak.



A waterproof tie point is the most effective one!

Solution 1

DK sealing cone system



Consists of 2 reusable DK sealing cones and a lost spacer tube. The through tie rod is advantageous when shuttering. A seal between cone and formwork compensates for unevenness, and prevents laitance trickling in.

Solution 2

SK tie cone system



Consists of 2 reusable SK tie cones and 3 tie rods, the middle one of which can be lost (eg for vaults and strongrooms and buildings providing radiation protection). For all other applications a spacer tube is used to enable the middle tie rod to be recovered. The seal is used similarly to the DK sealing system.



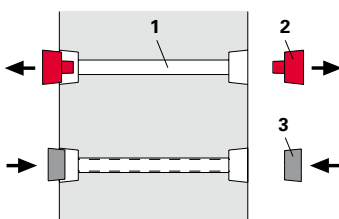
The DK system is:
waterproof, gas-proof,
fire resistant, soundproof



The SK system is:
At version 1
waterproof, gas-proof, fire resistant,
soundproof

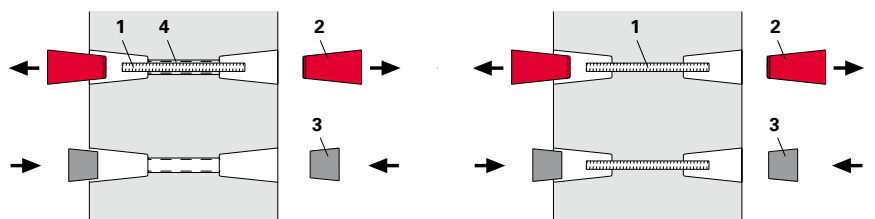
At version 2
waterproof, gas-proof, fire resistant,
soundproof, radiation-proof, suitable
for vaults and strongrooms

Reusable tie rod



- 1 Spacer Tube Rough (x1)
- 2 DK Sealing Cone (x2)
- 3 DK Concrete Cone (x2)

Lost tie rod



- 1 Reusable tie rod (x1)
- 2 SK Tie Cone (x2)
- 3 SK Concrete Cone (x2)
- 4 Spacer Tube Rough (x1)

- 1 Lost tie rod (x1)
- 2 SK Tie Cone (x2)
- 3 SK Concrete Cone (x2)

CB is climbing on the Al Reem island in Abu Dhabi 5 towers, 7 villas and a podium

Phase 1 – Plot 1 Zone C, Abu Dhabi



**Mr. Yap Tong Heng,
IJM-SUNWAY-ZELAN-LFE (ISZL):**
"PERI Formwork system is not new to us as we have used the PERI system in our home country, Malaysia. PERI system is a fast and safe system and also the good technical support received here."



I-S-Z-L, Consortium, a Malaysian based construction group has been established for the design, execution and completion of Phase 1, Plot 1 Zone C which consists of 5 residential towers CT 1, CT 2, CT 3, CT 4 and CT 5, 7 luxuries villas and associated podium at the Al Reem Island in Abu Dhabi. Zone C consists of 12.63 acres land area, with total GFA 408,887 m² of residential area is located along the water front mixed with retail mall and a supermarket at the ground floor level. The project will be finished by April 2009.

Dimensions of construction:

- Total Formwork Areas for 5 Towers Slab = 16,285 m² (1 level)
- Water Tank Wall = 1,944 m²
- Corewall = 3,525 m²

Heights, wall thickness, size:

Wall Heights:

- 3.30 m, 3.60 m and 5.10 m max.

Wall Thickness:

- 400 mm - 700 mm

Column Sizes:

- 750x600, 600x600, 800x600 mm

Column Heights:

- 3.60 m and 5.10 m

How many floors, columns:

- Project is 44 floors + Basement

PERI systems:

- VARIO + CB for Core Walls
- VARIO + CB for Shear Walls
- VARIO for Water Tank Walls
- VARIO for Columns
- MULTIFLEX + PD 8 for Slabs



Handbook 2008

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Fax: +971 (0)4.33 94 434
perillc@perime.com

Seminars and brochures

In order to provide our customers with the best know-how regarding our PERI Systems we offer them a wide range of different seminars and brochures.

The illustrations featured in this brochure are photographs taken at a particular time on a construction site. This is why the safety details shown cannot be considered as final.

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PERI L.L.C Formwork Shoring Engineering

Brashy Building,
Office no. 212
Sheik Zayed Road
P.O. Box 27933
Dubai, U.A.E.
Tel.: +971 (0)4.33 94 494
Fax: +971 (0)4.33 94 434
perillc@perime.com
www.perime.com