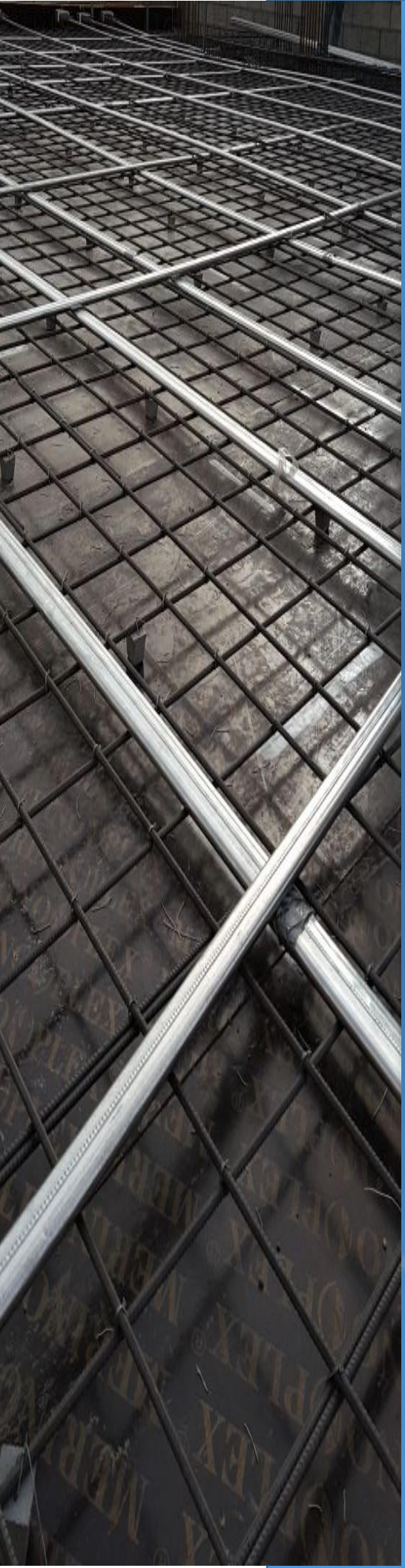


Bahrain Post-Tension

Pre-Qualification Document

P.O. BOX 5999, MANAMA, KINGDOM OF BAHRAIN
C.R. NO. 69393-4
TEL: 17008458 FAX: 17009314
E-MAIL: INFO@BPT-BH.COM WEBSITE: WWW.BPT-BH.COM

OHSAS 18001 BUREAU VERITAS Certification

TÜV NORD ISO 9001:2008

pti POST-TENSIONING INSTITUTE
A member of Post-Tensioning Institute (USA)

Table of Contents

Introduction

Bahrain Post-Tension Contracting "BPT" is a specialized Post-Tension contracting company which has stamped its strong presence in the market by virtue of successfully completed projects and satisfied clientele. BPT is rapidly emerging to be the contractor of choice for leading developers, consultants and building contractors. Based on track record and its resolve to relentlessly excel each day, BPT is aiming to be the market leader in the Post-Tensioning business.

Our Strength

BPT prides itself in its unconditional and continual pursuit of improvement. With an array of highly skilled manpower lead by a team of professional management, BPT is adequately equipped to take on projects of varied nature and sizes. We also benefit from having a strong supply-chain mechanism in place to ensure timely, cost effective and quality approved material and machines.

At BPT we believe in partnering with our clients to achieve a win-win outcome. Hence, we engage with all stakeholders very closely right from project inception stage until it reaches successful completion.

Our in-house design and engineering team as well as project team endeavors to work in close coordination with the consultants to maintain synergy between all stakeholders and maximize cost efficiency.

We not only strengthen concrete, but by virtue of our constant and zealous pursuit for excellence, we strengthen partnerships with our clients, suppliers and employees alike. **"Strengthening is our strength"**

Our Mission

Provide technically advanced and robust Post-Tensioning services to meet the demands of a challenging structural engineering sector by providing cost and time effective solutions and by pursuing continual improvement in all aspects of our business.

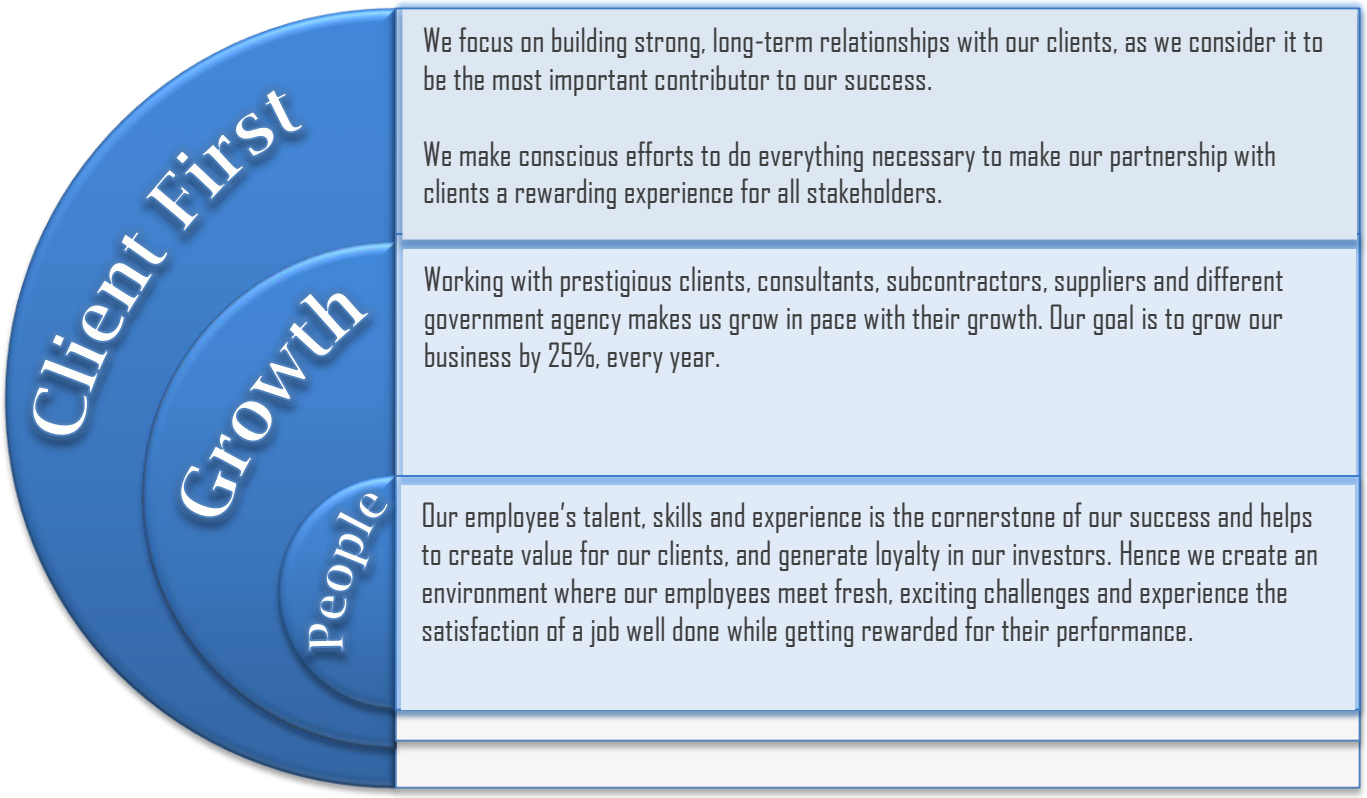
Our Vision

To be recognized as the most reliable partner for the construction industry, providing timely and cost effective services and be a market leader in the field of Post-Tensioning.

Safety Commitment

Providing a safe and incident-free work environment for our employees is an integral part of BPT goal to achieve operational excellence. BPT ensures strict adherence to all safety norms and strives to achieve incident free record at all times.

OUR CORE VALUES



QUALITY POLICY AND OBJECTIVES

- Understanding our clients business requirements to ensure highest quality service and build mutually beneficial partnership
- Assuring clients on the qualification, ability and professionalism of our team members to deliver at every aspect of the projects.
- We believe in being a team player and extending our support and cooperation in all aspects of the project.
- Our environmental, health and safety policies are a priority specifically at job sites to avoid even a single accident from occurring. We focus on improving our safety standards by educating and involving workforce in the importance of safety.

MANAGEMENT OBJECTIVES

- Enhance client satisfaction: Reduce customer complaints by 20% annually
- Maximize Employees contribution to achieve Organization's Vision and Objectives.
- Widen Organization's capabilities to meet client requirements
- Minimize negative impact on the environment due to organization's activities.
- Sustain, where possible improve, profitability of the business operation.

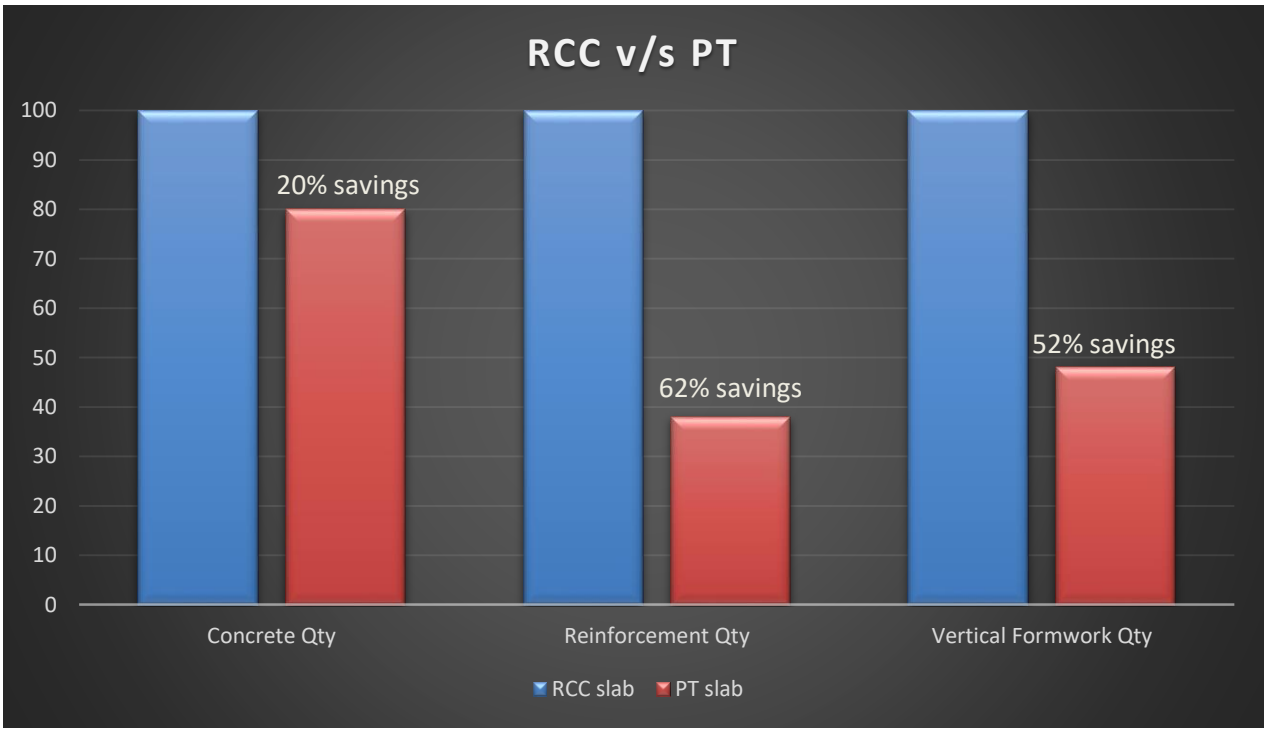
Post-Tensioning

Post Tensioning is a process of reinforcing or enhancing concrete strength by placing high strength stressing steel strands before casting and later stressing it. Post-tensioning is a form of pre-stressing which simply means that the steel is tensioned before the concrete has to support applied loads. This method of construction has, over the past 30 years, been widely used in many countries due to its several benefits over conventional methods.

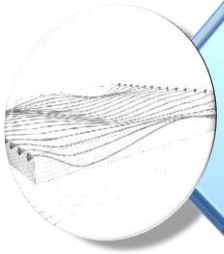
Benefits of Post-Tensioning

- Strength and increased resistance to differential movement in slabs, rafts and beams
- Eliminates/Reduces deflection
- Eliminates/Reduces cracks in slabs
- Faster construction cycle reducing duration of formwork, scaffolding and manpower
- Economical as lesser reinforcement and concrete is used
- Greater spans possible due to fewer beams required
- Thinner slabs for increased height advantage
- Reduced building mass especially significant in high seismic zones

Below graph illustrates typical average savings with the use of Post-Tensioning "PT" slabs compared to RCC slabs:

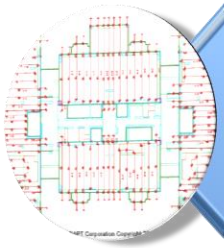


Our Services



Turnkey Post-Tensioning Works

Complete design, supervision, supply of material, manpower and installation of Post-Tensioning as per project drawings and specifications.



Designing

We can provide Post-Tensioning design based on project consultants drawings, specifications and requirements.

Structure Value Engineering

Our team can provide consultancy on alternative design solutions for rafts /beams/slabs to achieve cost reduction and time efficiency.

Supply

We can supply on a stand alone basis any element of the Post-Tensioning process including design, supervision, material, equipment and manpower.

Applications

BPT is fully equipped to provide complete turnkey Post-Tensioning services and solutions from consultancy, design, supervision through construction for commercial, industrial and residential projects such as:

- Residential buildings/towers
- Office complexes
- Private villas
- Bridges
- Car parks
- Hospitals
- Airports
- Showrooms
- Shopping Malls
- Schools/Institutes
- Restaurants
- Sports facilities
- Mosques
- Warehouses

RAFT AND TRANSFER SLABS

A raft slab, also known as a 'Slab on Grade', is used at the base of a structure to support the load from above via a number of integrated edge and internal beams designed within the concrete floor plate. Airports, car parks, warehouses and water tanks around the world are currently benefiting cost-effective design and construction solutions of Post-tensioned on grade slabs.

By using Post-tensioning there are proven savings of in the range of 20% to 70% and in some cases eliminates all piles.
The properties of a transfer slab are very similar to that of a raft slab, the only difference being its location within the structure. Transfer slabs occur where engineers need to shift the structural load through a building, for example where a column layout is arranged over another. The multi strand system can be used in the edge and internal beams of the slabs to help control and transfer the extremely high localized forces. Beams of up to two meters thick are not uncommon but when compared to traditional reinforced concrete methods, a multi strand solution is far superior in the efficiency of beam height, construction time and budget.

Advantages for Raft Slabs

- Faster construction, reduced excavation and sub-base preparation.
- Ability to cast slabs on grade greater than 2,500 M2 without joints with reduced chances of cracking.
- Greater savings, less concrete and minimal reinforcement required.
- Post-tensioned slabs on grade can carry greater loads than those that have been traditionally designed and have reduced ongoing maintenance costs.

Advantages for Transfer Slabs

- Superior efficiency of beam height using Multi strand solution
- Reduced construction time
- Greater savings, less concrete and minimal reinforcement required.

FLAT PLATE SLABS

Post Tensioned system enables the most efficient continual span of concrete at the minimal thickness supported only by columns. No column capitals or beams are incorporated, allowing maximum flexibility in ceiling zones.
By using Post Tensioning there are proven savings of up to 25%.
This strong, slender and efficient structure not only provides designers and engineers with a blank canvas, but the construction delivery is also more economical than traditional reinforced concrete.

Advantages tor Flat Plate Slabs

- Up to 50% reduction in handling of materials across a deck
- Up to 20% savings in concrete
- Up to 60% savings in reinforcement
- No vertical formwork, excluding the perimeter and pours
- Optimal clear/direct run layout
- Maximized floor to ceiling heights
- Space planning optimized

BAND BEAM SLABS

Bahrain Post Tension's solution to the construction industry's continuous push towards fewer columns, economical designs and on time delivery is smart, efficient band beam slab design.
By using Post-tensioning there are proven savings of up to 25% in a Band Beam System in concrete structures.
This one or two way suspended slab system can typically span between 10 to 16 meters clear of columns. The Bonded system utilizes 12.7 mm or 15.2 mm diameter 7-wire low relaxation strands in tendons which consist of up to five strands. Anchored at one end the strands are housed within a flat galvanized duct to achieve efficient drape within the depth of shallow concrete members.

The strands are individually stressed up to the designed load and gripped by wedges. The duct is then filled with a cement grout to bond the system and further protect it from corrosion.

A sound band beam design can incorporate functional demands from the location and spacing of columns to core or specific services.

Advantages for Band Beam Slabs

- A strong, slender and efficient structure with design flexibility
- Reduced slab thickness and greater spans in concrete
- Greater floor to floor heights or additional levels
- Reduced foundation loads
- Controlled slab deflection and cracking
- Savings in material costs, and minimum maintenance costs
- Less material handling, early formwork stripping and faster construction time

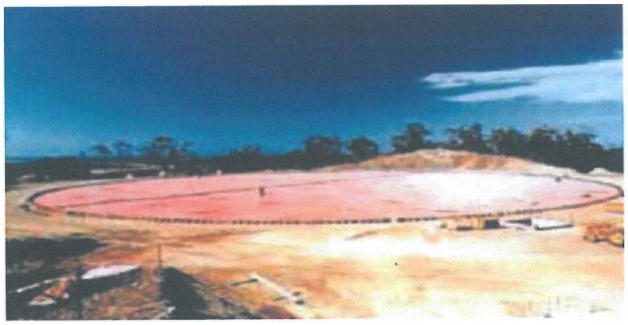
TANKS & SILOS

In many ways, concrete is the perfect material for the construction of storage containers, being resistant to abrasion and to a wide range of chemical attack. In particular cylindrical tanks and silos maximize efficiency by offering the greatest internal volume for a given quantity of material. Such shapes are also readily Post tensioned, the wires or tendons accommodating the curvature with ease.

By using Post-tensioning there are proven savings on water tanks of up to 30%.

Advantages for Tanks and Silos

- Increased volume efficiency
- Post-tensioned strand lends itself to the curvature of the structure
- Greatly reduces the amount of radial reinforcement required within the structure
- Increased speed of construction, making better use of the slip form

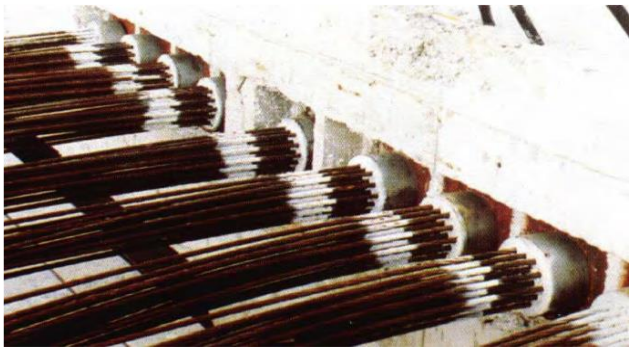


MULTISTRAND

Multi-Strand system is used extensively in projects throughout the world. The most common use is in transfer beams, underground and submerged structures, bridges, headstocks and tank structures. This system is the traditionally recognized Post-tensioning solution and tends to be more common in situations where extremely high localized forces are required.
A Mu1tlstrand system uses up to 55 multiple strands (12.7 mm or 15.2 mm) to form the tendon which is inserted into a single circular galvanized or plastic corrugated duct. The end of the strands are placed in individual holes within the metal anchor head and simultaneously stressed. The strands are stressed simultaneously followed by pressure grouting.

Advantages of the Multi-Strand System

- Reduction of depth of beams (common depth/span ratios of 1:20)
- Allows for significantly lower concrete strength prior to stressing, resulting in shorter construction cycles
- Less reinforcement in the anchorage zone is required, resulting in time, labour and cost savings
- Increased span lengths and load-carrying capacity with reduced deflection



Our Team

Managing Director
Ali Al Derazi

Accounts

HR

Commercial Manager
Firoz Ahmed

Projects Manager
Ahmed Khedr

Purchase Team

Marketing Team

Site Engineers

Supervisors

Technicians

Labors

LICENSES AND CERTIFICATES

مركز البحرين للمستثمرين
Bahrain Investors Center

شهادة قيد السجل التجاري

Commercial Registration Certificate

مملكـــة البحـــرين
Kingdom of Bahrain
وزارة الصنـــاعة والتجـــارة والسياحـــة
Ministry of Industry, Commerce & Tourism

Directorate of Registration in the Ministry of Industry, Commerce and Tourism certifies the details of the below

تشهد إدارة التسجيل بوزارة الصناعة والتجارة والسياحة بأنه قد تم تسجيل القيد المبينة تفاصيله أدناه وفقا للمرسوم بقانون رقم (27) لسنة 2015 بشأن السجل التجاري.

Mentioned entry in accordance with Decree Law (27) for the year 2015 of the Commercial Registration

Due Date	19/04/2018	تاريخ الاستحقاق	Registration Date	19/04/2017	تاريخ القيد	Registration No. 69393 - 4	رقم القيد
Group Commercial Name	FUNDAMENT S P C				فوندامنت ش ش و		اسم المجموعة
Commercial Name	BAHRAIN POST TENSION CONTRACTING				بحرين بوست تنشن للمقاولات		الاسم التجاري
Registration Type	Single Person Company				شركة الشخص الواحد		نوع القيد
CR Status	ACTIVE				نشطة		حالة القيد
Commercial Address	P.O.BOX ص.ب	Area المنطقة	Block مجمع	Road طريق	Building مبنى	Flat/Shop شقة/محل	العنوان التجاري
	659	MANAMA / UMM ALHASSAM / المنامة / أم الحصم	339	3919	796	21	

Activities	الأنشطة
Other specialized construction activities	أنشطة التشييد المتخصصة الأخرى

* هذا القيد لا يجيز لصاحبه بمزاولة نشاط استثمار أموال الغير

* This commercial registration does not permit its holder to practice investment activities on behalf of others

إدارة التسجيل
Directorate of Registration

Printing date: 03/05/2017

Page 1 of 1

Please post this certificate at a visible place.
Please read the guidelines at the back.

Tel : +973 17562222 - 80001700 - www.moic.gov.bh. - www.big.bh

يرجى تثبيت هذه الشهادة في مكان بارز داخل المحل.
يرجى قراءة الارشادات خلف الشهادة.

Kingdom of Bahrain
Housing Projects
Construction & Maintenance Directorate
Construction Management Section "B"

مملكة البحرين
إدارة إنشاء وصيانة المشاريع الإسكانية
قسم إدارة الإنشاءات "B"

SUB CONTRACTOR APPROVAL FORM

FORM No. : 6

For Contractor Use :

Main Contractor : Fundament SPC Site : 180, Block 339 @ Um Al Hassam

Project: 1No.10Storey Apartment Building Type 'AU', Contract 'D'

Contract No. : HP/10/13 Start Date : 19/10/2013 Completion Date : 18/07/2014

We here by request approval to the following sub contractor to work on the above mentioned project and as follows:

Sub-Contractor Name : Fundament SPC (in house) 02.01.2014 C.R. NO : 69393

Work To be Sub Contracted : Post - Tensioning -21 5

Contact Name : Mr. Jaysen Daware 14699 Tel. No.: 38444375

Signed for Main Contractor : JmDaware

Stamp : SCAF

Date : 24/12/2013

Julie

Enclosures (Please Tick) :

- [x] List of undergoing/ completed projects with locations and dates.
- [ ] Sub contractor resources/ manpower/ plants etc.
- [x] Sub contractor manpower which will be used on the above site qualification/ experience/ CPR number.
- [ ] List of tools and equipment to be used.
- [ ] Appraisals of the sub contractor on previous projects.
- [ ] Copy of valid Ed license. (For Electrical Sub Contractor only).
- [ ] Copy of valid Wiremen License. (For Electrical Sub Contractor only).

For MOH

S.S.E:	Head, Construction Projects Section "B"
It is recommended to ☑ Approve / ☐ Reject	It is recommended to ☑ Approve / ☐ Reject
Signature : Date : 24/12/2013	Signature : Date : 30/12/2013
Comments :	Comments :

Chief, Construction Management Section "B"

Signature : Date : 30/12/13

☐ Approved ☐ Rejected

Note : This approval is subject to satisfactory workmanship and performance of sub contractor on site.

Received JmDaware 2/1/2014

وزارة الأشغال
Ministry of Works
إدارة مشاريع البناء
Construction Projects Directorate

CP/CS1/134/2015.
08th June 2015.

M/s. First Kuwaiti for General Trading & Contracting
P O Box: 480
Al-Souk Al-Dakhli,
Fax: +965 1800 600

Attn: Samia Adra, Project Manager

Dear Sirs,

Project: Comprehensive Handicapped Complex for Ministry of Social Development at A'Ali
Job No. 12 056, Contract No. CPD-14/10

With reference to your letter No.: FKTC/BH-078/2015 dated 10th May 2015, please be advised that we have no objection to your proposal to appoint M/s S.F. Post Tensioning – Fundament SPC, P.O Box-659, Manama, Kingdom of Bahrain, as your sub-contractor to carry out Post Tensioning works for the above mentioned project.

Furthermore, this approval shall not relieve the Contractor from any liability or obligation under the Contract and the Contractor shall remain responsible for the acts, defaults and neglects of any sub-contractor and its agents, servants or workmen as per clause 3.2 (page 18/19) of the "Standard Contract Agreement and Conditions of Contract" (copy attached).

Yours faithfully,

Shehab Ali Bader
Chief, BCSS

CC: CBDS/CC&BMPS (QS)
GCC Program Manager (Sameh El-Refaay)
HCSG / Project Manager
FILE.

RTP

TAKAFUL INTERNATIONAL
التكافل الدولية

POLICY SCHEDULE

Type/Class	:	Professional Indemnity - Annual Cover
Policy No.	:	1701GAPI000171
Original Insured	:	BAHRAIN POST TENSION CONTRATING CO
Policy Period	:	12 months from 29th July, 2017 to 28th July, 2018
Retroactive Date	:	29th July, 2017
Trigger	:	Claims Made
Insured's Activity	:	Post tensioning works
Scope of Cover	:	Professional Services
Estimated Annual fees	:	BHD 180,000/-
Territorial Limits	:	Kingdom of Bahrain
Limit of Indemnity	:	BHD 250,000/- any one claim and BHD 1,000,000/- in the aggregate including costs and expenses during the policy period
Deductible	:	BHD 1000/- each and every claim including costs and expenses
Original Conditions	:	- Wording: As per Takaful International PI wording for A&E with exclusion "3" deleted and replaced with: "any liability loss or expense arising out of defective workmanship, manual labour operations, or any defective materials, workmanship or production techniques used in the actual manufacture of the product. This exclusion shall not apply where such liability is otherwise indemnifiable hereunder and arises from negligent design where such professional services are undertaken by a professionally qualified architect or engineer." - Law & Jurisdiction: Bahrain - Costs Inclusive Clause - Warranted N.K.O.R.L, nor circumstances that might lead to loss, last five years up to date of binding cover / inception date - In case of cancellation short period rate will apply - Retroactive cover clause - Professional Services Definition - Wherever the word "Insured" "Assured" appears in this Policy Schedule/Wording or Clauses attached herewith, shall deemed to have the same meaning. - Wherever the word "Company" "Insurer" "Underwriter" appears in this Policy Schedule/Wording or Clauses attached herewith, shall deemed to have the same meaning - No maintenance period / ERP coverage provided

Takaful International Co. BSC
شركة التكافل الدولية ش.م.ب
Qatar QFC Branch
فـرع قطـر
P.O.Box. 31240, Doha
ص.ب.
Tel. (+974) 44916444
هاتف.
Fax. (+974) 44916445
فاكس.
Head Office
المركز الرئيسي
P.O.Box. 3230, Manama
ص.ب.
Tel. (+973) 17565656
هاتف.
Fax. (+973) 17582688
فاكس.
شركة مرخصة من قبل مصرف البحرين المركزي كشركة تكافل عام وعائلي
Licensed as a General and Family Takaful Company by the CBB
Takaful Hotline: 8000 8050
www.takaful.bh I Email: takaful@takafulweb.com

TAKAFUL INTERNATIONAL
التكافل الدولية

Exclusions	:	- Excluding all matters, which have been notified to the insured or of which the insured is aware at inception - Excluding cover for any kind of guarantee or warranty whatsoever in respect of reaching the intended target production - War, sabotage and Terrorism Exclusion NMA2918 - Total Asbestos Exclusion - Cyber Risk Exclusion - Radioactive Contamination And Explosive Nuclear Assemblies Exclusion Clause NMA1622 - Public & Product Liability Exclusion - Excluding any claim arising out of what would otherwise be covered under the following insurances; Contractors All Risk; Erection All Risk; Machinery Breakdown; or their equivalent. - Excluding agents, Sub-Consultants, Sub-Contractors - Consequential Loss exclusion - Single Project Professional Indemnity Exclusion - Marine liability – totally excluded - Excluding punitive or exemplary damages, fines, penalties, liquidated damages or the return or withdrawal of professional fees or any other damages resulting from the multiplication of compensatory damages - If the supervision services are included in the coverage, irrespective of whether contracts are signed under a design & construct project structure or not, this insurance does not provide cover for claims arising out of the day to day supervision of labour and construction work which under a traditional form of contract would normally be the responsibility of the building or engineering contractor rather than being the professional duty of the professional team. - Decennial liability exclusion: Cover provided under the policy does not meet the statutory requirements for Decennial Liability (i.e. ten-year joint several liabilities as per the Civil Code of the Country).
Premium	:	**As Agreed**
Claims Experience	:	Nil claim for the past 5 years confirmed in the copy signed and dated proposal form provided
Information	:	As per proposal form signed, stamped and dated 02/05/2017

FOR AND ON BEHALF OF
TAKAFUL INTERNATIONAL COMPANY

TAKAFUL INTERNATIONAL
التكافل الدولية
General Takaful
P.O. Box 3229, Manama, Kingdom of Bahrain

Takaful International Co. BSC
شركة التكافل الدولية ش.م.ب

Qatar QFC Branch
فرع قطر
P.O.Box. 31240, Doha
ص.ب.
Tel. (+974) 44916444
هاتف.
Fax. (+974) 44916445
فاكس.

Head Office
المركز الرئيسي
P.O.Box. 3230, Manama
ص.ب.
Tel. (+973) 17565656
هاتف.
Fax. (+973) 17582688
فاكس.

TÜV NORD

CERTIFICATE

Management system as per
EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures, it is hereby certified that

Fundament SPC
Building 89, Block 339, Road 338
Flat 12, Um Al Hassam
P. O. Box 659, Manama
Kingdom of Bahrain

FUNDAMENT SPC
فوندامنت ش ش و

applies a management system in line with the above standard for the following scope

Major Building Contracting

Certificate Registration No. 44 100 15580001
Audit Report No. 5800 3143

Valid from 2015-03-22
Valid until 2018-03-21

Certification Body
at TÜV NORD CERT GmbH

Abu Dhabi, 2015-03-22

This certification was conducted in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.com

DAkkS
Deutsche
Akkreditierungsstelle
D-ZM-12007-01-01

BUREAU VERITAS
Certification

FUNDAMENT SPC

FLAT NO.12, BLDG 89, ROAD 338, BLOCK 339, UMM AL HASSAM, P.O. BOX 659, MANAMA, KINGDOM OF BAHRAIN

Bureau Veritas Certification Holding SAS – UK Branch certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standard

OHSAS 18001:2007

Scope of certification

GENERAL CONSTRUCTION & CONTRACTING WORKS

Certification cycle start date: **19-November-2014**

Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on: **18-November -2017**

Original certification date: **19-November-2014**

Certificate No. IND 14.7576 HS **Version: 01, Revision Date: 19-November-2014**

Signed on behalf of BVCH SAS UK Branch

Certification body address: ***66 Prescot Street, London, E1 8HG***
Local office: Bureau Veritas Certification Bahrain Flat No. 11, Building No. 574, Road 1111, Tubli 711, Kingdom of Bahrain.

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation. To check this certificate validity please call: **+973-17877574**

Our Bankers

1. Kuwait Finance House
P.O. Box No. 2066,
Manama,
Kingdom of Bahrain
Tel No.: 77000134, Fax No.: 77000150

2. Itmaar Bank of Bahrain (Al Shamil Bank)
P.O. Box No. 3005,
Manama,
Kingdom of Bahrain
Tel No.: 17-363111, Fax No.: 17-826080

3. BMI
P.O. Box No. 350,
Manama
Kingdom of Bahrain
Tel: 17-508080, Fax: 17-226641

4. National Bank of Bahrain
P.O. Box No. 106
Manama,
Kingdom of Bahrain
Tel: 17-228800, Fax: 17-205571

CLIENT REFERENCES

1. Ministry of Works
2. Ministry of Housing
3. Bahrain Engineering Bureau
4. Gulf House Engineering
5. Ismail Khonji Associates
6. Arab Architect Engineering
7. Modern Architect
8. Arsinal Engineering
9. Mashtan Engineering
10. Gharib Engineering Est.
11. Al A'Ali Engineering
12. Al Jazeera Engineering
13. Yousif Engineering
14. Epco Engineering
15. Riyadh Al Arrayed
16. Al Taweel Engineering
17. Ayman Yusuf Engineering
18. Mirai Engineering
19. NJ Engineering
20. Busaad Engineering
21. Design Studio
22. Architecture 360

Completed Projects

SN No.	Job No.	Project	Client	Consultant	Contractor	Location
1	PT-05	22 STOREY RESIDENTIAL BUILDING	Ms. BUROOJ PROPERTY DEVELOP. W.L.L	M/s. GHARIB ENGINEERING EST.	M/s. MIDDLE EAST CONTRACTING.	AMWAJ ISLAND
2	PT-06	22 STOREY TILAL TWIN TOWERS	Mr. FAISAL AL MATROOQ	M/s. BAHRAIN ENGINEERING BUREAU	M/s. CHAPU CONTRCTING CO.	AMWAJ ISLAND
3	PT-07	6 STOREY RESIDENTIAL BUILDING.	Mr.ALI ABDULLA MALIK	M/s. GHARIB ENGINEERING EST.	M/s. SEIF SAEED AL JUNAID CO.	GUDAIBIYA
4	PT-08	8 NOS. (4 STOREY RESIDENTIAL)	Ms. KENAZ AL QADAM REAL ESTATE.	M/s. RIYADH AL ARRAYED ENGINEERING	M/s. FUNDAMENT SPC.	AL QADAM
5	PT-09	25 STOREY MBM TOWER	Mr. MOHAMMED MUSALLAM	M/s. GULF HOUSE ENGINEERING.	M/s. FUNDAMENT SPC.	SEEF
6	PT-10	5 STOREY RESIDENTIAL BUILDING.	MS. EL HOUSE IN LIMITED	M/s. RIYADH AL ARRAYED ENGINEERING	M/s. RIYADH AL ARRAYED ENGINEERING	SAAR
7	PT-11	20 STOREY RESIDENTIAL BUILDING	Mr. NASSER AL FADHEL	M/s. MODERN ARCHITECT.	M/s.ALFADHEL GROUP.	SEEF
8	PT-12	17 STOREY PARKINN HOTEL	Mr. FOUAD AL MUTAWA	M/s. EPCO ENGINEERING.	M/s. FUNDAMENT SPC.	SEEF
9	PT-13	HANDICAPPED COMPLEX (8 BUILDING)	Ms. MINISTRY OF SOCIAL DEVELOPMENT	M/s. MINISTRY OF WORK	M/s. FIRIST KUWAIT CO.	AALI
10	PT-14	17 STORY BUILDING (JF5 TOWER)	Ms. MOZON REAL ESTATE.	M/s. IKA CONSULTANT.	M/s. FUNDAMENT SPC.	JUFFAIR
11	PT-15	5 STOREY RESIDENTIAL BUILDIBNG	Mr. HASSA SULTAN	M/s. YOUSIF ENGINEERING	M/s. DELTA CONTRACTING CO.	AMWAJ ISLAND
12	PT-16	2 STOREY MOSQUE	Mr. HASSAN BUKHOWA	M/s. GULF HOUSE ENGINEERING	M/s. BOKHOWA GROUP.	SAAR
13	PT-17	4 STOREY RESIDENTIAL BUILDING	Mr. HUSSAIN AL HAMMAR	M/s. MIRAI ENGINEERING	M/s. TITOLO DESIGN AND BUILD.	JANABIYAH
14	PT-18	5 STOREY RESIDENTIAL BUILDIBNG	M/s. AL EHSAN SOCIETY	M/s. MIRAI ENGINEERING	M/s. SAFWAN CO.	AMWAJ ISLAND
15	PT-19	6 STOREY RESIDENTIAL BUILDING	Mr. NASSER AL FADHEL	M/s. MODERN ARCHITECT.	M/s. ALFADHEL GROUP.	HIDD
16	PT-20	3 STOREY LEBANON RESTAURANT	Mr. ALI HASSAN MAHMOUD	M/s. RIYADH AL ARRAYED ENGINEERING	M/s. FUNDAMENT SPC.	MANAMA
17	PT-21	WORKSHOP & LABOUR ACCOMODATION	Mr. ALI AHMED ALDERAZI	M/s. MASHTAN ENGINEERING.	M/s. FUNDAMENT SPC.	ALBA
18	PT-22	3 NOS. (6 STORY RESIDENTIAL BUILDING)	Mr. ABDULLA AMIN	M/s. Al MOHANDES ENGINEERING.	M/s. ABDULLAH AMEEN CO.	HIDD
19	PT-23	5 STOREY RESIDENTIAL BUILDIBNG	Mr. KHALIFA AL NOIMI	-	M/s. KHALIFIA AL NOIMAI CO.	HIDD
20	PT-24	MCDONALD'S RESTAURANT	M/S. MCDONALD BAHRAIN	M/S. MIDDLE EST ENGINEERING	M/S. BISMILLAH CO.	ADLIYA

Completed Projects

SN No.	Job No.	Project	Client	Consultant	Contractor	Location
21	PT-25	4 STOREY BUILDING AT HIDD	HH. ABDULAZIZI SAUD AL KHALIFA.	M/s. BUSAAD ENGINEERING.	M/s. AL FADHEL CO.	HIDD
22	PT-26	2 STOREY VILLA	Mr. ALI ARAZI.	M/s. GULF HOUSE ENGINEERING.	M/s. FUNDAMENT SPC.	SAAR
23	PT-27	6 STOREY RESIDENTIAL BUILDING	M/s. EBRAHIM JASSIN HASSAN	M/s. GHARIB ENGINEERING EST.	M/s. YAMAL AL SHAM CO.	HIDD
24	PT-28	3 NOS (6 STOREY) RESIDENTIAL BUILDING	-	M/s. RIYADH AL ARRAYED ENGINEERING	M/s. BAWAB CONTRACTING.	HOORA
25	PT-29	3 STORY WARE HOUSE	M/s. BAHRAIN AND GULF CO.		M/s. BAHRAIN AND GULF CO.	AALI
26	PT-30	4 STORY RESIDENTIAL BUILDING	Mr. ALI HASSAN MAHMOUD	M/s.AL JAZEERA ENGINEERING.	M/s. ALI HASSAN MAHMOUD CO.	SUGAYYA
27	PT-32	4 STOREY SHOW ROOM & WORKSHOP	M/s. MOIZE TRADING EST.	M/s. AL JAZEERA ENGINEERING	M/s. DELTA CONTRACTING CO.	AL QARYAH.
28	PT-33	4 NOS (2 STORY VILLA)	Mrs. MINA ANDULHUSSAIN MERZA.	M/s. SAMI AL AALI ENGINEERING	M/s. BAHRAIN AND GULF CO.	AL MARKH
29	PT-34	4 STOREY RESIDENTIAL BUILDING	Mr. HUSSAIN AL HAMMAR	M/s. MIRAI ENGINEERING	M/s. TITOLO DESIGN AND BUILD.	JANABIYAH
30	PT-35	5 STORY RESIDENTIAL BUILDING	M/s. YOUSUF ABDUL GHAFFAR	M/s. NJ ENGINEERING.	M/s. YOUSUF ABDUL GHAFFAR	HIDD
31	PT-36	4 STORY RESIDENTIAL BUILDING	Mr. FAISAL MOHAMMED TAHOO	M/s. AL TAWEEL ENGINEERING.	M/s. STONEHENGE CO.	HOORA
32	PT-37	4 STOREY LABOUR ACCOMODATION	Mr. ABDUL HASSAN EBRAHIM BUHUSAIN	M/s. ARSINALS ENGINEERING.	M/s. UCA CONSTRUCTION CO.	RAS ZUWAID
33	PT-38	2 STOREY VILLA	Mr. HASSAN SULTAN	M/s. YUSUF ENGINEERING.	M/s. 110 CONSTRUCTION CO.	AMWAJ
34	PT-43	4 STOREY LABOUR ACCOMODATION	Mr. TAWFEEQ ALI MOHAMMED TAQI.	M/s. ARSINALS ENGINEERING.	M/s. UCA CONSTRUCTION CO.	RAS ZUWAID
35	PT-44	4 STOREY LABOUR ACCOMODATION	Mrs. NAWAL YOUSUF AL SABBAGH	M/s. ARSINALS ENGINEERING.	M/s. UCA CONSTRUCTION CO.	RAS ZUWAID
36	PT-45	2 STORY OFFICE BUILDING.	Mrs. AISHA AL MEER	M/s. MASTER ONE ARCH.	M/s. ALI RAFIA CO.	MUHARRAQ

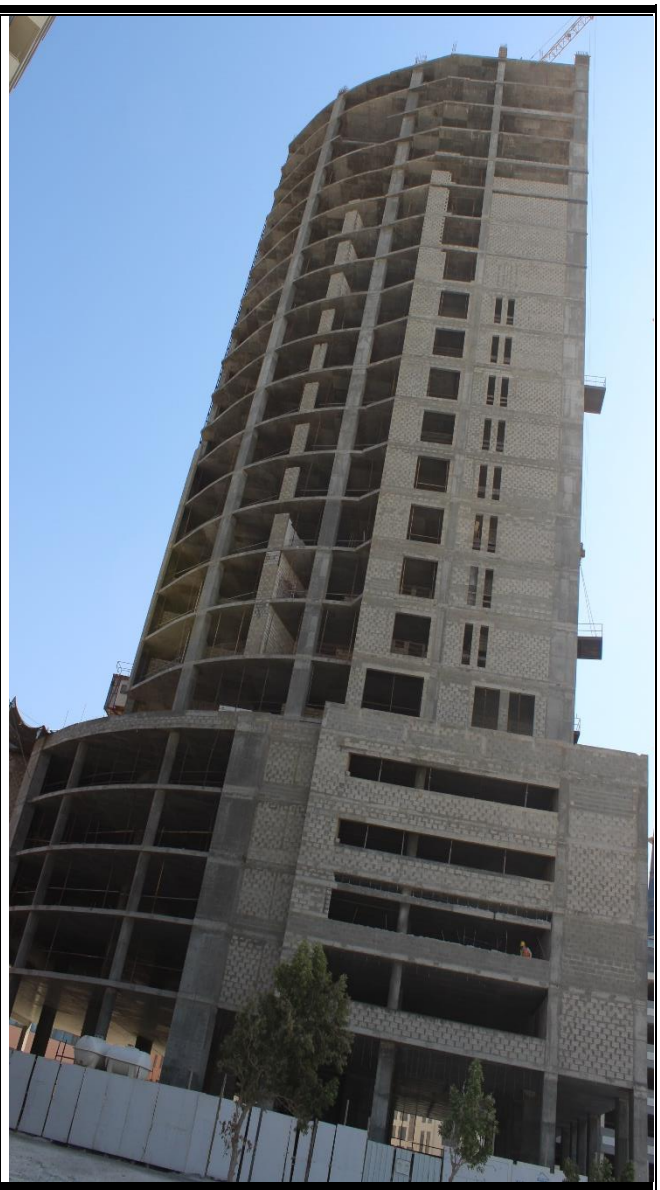
Ongoing Projects

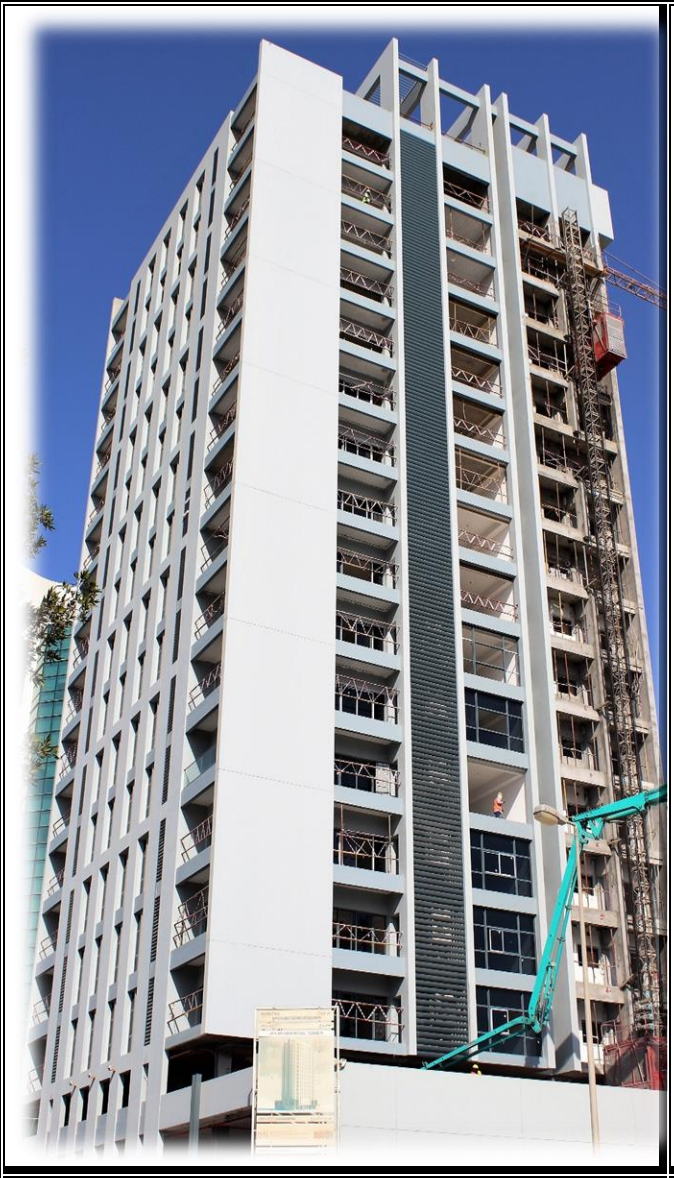
SN No.	Job No.	Project	Client	Consultant	Contractor	Location
1	PT-31	22 STOREY RESIDENTIAL BUILDING	Mr. AUSAMA EBRAHIM ABUDALAMA.	M/s. AL JAZEERA ENGINEERING	M/s. MIDDLE EAST CO.	AMWAJ
2	PT-39	4 STORY RESIDENTIAL BUILDING	Mr. ALI MAKKI		M/s. ALI MAKKI CO.	SANAD
3	PT-40	10 STORY RESIDENTIAL BUILDING	Mr. YUSUF GHULOOM ABBAS ALI.	M/s. AYMAN YUSUF ENGINEERING.	M/s. UCA CONSTRUCTION CO.	JANABIYAH
4	PT-41	4 STORY RESIDENTIAL BUILDING	Mr. ALI HASSAN MAHMOUD	M/s. RIYADH AL ARRAYED ENGINEERING	M/s. ALI HASSAN MAHMOUD CO.	SUGAYYA
5	PT-42	2 STOREY VILLA	Mr. ALI AHMED SAEED AL MULLA.	M/s. AL AALI ENGINEERING.	M/s. TITOLO DESIGN & BUILD CO.	SAAR
6	PT-46	2 STOREY VILLA	Dr. MAHER A. AZIZ AL SHAER	M/s. DESIGN STUDIO.	M/s. FUNDAMENT SPC.	BUHAIR
7	PT-48	2 STOREY RESTAURANT	MRS. FATINAH HASHIM M. SAWAN		M/s. FUNDAMENT SPC.	GUDAIBIYAH
8	PT-49	52 STORY AL TIJARIAH TOWER	Mrs. AL TIJARIAH	M/s. ARAB ARCHETICT ENGINEERING.	M/s. FUNDAMENT SPC.	HOORA
9	PT-50	PRIVATE VILLA	MR. KHALID AL QAED	ARCHITECTURE 360	M/s. FUNDAMENT SPC.	SAAR
10	PT-51	2 STOREY BLDG.	MRS. LAYLA MOHD. AL JASIM	GHARIB ENG. EST	YAMAL AL SHAM CONTRACTING	JUFFAIR
11	PT-52	4 STOREY BLDG.	MRS. DONYA AHMED ALWAZZAN	GHARIB ENG. EST	YAMAL AL SHAM CONTRACTING	GUFFOL
12	PT-53	10 STOREY CLINIC	NAWAFCO	Al TAWEEL ENG.		BUSAITEEN
13	PT-54	AXA Headquarter	AXA INSURANCE	NORMA	CHAPO	MANAMA
14	PT-55	14 STOREY BLDG	Sh. TAWFIQ	Dr. TAMER HANAFY	CORNER ELITE	HIDD
15		DIFAAF DEVELOPMENT	REEF VENTURE HOLDING CO. WLL	GULF HOUSE ENGINEERING	M/s. FUNDAMENT SPC.	REEF ISLAND
16		ONE BAHRAIN	GLOBAL REAL ESTATE	EMAAR Engineering	M/s. FUNDAMENT SPC.	REEF ISLAND

FEW OF OUR COMPLETED PROJECTS [Photo Gallery]

	
TILAL RESIDENCE TWIN TOWERS **AMWAJ ISLAND -BAHRAIN** **SLAB AREA: 52,000 m^2**	**LAGOONA BEACH RESORT** **BUDAIYYA -BAHRAIN** **SLAB AREA: 26,000 m^2**

	
22 STOREY RESIDENTIAL TOWER **AMWAJ ISLAND –BAHRAIN** **SLAB AREA: 19,000 m^2**	**21 STOREY RESIDENTIAL TOWER** **SEEF -BAHRAIN** **SLAB AREA 27,000 m^2**

	
PARK INN HOTEL (17 STOREY) **SEEF -BAHRAIN** **SLAB AREA 18,000 m^2**	**MBM TOWER (25 STOREY)** **SEEF -BAHRAIN** **SLAB AREA: 14,000 m^2**



17 STOREY RESIDENTIAL BUILDING
JUFFAIR -BAHRAIN
SLAB AREA: 12,000 m^2

10 STOREY BLDG FOR MINISTRY OF HOUSING
UM AlHASSAN -BAHRAIN
SLAB AREA: 10,000 m^2

8 NOS. (4 STOREY RESIDENTIAL BUILDING)
AL QADAM -BAHRAIN
SLAB AREA: 10,500 m^2

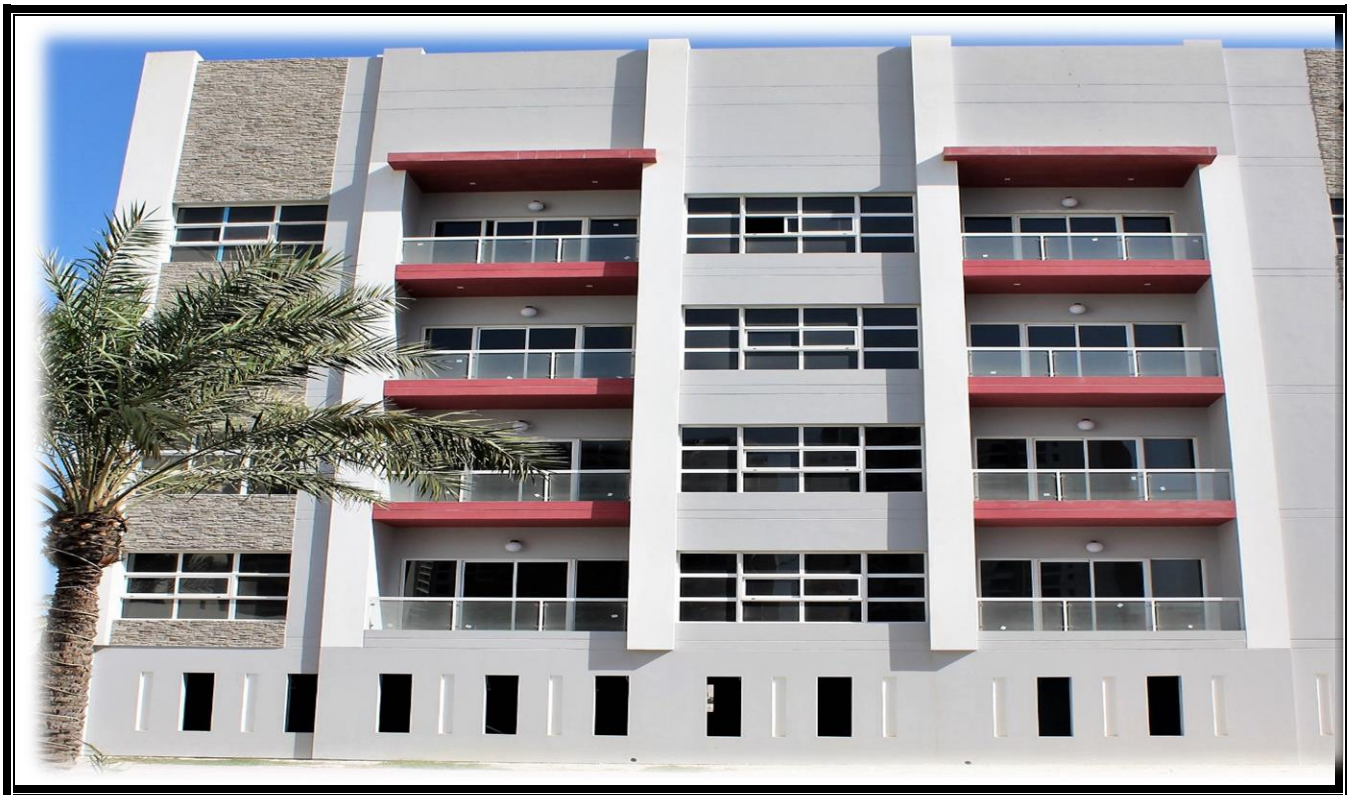
9 NO's HANDICAPPED COMPLEX- MINISTRY OF WORKS
AL'AALI –BAHRAIN - SLAB AREA: 16,000 m^2

4 STOREY RESIDENTIAL BUILDING
GALALI –BAHRAIN - SLAB AREA: 2,500 m^2

4 STOREY RESIDENTIAL BUILDING
JANABIYYAH – BAHRAIN
SLAB AREA: 6,500 m^2

7 STOREY RESIDENTIAL BUILDING
HIDD -BAHRAIN - SLAB AREA: 9,000 m^2

(3NOS) 6 STOREY RESIDENTIAL BUILDING
HIDD –BAHRAIN - SLAB AREA: 7,000 m^2

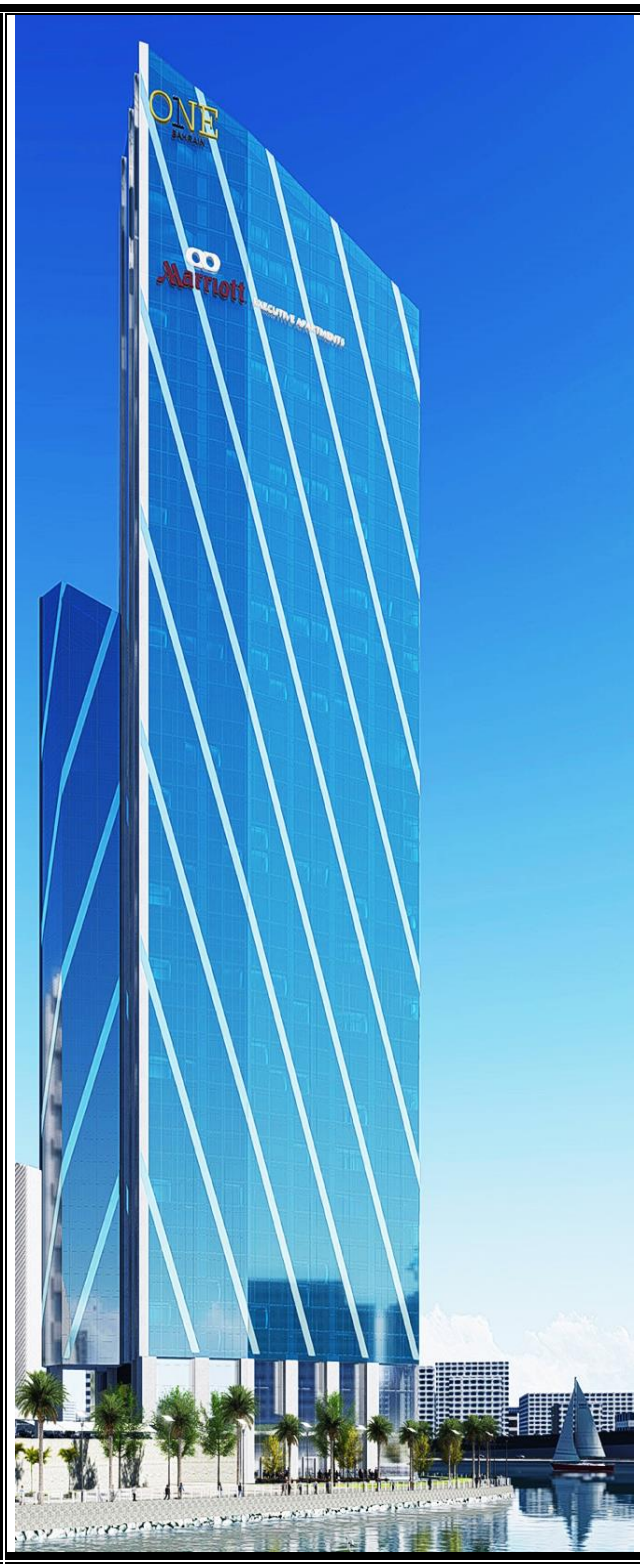


5 STOREY RESIDENTIAL BUILDING
AMWAJ ISLAND –BAHRAIN - SLAB AREA: 4,000 m^2

4 STOREY RESIDENTIAL BUILDING
SUGAYYA–BAHRAIN - SLAB AREA: 2,500 m^2

FEW OF OUR ONGOING PROJECTS [Photo Gallery]

AL TIJARIAH - 50 STOREY TOWER
HOORA-BAHRAIN
SLAB AREA: 65,000 m^2



ONE BAHRAIN - 49 STOREY TOWER
REEF ISLAND-BAHRAIN
SLAB AREA: 90,000 m^2

	
DIFFAF TWIN TOWERS 30 STOREY EACH REEF ISLAND-BAHRAIN SLAB AREA: 87,000 m^2	**WAVES TOWER HIDD-BAHRAIN SLAB AREA: 45,000 m^2**

POST TENSION SAFE WORK METHOD STATEMENT

1.0 INTRODUCTION

This Method Statement outlines the procedures to be adopted for the installation, Stressing and grouting operations for the post tensioning work.

1.1 PREPARATION

1.1.1 Stock of the materials will be arranged as per main contractor work program.
1.1.2 Shifting, handling and storage of the materials will be coordinated with the main contractor using the main contractor equipments such as (Tower cranes - Fork lift - etc.)
1.1.3 Work preparation station and materials storage will be arranged with the main contractor
1.1.4 Programme of the work will be produced such that the main contractor are aware of proposed areas of work and can advise on logistical constraints imposed by other operatives.
1.1.5 Bahrain Post Tension will use access and egress routes and areas for temporary site establishment as directed by the main contractor and coordinated with other site works.
1.1.6 Other construction activities will be coordinated with the main contractor team.
1.1.7 All necessary safety rails will be fitted to slab perimeter by the main contractor scaffolding team prior to any other site personal gaining access to the slab.
1.1.8 Approved drawings for post tensioned slabs must be available prior to concrete being poured.

1.2 CONTROL MEASURES

1.2.1 All Bahrain Post Tension management will undergo site induction and complete specified method statement briefing.
1.2.2 Bahrain Post Tension will work to an approved method statement.
1.2.3 Storage areas for PT components are clearly defined by the main contractor.
1.2.4 All materials to remain within the permanent works (or which are applied to the permanent works) will be issued and approved by the consultant under material submittal process, this includes but not limited to

- Strand
- Ducting
- Anchorages
- Profile bar chairs
- Grout Admixture
- All other sundry components

1.2.5 Approved shop drawings will be available prior to offering complete reinforcement works approval to Main Contractor / Consultant.

2.0 Machines, Equipments, Tools Responsibility

2.1	Stressing Jacks	Bahrain Post Tension
2.2	Stressing Pumps	Bahrain Post Tension
2.3	Onion Jacks	Bahrain Post Tension
2.4	Grout Pumps	Bahrain Post Tension
2.5	Stapler Guns	Bahrain Post Tension
2.6	PT Strand Dispenser	Bahrain Post Tension
2.7	Disc Cutter	Main Contractor
2.8	Drill	Main Contractor
2.9	Jig-saw	Main Contractor

3.0 Staff Involved in the Work

3.1 P.T Project Manager is to coordinate all the drawings between the consultants and main contractor with the P.T. design team and manage the work program, materials in the site, manpower.

3.2 P.T site engineer is to carry out the daily activities, inspect the slab work after work completion and arrange site shop drawings, cutting length, stressing reports.

3.3 P.T supervisor is to supervise all P.T site works (Tendon's location marking, anchors fixing, duct, laying, strand pushing, profile chairs fixing, stressing, grouting).

3.4 Qualified steel fixers, carpenters, labors to work under the P.T supervisor in all P.T activities (the numbers will be as per work requirements).

4.0 Post Tension Installation Methodology

4.1 Pre-Check

4.1.1 Post tensioned strand will be issued and approved as per the Main Contractors material submittal requirements.

4.1.2 Grouting admixture will be issued and approved as material submittal as above.

4.1.3 GI Duct / bar chairs and all items included in the concrete will be issued and approved.

4.1.4 All post tensioning record sheets shall provide by Bahrain Post Tension and are to be approved by the Main Contractor.

4.1.5 All P.T materials are subject to be tested upon consultant's discretion.

4.2 Traditional Reinforcement

4.2.1 Form work, side shuttering and bottom reinforcement shall be completed and approved by the consultant's engineer prior to ducting installation and commencement of Post Tensioned works.

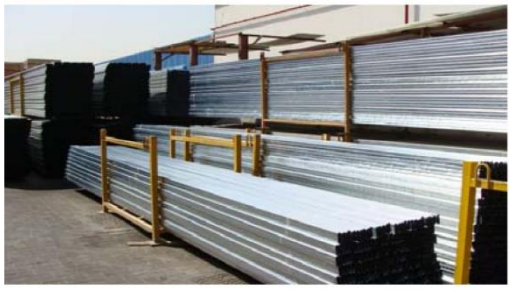
4.3 Installation of Ducting

4.3.1 Position strand coil adjacent to work area. Strands will not be laid on sand or curing water on slab and shall not be walked on at any time.

4.3.2 Strands to be loaded using bripack coil lifting frame (Fig 1) in accordance with the Main Contractor lifting operations plan.

4.3.3 Ducting to be loaded using bripack coil lifting frame (Fig 2) in accordance with the Main Contractor lifting operations plan.

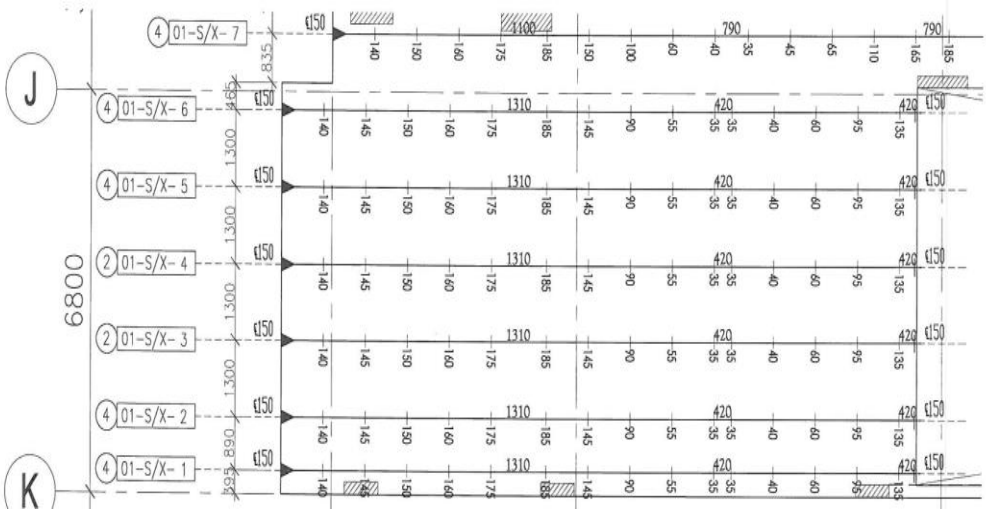
Bripack for Cradling and Lifting Strand (Fig 1)



Duct Lifting Cradle (Fig 2)

4.3.4 Ensure area is of sufficient strength to support weight of coil (approximately 3 tons)

4.3.5 Tendon sizes and profiles are indicated in the drawings as shown in (Fig 3) after coordination with other services such as (MEP, etc.)



Example of Shop Drawing (Fig 3

4.3.6 Seven wire drawn grade stress relieved low relaxation strand will be used. All strands will be issued and approved under material submittal.

4.3.7 Mark live end and dead end positions of formwork and slab edge forms and spray tendon alignment on decking (Fig 4)

Marking of Tendon Locations (Fig 04)

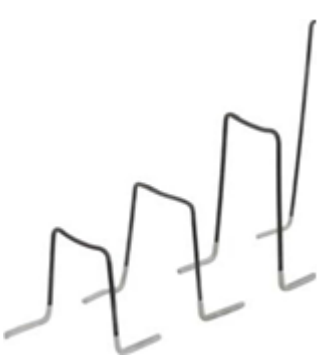
4.3.8 The inside cross sectional area of ducts shall be at least two times the net area of the strand to allow for sufficient bonding of the strands during grouting.

4.3.9 Layout ducting starting from the live or dead end point sand firmly tape joints.

4.3.10 Ducts are bell-ended to assist with joining and ensure no Concrete ingress during casting.

4.3.11 Profile bar chairs to be placed at 1000mm centres. Chair installation and checking may be completed once strand is installed in to the ducting.

4.3.12 Tendons shall be secured by stapling the bar chairs to the form work using a mechanical staple gun.



(Fig-5) **(Fig-6)**

Above – Bar Chairs **Above- Staple Gun**

4.3.13 In order to avoid affecting the tendon profile due to high points of tendon and top reinforcement, additional support reinforcement chairs will be provided by the Main Contractor to avoid sagging of rebar during steel fixing.

4.3.14 All tendon locations have an allowance of up to 150mm either side of the approved shop drawing tendon location to pass obstructions/penetrations in the slab.

4.3.15 All profile bar chairs have an allowance of +/- 5mm.Therefore chairs are typically supplied in graduations of 10 mm to allow conformance to specifications /codes.

Right-Checking of Tendon Profile (Fig-8)

4.4 Installation of Strand

4.4.1 Post tensioned shop drawings show the tendon number, the end type and the number of individual strands which make up each tendon.(ref: fig 3)

4.4.2 Cut strands to length as indicated on the shop drawings. Heat-type cutting devices NOT to be used to cut strand.

4.4.3 Where tendons in two directions do not have clearance, alternately raise and lower the transverse or longitudinal tendons to center the combined effect of the tendons at the required locations.

4.4.4 Ensure pushing area is cordoned off and signage is placed to maintain safe work areas. Only Bahrain Post Tension's trained personnel will be permitted to enter the zone in between pusher and coil while the strand is being drawn from coil into duct.

4.4.5 Straighten and profile duct as per drawing details. Support and fasten ducts so that they will maintain their positions during placing and compaction of concrete.

Cable Pushing (Fig-9)

4.5 Installation of Anchorages

4.5.1 With the live end marked on the side shuttering, the shuttering is then cut by the Main Contractor to accommodate the anchorages.

4.5.2 The anchorages are then mounted on to the side shuttering using bolt and/or wire.

4.5.3 Anti-burst reinforcement assemblies are supplied and added by the Main Contractor under P.T engineer supervision to the live end and dead end as dimensioned in the post tensioning typical details.

4.5.4 Box outs (pan box)will be supplied and added by the Main Contractor under P.T engineer Supervision and shall be secured once top reinforcement is fixed.

4.5.5 Dead end Types will typically be "onion" ends.

Above-Anchorage

(Fig-10)

Above-Dead end (onion end)

(Fig-11)

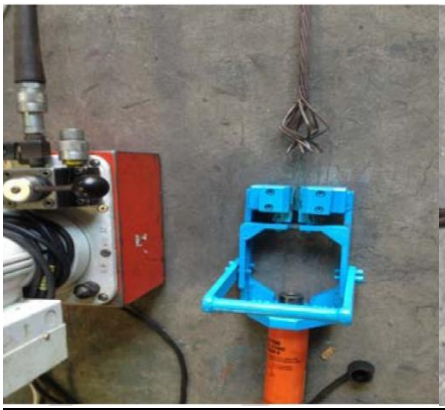
4.6 Dead End Types (Onion Ends)

4.6.1 These will be formed on site using a mechanical machine "onion jack" utilizing hydraulic pressure.

4.6.2 Individual strands are threaded in to the machine and 'pushed back' causing the strand to "onion".

Above–Onion Jack and Stressing pump(Fig-12)

AboveOnion Jack Creating an Onion (Fig-13)



Left —Creation of onion end (Fig-14)

Left–Completed onion end (Fig-15)

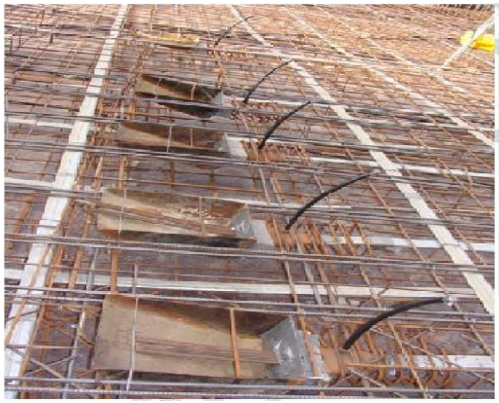
4.6.3 Dead ends and anti-burst links will be combined to form the completed assembly as the contract drawing / approved Consultant shop drawing.

4.7 Installation of Grout Tube sand Grout Vents

4.7.1 Once all the tendons have been installed and profiled the grout tubes will then be placed at both the live and dead end.

4.7.2 If at end on exceeds 25metres in length a grout vent will be added in the centre of the tendon as a breather hole for the grout.

4.7.3 If there are any obstructions to the grout tube to be placed at the above mentioned areas, extra grout vents maybe added to the tendon to allow for ease of grouting.



Above-Pan End Grout Tube Above–Dead End Tube
(Fig-16) (Fig-17)

4.8 Completion of Slabs-Top Reinforcement

4.8.1 Bahrain Post Tension must complete the installation of the anchors/ducting/strand and profiling before the top reinforcement is fixed.

5.0 POSTTENSION STRESSING METHODOLOGY

5.1 Pre-Stressing Works-Equipment & Supervision

5.1.1 72 hours concrete cube test results must be done and approved before final stressing.

5.1.2 All post tensioned concrete shall be submitted to P.T engineer for approval then finally passed onto the consultants for formal approval before stressing can commence.

5.1.3 Prior to stressing works commencing all stressing equipment shall be checked for damage, if it is found to be damaged the equipment shall be quarantined and replacement equipment shall be used.

5.1.4 The required stressing loads shall be clearly specified on the general notes of the approved drawings.

5.1.5 Stressing jacks will be mono-strand jacks supplied and serviced as required.

5.1.6 The stressing jack and gauge will be calibrated on a6monthlybasis. The serial numbers for both equipment types will be mentioned on the calibration certificate.

5.1.7 The stressing calibration certificate shall be submitted to the consultant and approved prior to stressing.

Stressing Jack (Fig-18) **Stressing Pump(Fig-19)**

5.1.8 Only suitably trained P.T Supervisor personal will undertake stressing works.

5.2 Procedure –Preparation of Stressing

5.2.1 Extreme care will be taken not to damage tendons when striking, cleaning or removing formers.

5.2.2 Inspect strands prior to further preparation work.

5.2.3 With strands clean the wedge block and wedges can be made ready and prepared for stressing.

Above-Anchor recess removal (Fig-20)

Above-Stressing block installation (Fig-21)

5.2.4 With the assemblies checked and prepared place over the exposed strand ends.

5.2.5 Again check tendon for damage and note any obstructions that occur when block is being installed.

5.2.6 Complete loose fixing of assembly.

5.2.7 Prior to marking of strands for extension measurement, the wedges and assembly MUST be securely fastened into position to ensure a true reading of the elongation.

5.2.8 Once the wedge block and wedges are inserted into position the strand and wedge is the spray painted for reference when measuring elongations.

Stressing in progress signage (Fig-23)

5.2.9 Prior to stressing operations commencing, access will be limited to area around stressing with barrier tape and signage.

5.2.10 Before final stressing is carried out a Permit to Stress will be raised.

5.3 Pre-Stressing Works –Site Checks

5.3.1 Before Final Stressing is carried out the Main Contractor will raise a Permit to Stress (concrete cube result) and issue to P.T engineer.

5.4 Final Stressing

5.4.1 Final stressing to shall be carried out to project specifications of the design load will be carried out once the concrete has achieved the correct strength.

5.4.2 The concrete cube test must be cured on site in the same conditions as the slab (air cured) any laboratory curing will not be accepted.

5.5 Stressing Procedure

5.5.1 All stressing will be carried out by trained P.T supervisors with at minimum 12 months experience of stressing operations.

5.5.2 Any requirements for order of stressing of tendons will be specified on the approved drawings.

5.5.3 The jack calibration should be checked and the machine, gauge and pump checked by the supervisor and confirmed as in good order.

5.5.4 Both the Main Contractor and consultant will officially be informed before stressing operation has commenced and may witness if required.

5.5.5 Permit to stress shall be completed.

Above-Stressing Operations (Fig 24)

5.5.6 Pushes the stressing jack firmly onto the strand ensure the stressing jack nose is in proper contact with the wedges and wedge block.

5.5.7 Load is then applied gradually using the stressing pump and monitoring the gauge until reaching the load limit specified.

5.5.8 With the appropriate load reached the stressing jack is disengaged.

5.5.9 Repeat the same process for each strand until the entire tendon is completed. Once the tendon is completed move to next tendon and repeat the process.

5.5.10 Where double live ends are, stress first end to30% of design load, and the second to the 100% load of designed load.

Above-Gauge Monitoring Above Extension Measurement (Fig-25)(Fig-26)

5.6 Confirmation of Elongations and Permits to Cut Excess Strand

5.6.1 Once elongations have been measured they will be assessed against the theoretical elongation to verify that the correct amount of pre-compression is present in the concrete slab.

5.6.2 Elongation results will be input into elongation sheets and variations recorded.

5.6.3 The site and theoretical elongation report shall have a variance of(+/-10%)

5.6.4 Once the slab elongation reports are completed and have been verified by P.T engineer, the consultants will be handed the final report for official review/approval.

5.6.5 Only when consultants give official approval for the elongation report P.T supervisor may proceed with excess strand cut off.

5.7 Cutting and Sealing Tendons

5.7.1 Cutting of tendons will be carried out using a disc cutter or other abrasive wheel. The use of welding or oxy-acetylene cutting equipments STRICTLY prohibited and no such equipment should be utilized in post tensioned concrete construction.

5.7.2 All such infill areas will require minimum setting period of 24 hrs, grouting may commence after this time period.

5.7.3 It is the Main Contractors responsibility to use an approved concrete patching material and execute filling anchor and pan box voids.

5.7.4 Once the above has been carried out the Main Contractor can start to remove the floor shuttering and prepare for back propping as per the P.T engineer instruction and approval.

Completed End Stressing Infill (Fig-27)

6.0 POST-TENSION GROUTING METHODOLOGY

6.1 Specialist Pre-Check

6.1.1 Post tension edge routing materials will be issued and approved as a material submittal.

6.1.2 The procedure for grout testing and testing frequencies shall be agreed.

6.2 Mix Trials

6.2.1 In accordance with BS446, trial mixes of the proposed grout shall be carried out in advance of commencement of grouting operations.

6.2.2 The trail mix shall include-water/cement ratio, fluidity test, bleed test, expansion test and compressive strength.

6.2.3 The above tests shall be carried out by an approved laboratory and/or site under the witness of the consultant Engineer.

6.2.4 The plant/materials and supervisory personnel executing the trail shall be maintained throughout the grouting operations during project execution.

6.2.5 Control of grout temperature shall be in accordance with BS446 with a target maximum temperature of 35°C.Shouldthe temperature of the grout exceed this,

6.2.6 but remainbelow40°Cduringoperationalgroutingthenadditionalcube samples will be taken to confirm that grout has reached adequate strength.

6.2.7 If the ambient temperature exceeds 32 C ice will be added to the water. The Main Contractor shall provide the following-fresh water, ice (if required)and high quality OPC cement.

6.3 During the trial, demonstration shall be made to the engineer of:

6.3.1 Adequate volumetric control of water.

6.3.2 Adequate volumetric control of additives for fluidity, in this case ISOLA NSA Grout.

6.3.3 Adequate mass/volumetric control for the addition of cement.

6.3.4 Proper service ability and suitability of mixing/pumping equipment.

6.3.5 Adequate supervisory knowledge of personnel involved in grouting operations as describedinBS446.

6.3.6 Fluidity tests shall be carried out in accordance with BS447 cone method Bleed test shall be carried out inaccordancewithBS447, bleeding tests volumetric change test carried out in accordance with BS447.

6.3.7 Cylinder method Compressive strength will be determined by crushing of 2setsof 3No. 100mmx100mmcube samples. Cubes willbetestedat7and 28days,limitsasspecifiedbelow.

6.4 Testing Limits

6.4.1 Post tensioned concrete specification provides limits for compressive strength hand bleed only with no specified fluidity values. These values shall be taken as acceptable if limits specified in BS447 are satisfied.

6.4.2 Fluidity:AsBS447

- Immediately after mixing>10 seconds<25 seconds
- 30min after mixing>10 seconds<25seconds

6.4.3 CompressiveStrengthLimitsBS447

- 100mm3 cube at 7 days >20N/mm2
- 100mm3 cube at 28 days >30N/mm2

6.4.4 Bleed TestasBS447

6.4.5 The allowable bleed value of <2% is acceptable

6.5 Grout cubes must be left on site for 24 hrs only.

6.5.1 The Main Contractor must remove the grout cubes from site to an approved laboratory.

6.6 Expansion Test as BS447

6.6.1 After24hrs>1% and<5%isacceptable.

6.6.2 Note that the above tests are carried out prior to official grouting work commencing for consultant approval. During grouting operations only fluidity test and compressive test shall be executed.

6.7 Clearing of Tendons

6.7.1 Prior to commencement of operational grouting the tendons shall be shown to be free and clear of debris. This shall be done by:

•Blowing dry (oil-free) compressed air through the ducting (air compressor to be provided by main contractor)
•Once the tendons are clear and have been demonstrated to the consultant Engineer that the tendons are ready to receive grout.

6.8 Tendon Blockage

6.8.1 The case of a tendon blockage a method statement shall be submitted by BPT to the main-contractor/consultant for their review and approval.

6.9 Grouting of Tendons-Mixing

6.9.1 The grouting design mix ratio shall not exceed W/C 0.45 2:1

6.9.2 Full grouting mix ratio

- 200 kg Cement
- 90 liters of water
- 1kg of Admixture

6.9.3 Yield is approximately 145 liters of Grout

6.9.4 Mixing shall takeapprox.5mins until the grout is flow-able and lump free.

6.9.5 Grouting shall commence within 30minutes of mixing material.

6.10 Grouting of Tendons-Grout Injection

6.10.1 Sequence of Grouting

(i) Grout is first injected in either the live or dead end tube and pumped through the line of the tendon until the grout emerges at the opposite end of tendon of the same consistency as that being injected.

(ii) The grout is then pressurized and both tubes are locked off with the process repeated for each tendon.

Grout Pump (Fig-28)

7.0 Health and Safety

7.1 Protective and safety equipment:

7.1.1 Helmets are to be worn at all times.
7.1.2 Safety footwear is to be worn at all times.
7.1.3 Reflective safety jackets or equivalent to be worn at all times.
7.1.4 Gloves are to be worn at all times.
7.1.5 Safety glasses are to be worn when working with grinders.
7.1.6 Safety harnessers are to be worn on platforms.
7.1.7 Safe and secure stressing access preferably 1m wide is to be provided by the main contractor.

7.2 Safety rules for strand cutting operations:

7.2.1 Prior to any strands cutting operations, coils should be installed in the strand dispenser.
7.2.2 Only manual steel cutter to be used to release the coil from the dispenser.
7.2.3 Goggles to be worn at all times.

7.3 Safety rules for stressing operations:

7.3.1 Danger, stressing in progress signs to be displayed at all times.
7.3.2 Personnel not involved in the stressing operations are to be cleared from the area.
7.3.3 No personnel are to be behind the stressing jack.
7.3.4 Equipment and personnel should not be directly above the tendon anchorage during stressing.

7.4 Safety rules for grouting operations:

7.4.1 Correct PPE to be worn all times.
7.4.2 Be aware of non P.T personnel and surrounding environment.

SYSTEM SPECIFICATIONS

STRAND PROPERTIES - TO BS5896 & AS1311

Nominal Diameter	Nominal Steel Area	Nominal Mass	Minimum Breaking Load UTS	Minimum Proof Load (0.2% Offset) kN		Minimum Elongation to Fracture in 600mm	Relaxation After 1,000hrs at 0.7 Breaking Load %		Modulus of Elasticity
mm	mm^2	kg/m	kN	Norm.	L-R	%			MPa
12.7	100.1	0.786	184	-	156.4	3.5	-	2.5	180-205
15.2	143.3	1.125	250	-	212.5	3.5	-	2.5	$x10^3$
12.9	100.0	0.785	186	156.4	165.6	3.5	8	2.5	195
15.7	150.0	1.180	265	225.0	238.5	3.5	8	2.5	195

TENDON PROPERTIES - 12.7

SMS No.	No. of Strands	Cement kg/m	Int. Duct Dia. mm	Prestressing Force (kN) as a % of UTS 12.9 75%	12.7 85%	12.7 100%
SMS 7	2	2.9	55	279	313	368
	3	2.7		419	469	552
	4	2.6		558	626	736
	5	2.5		698	782	920
	6	2.3		837	938	1104
	7	2.2		977	1095	1288
SMS 13	8	3.3	65	1116	1251	1472
	9	3.2		1256	1408	1656
	10	3.1		1395	1564	1840
	11	2.9		1535	1720	2024
	12	2.8		1674	1877	2208
	13	2.7		1814	2033	2392
SMS 19	14	5.6	84	1953	2190	2576
	15	5.3		2093	2346	2760
	16	5.2		2232	2502	2944
	17	5.1		2372	2659	3128
	18	4.9		2511	2815	3312
	19	4.8		2651	2972	3496
SMS 27	20	6.7	95	2790	3128	3680
	21	6.6		2930	3284	3864
	22	6.4		3069	3441	4048
	23	6.3		3209	3597	4232
	24	6.2		3348	3754	4416
	25	6.1		3488	3910	4600
	26	5.9		3627	4066	4784
	27	5.8		3767	4223	4968
SMS 31	28	8.8	110	3096	4379	5152
	29	8.7		4046	4536	5336
	30	8.6		4185	4692	5520
	31	8.5		4325	4848	5704
SMS 37	32	8.3	110	4464	5005	5888
	33	8.2		4604	5161	6072
	34	8.1		4743	5318	6256
	35	7.9		4883	5474	6440
	36	7.8		5022	5630	6624
	37	7.7		5162	5787	6808
SMS 43	38	13.9	135	5301	5943	6992
	39	13.7		5441	6100	7176
	40	13.6		5580	6256	7360
	41	13.5		5720	6412	7544
	42	13.3		5859	6569	7728
	43	13.2		5999	6725	7912
SMS 55	44	13.1	135	6138	6882	8096
	45	12.9		6278	7038	8280
	46	12.8		6417	7194	8464
	47	12.7		6557	7351	8648
	48	12.6		6696	7507	8832
	49	12.4		6836	7664	9016
	50	12.3		6975	7820	9200
	51	12.2		7115	7976	9384
	52	12.0		7254	8133	9568
	53	11.9		7394	8289	9752
	54	11.8		7533	8446	9936
	55	11.6		7673	8602	10120

TENDON PROPERTIES - 12.2

SMS No.	No. of Strands	Cement kg/m	Int. Duct Dia. mm	Prestressing Force (kN) as a % of UTS 15.7 75%	15.2 85%	15.2 100%
SMS 7	2	2.8	65	398	475	500
	3	2.6		596	638	750
	4	2.4		795	850	1000
	5	2.2		994	1065	1250
	6	2.0		1193	1275	1500
	7	1.8		1391	1488	1750
SMS 13	8	2.9	84	1590	1700	2000
	9	2.7		1789	1913	2250
	10	2.5		1988	2125	2500
	11	2.3		2186	2338	2750
	12	2.1		2385	2550	3000
	13	1.9		2584	2763	3250
SMS 19	14	4.7	110	2783	2975	3500
	15	4.5		2981	3188	3750
	16	4.3		3180	2400	4000
	17	4.1		3379	3613	4250
	18	3.9		3578	3825	4500
	19	3.7		3376	4088	4750
SMS 27	20	5.6	110	3975	4250	5000
	21	5.4		4174	4463	5250
	22	5.2		4373	4675	5500
	23	5.0		4571	4888	5750
	24	4.8		4770	5100	6000
	25	4.6		4969	5313	6250
	26	4.4		5168	5525	6500
	27	4.2		5366	5738	6750
SMS 31	28	7.2	110	5565	5950	7000
	29	7.1		5764	6163	7250
	30	6.9		5963	6375	7500
	31	6.7		6161	6588	7750
SMS 37	32	6.5	135	6360	6800	8000
	33	6.3		6559	7013	8250
	34	6.1		6758	7225	8500
	35	5.9		6956	7438	8750
	36	5.7		7155	7650	9000
	37	7.7		7354	7863	9250
SMS 43	38	11.7	135	7553	8075	9500
	39	11.5		7752	8288	9750
	40	11.3		7950	8500	10000
	41	11.1		8149	8713	10250
	42	10.9		8348	8925	10500
	43	10.8		8547	9138	10750
SMS 55	44	10.6	154	8745	9350	11000
	45	10.4		8944	9563	11250
	46	10.2		9143	9775	11500
	47	10.0		9342	9988	11750
	48	9.8		9540	10200	12000
	49	9.6		9739	10413	12250
	50	9.4		9938	10625	12500
	51	9.2		10137	10838	12750
	52	9.1		10335	11050	13000
	53	8.9		10534	11263	13250
	54	8.7		10733	11475	13500
	55	8.5		10932	11688	13750

The Post tensioning Slab System (SSS), developed in Australia over the past 30 years, is a fully integrated post tensioning system for thin concrete sections such as floor slabs.

During this time, the SSS has been steadily refined and now features horizontally longed anchorage and ducting accepting up to five 15.2mm diameter strands. Such designs are gaining an ever-increasing share of the slab construction market.

STRAND PROPERTIES - TO AS & BS CODE

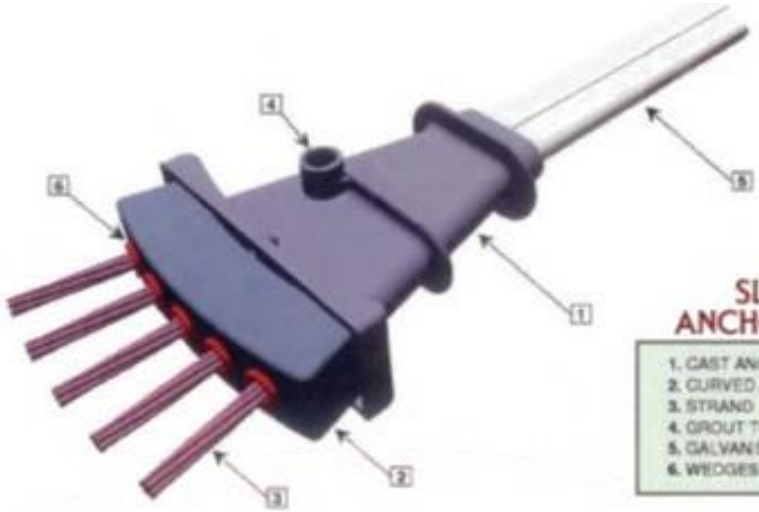
Nominal Diameter mm	Nominal Steel Area mm²	Nominal Mass kg/m	Minimum Breaking Load UTS kN	Minimum Proof Load kN 0.1%		0.2%	Minimum Elongation to Fracture in 500mm %	Relaxation After 1,000hrs at 0.7 Breaking Load % Relax 1		Relax 2	Modulus of Elasticity GPa
12.7	98.6	0.774	184	151	-	156	3.5	8	-	2.5	195 ± 10
15.2	143	1.122	260	205	-	212	3.5	8	-	2.5	195 ± 10

TENDON PROPERTIES - 12.7

Tendon type	No. Of Strands	Conveit kg/m	Nominal Area mm²	Int Duct Dim. Min	Prestressing Force (kN) as a % of UTS 75%	85%	100%
1 - 5	1	0.3	98.6	19 x 19	156	156	184
2 - 5	2	0.7	197.2	43 x 19	313	313	368
3 - 5	3	1.4	295.8	70 x 19	469	469	552
4 - 5	4	1.2	394.4	70 x 19	626	626	736
5 - 5	5	1.1	493	70 x 19	782	782	920
6 - 5	6	1.5	591.6	90 x 19	938	938	1104

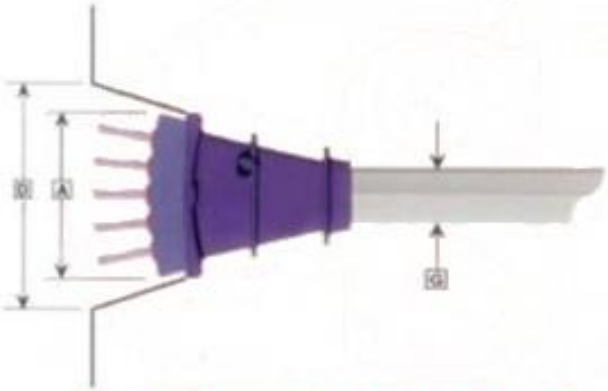
TENDON PROPERTIES - 15.2

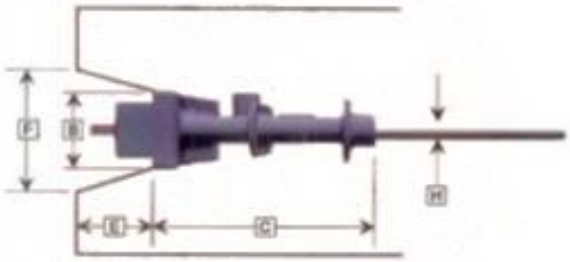
Tendon type	No. Of Strands	Conveit kg/m	Nominal Area mm²	Int Duct Dim. Min	Prestressing Force (kN) as a % of UTS 75%	85%	100%
1 - 6	1	0.2	143	19 x 19	213	213	250
2 - 6	2	0.6	286	43 x 19	425	425	500
3 - 6	3	1.2	429	70 x 19	638	638	750
4 - 6	4	1.0	572	70 x 19	850	850	1000
5 - 6	5	1.3	715	90 x 19	1063	1063	1250



SLAB ANCHORAGE

1. CAST ANCHORAGE
2. CURVED ANCHOR HEAD
3. STRAND
4. GROUT TUBE
5. GALVANISED DUCT
6. WEDGES





SLAB ANCHORAGE 12.7 - 12.9

No. Of Strands	1	2	3	4	5	6
A	145	153	153	215	215	266
B	65	70	70	72	72	79
C	95	197	197	210	210	269

SLAB ANCHORAGE 15.2 - 15.7

No. Of Strands	1	2	3	4	5
A	145	153	215	215	266
B	65	70	72	72	79
C	95	197	210	210	269

RECESS FORMER 12.7 - 12.9

No. Of Strands	1	2	3	4	5	6
D	150	200	200	315	315	320
E	100	100	100	100	100	100
F	100	100	100	100	100	100

RECESS FORMER 15.2 - 15.7

No. Of Strands	1	2	3	4	5
D	150	200	315	315	320
E	100	100	100	100	100
F	100	100	100	100	100

DUCT 12.7 - 12.9

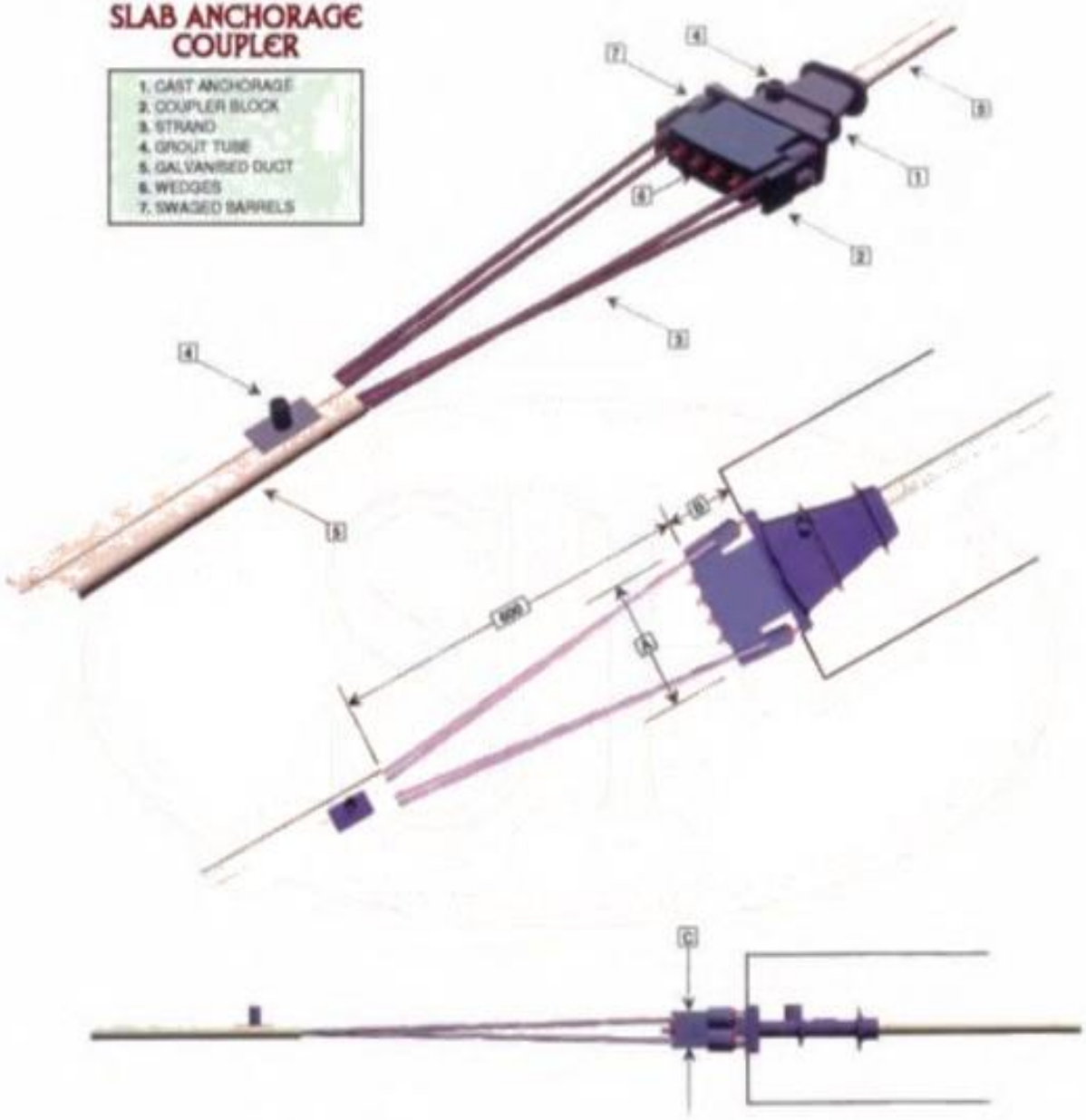
No. Of Strands	1	2	3	4	5	6
G	19	43	43	70	70	90
H	19	19	19	19	19	19

DUCT 15.2 - 15.7

No. Of Strands	1	2	3	4	5
G	19	43	70	70	90
H	19	19	19	19	19

SLAB ANCHORAGE COUPLER

1. CAST ANCHORAGE
2. COUPLER BLOCK
3. STRAND
4. GROUT TUBE
5. GALVANISED DUCT
6. WEDGES
7. SWAGED BARRELS



COUPLER BLOCKS 12.7 - 12.9

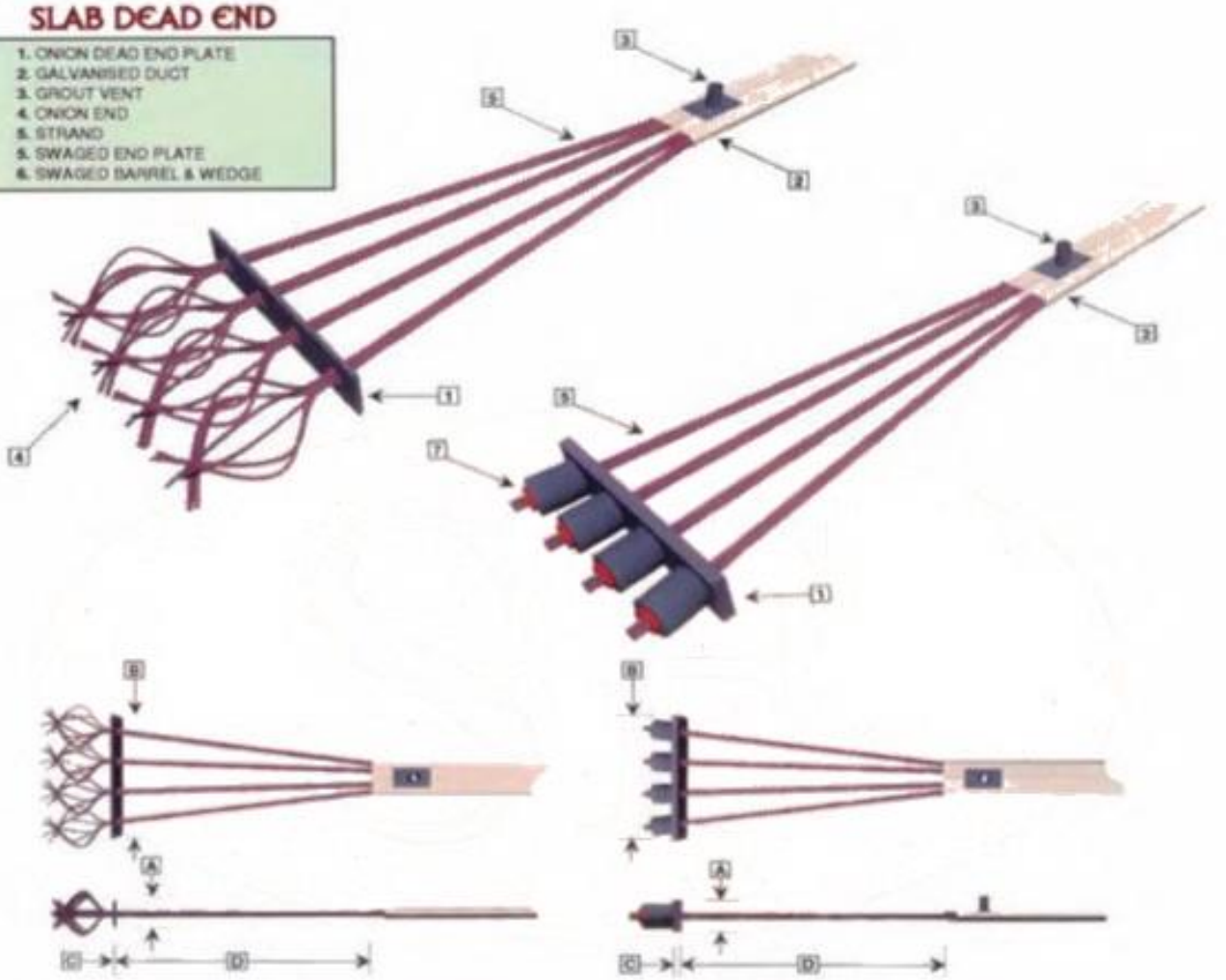
No. Of Strands	1	2	3	4	5
A	190	190	190	224	298
B	120	120	120	120	125
C	60	60	60	60	60

COUPLER BLOCK 15.2 - 15.7

No. Of Strands	1	2	3	4	5
A	190	190	190	190	190
B	135	135	135	135	135
C	60	60	90	150	150

SLAB DEAD END

1. ONION DEAD END PLATE
2. GALVANISED DUCT
3. GROUT VENT
4. ONION END
5. STRAND
5. SWAGED END PLATE
6. SWAGED BARREL & WEDGE



DEAD END PLATE 12.7 - 12.9

No. Of Strands	1	2	3	4	5	6
A	50	50	50	50	50	50
B	50	100	250	250	300	350
C	3	3	3	3	3	3
D	800	800	800	800	800	800

DEAD END PLATE 15.2 - 15.7

No. Of Strands	1	2	3	4	5
A	50	50	50	50	50
B	50	100	250	270	350
C	3	3	3	3	3
D	900	900	900	900	900

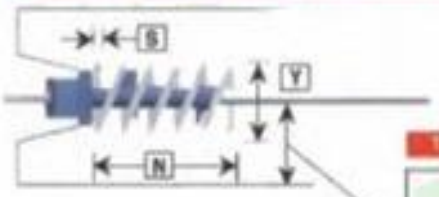
SWAGED DEAD END 12.7 - 12.9

No. Of Strands	1	2	3	4	5	6
A	50	50	50	50	50	50
B	50	100	250	250	300	350
C	10	10	10	10	12	12
D	150	150	350	350	500	500

SWAGED DEAD END 15.2 - 15.7

No. Of Strands	1	2	3	4	5
A	50	50	50	50	50
B	50	100	250	270	350
C	10	10	10	10	12
D	150	150	350	500	500

HELIX TYPE ANTIBURST REINFORCEMENT

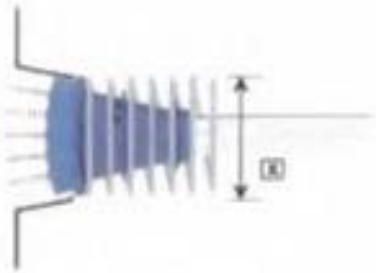


Min. Concrete strength at Jacking load of 782 kN = 22MPa.
Min. Concrete Strength at Jacking Load > 782 = 25 MPa.

The above concrete strengths must be obtained from site cured test samples.

TYPE C/L TO EDGE

2 - 5 = 60mm
3 - 5 = 70mm
4 - 5 = 80mm
5 - 5 = 90mm
6 - 5 = 100mm
5 - 6 = 100mm



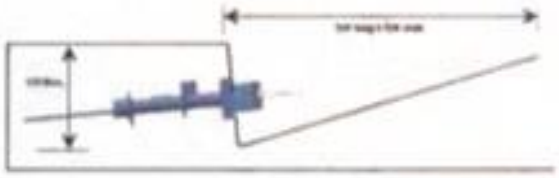
Note: The nominal draw-in is approximately 6mm at lock off

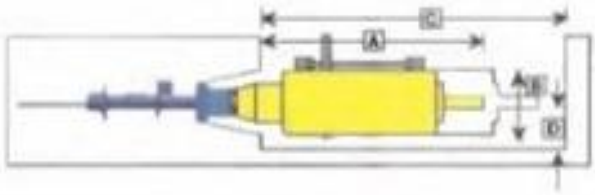
- Anchorage Friction Losses = 3%
- Internal Pockets = 5%
- Duct Friction Losses $\mu = 0.20$
- Wobble Factor = 0.02

HELIX TYPE ANTIBURST DIMENSIONS

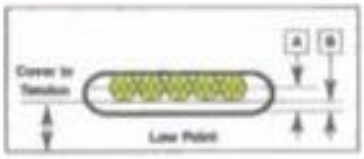
System	Bar Size (S)	Pitch mm	No. of Turns (N)	Width mm (X)	Height mm (Y)
Up to 5 x 12.7Ø	R10	60	5	260	100
6 x 12.7Ø & Up to 5 x 15.2Ø	N12	60	7	300	110

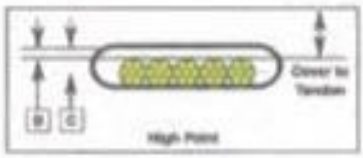
RECESS FOR STRESSING PAN





STRAND OFFSET IN DUCT



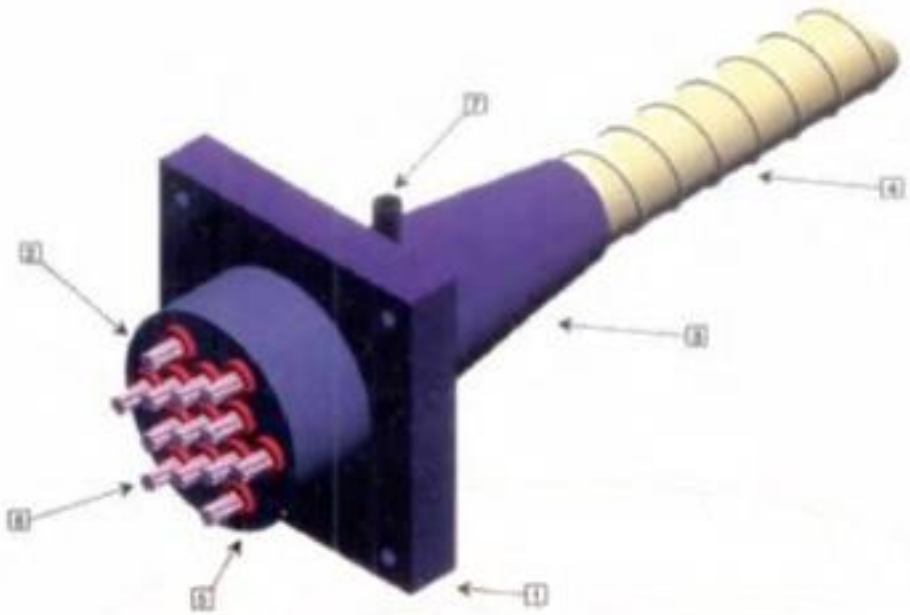


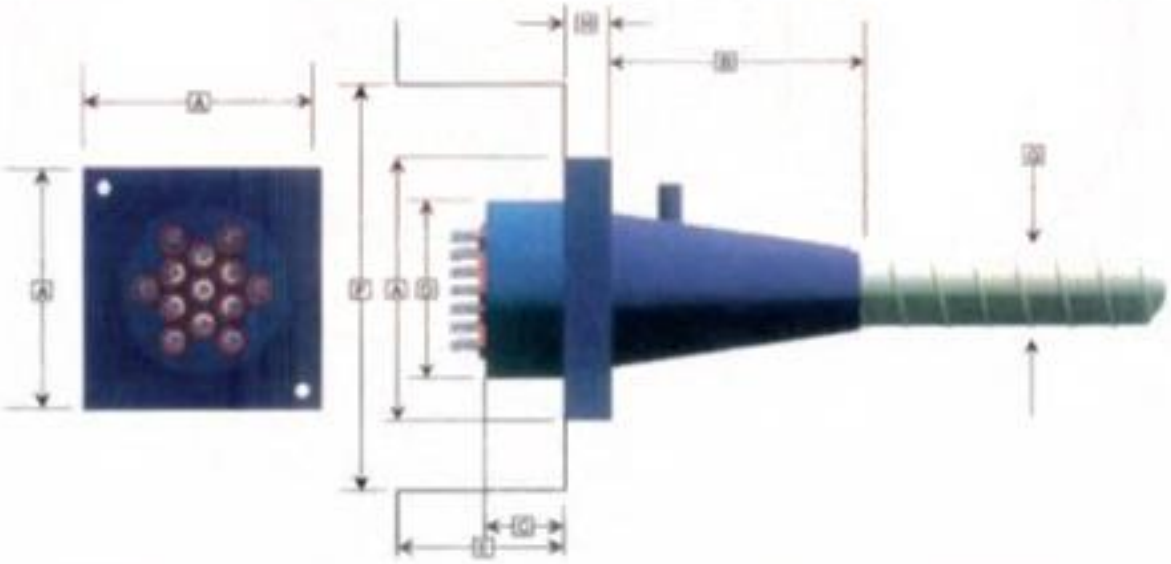
HELIX TYPE ANTIBURST DIMENSIONS

System	Bar Size (S)	Pitch mm	No. of Turns (N)	Width mm (X)	Height mm (Y)
Up to 5 x 12.7Ø	R10	60	5	260	100
6 x 12.7Ø & Up to 5 x 15.2Ø	N12	60	7	300	110

STRAND OFFSET IN DUCT

Strand Diameter	A (Nom.)	B (Nom.)	C (Nom.)
12.7	13	6	6
15.2	11	4	6



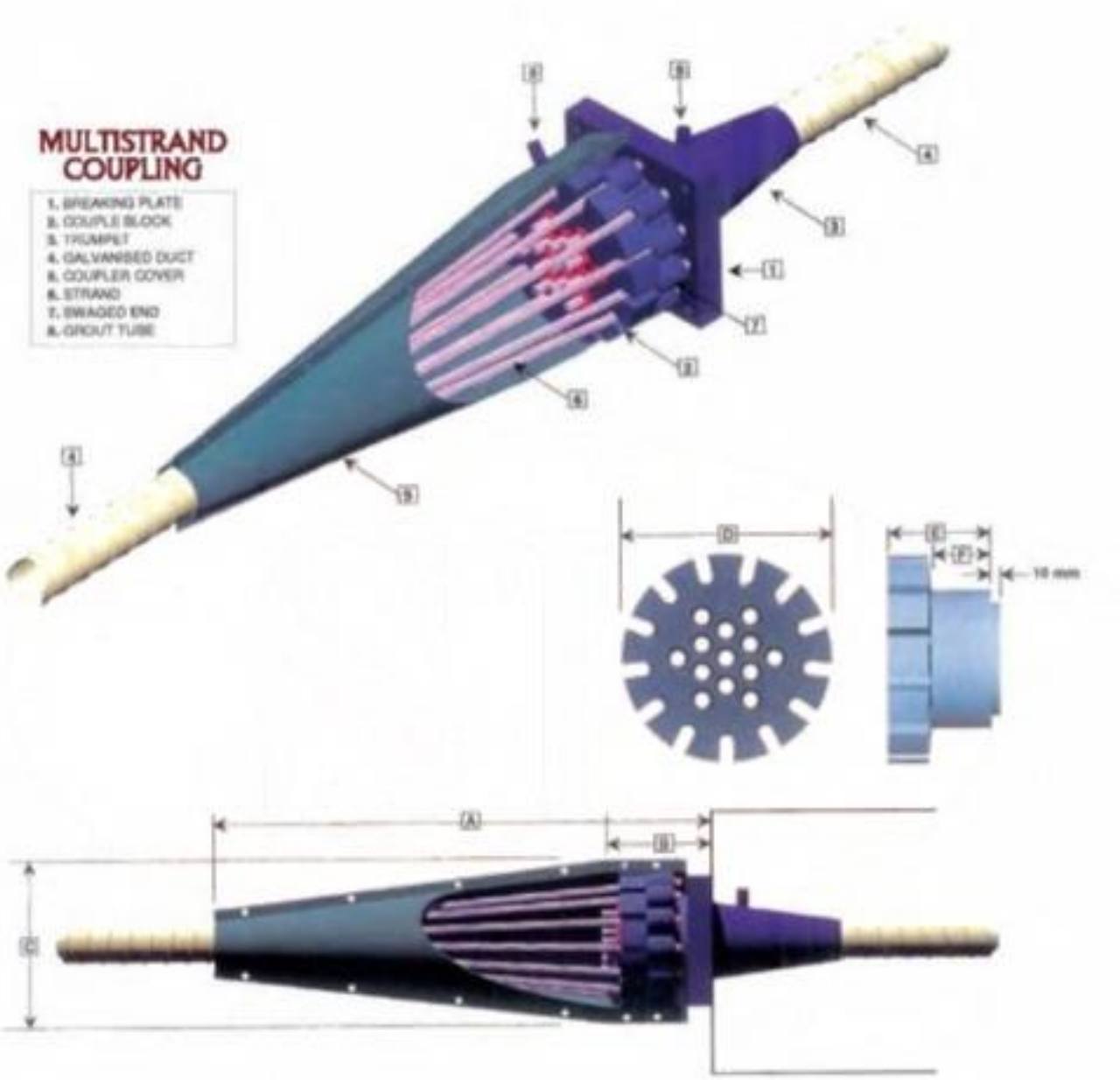


LIVE END ANCHORAGE 12.7

0.6" Tendon Type	A	B	C	D	E	F	G (Dia)	H
7-6	180	185	50	110	100	250	55	32
13-6	220	250	65	150	115	300	65	35
19-6	270	290	80	180	130	350	84	50
27-6	320	350	100	225	150	400	95	50
31-6	340	350	100	225	150	425	110	60
37-6	380	400	120	260	175	450	110	60
43-6	400	500	145	300	200	475	135	75
55-6	475	600	148	320	200	550	135	80

LIVE END ANCHORAGE 15.2

0.6" Tendon Type	A	B	C	D	E	F	G (Dia)	H
7-6	220	250	65	150	115	300	65	36
13-6	270	290	80	180	130	350	84	50
19-6	340	350	100	225	150	425	110	60
37-6	380	400	125	260	175	450	110	60
31-6	400	400	125	260	200	475	110	75
37-6	475	500	145	300	200	550	135	80
43-6	560	550	145	300	205	475	135	100
55-6	610	650	150	305	210	550	135	120



COUPLER COVER & BLOCK ANCHORAGE 12.7

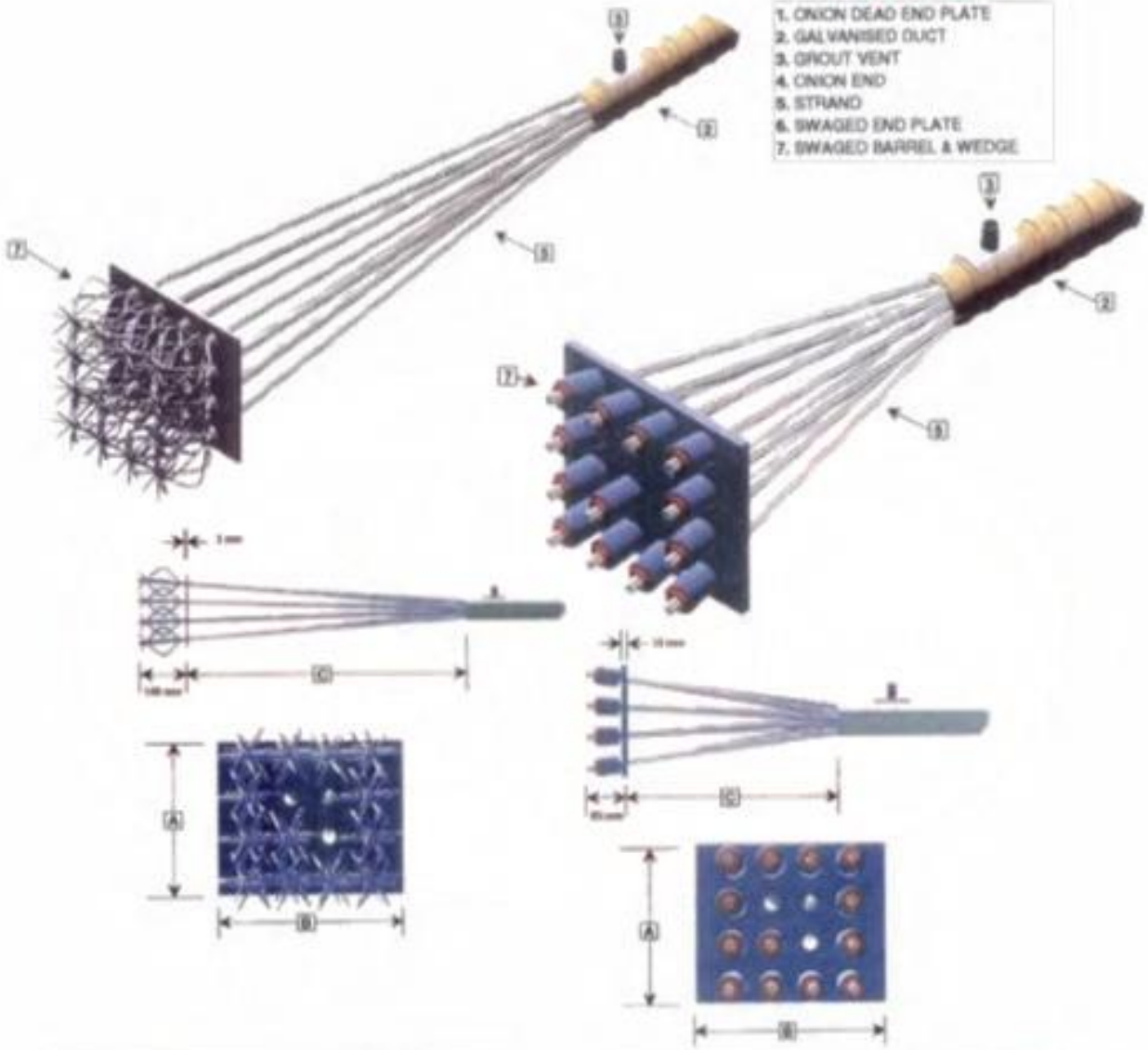
SMS Tendon Type	A	B	C	D	E	F
7-6	500	110	196	186	110	63
13-6	600	110	226	226	110	63
19-6	650	110	266	276	110	63
27-6	900	115	362	372	115	63
31-6	950	115	362	372	115	63
37-6	1200	130	430	420	130	63
43-6	1250	145	470	460	130	63
55-6	1300	165	490	480	140	63

COUPLER COVER & BLOCK ANCHORAGE 15.2

SMS Tendon Type	A	B	C	D	E	F
7-6	630	110	210	226	110	70
13-6	740	110	250	276	110	70
19-6	860	110	310	372	115	70
27-6	1000	150	390	420	130	70
31-6	1100	150	395	420	130	70
37-6	1400	150	420	460	140	70
43-6	TBA	TBA	TBA	TBA	TBA	TBA
55-6	TBA	TBA	TBA	TBA	TBA	TBA

MUTLISTRAND DEAD END

1. ONION DEAD END PLATE
2. GALVANISED DUCT
3. GROUT VENT
4. ONION END
5. STRAND
6. SWAGED END PLATE
7. SWAGED BARREL & WEDGE



ONIONED DEAD END 12.7

No. of Strands	7	13	19	31	37	43	55
A	200	300	250	350	400	450	550
B	200	250	300	400	450	500	600
C	800	1000	1000	1000	1000	110	1200

ONIONED DEAD END 15.2

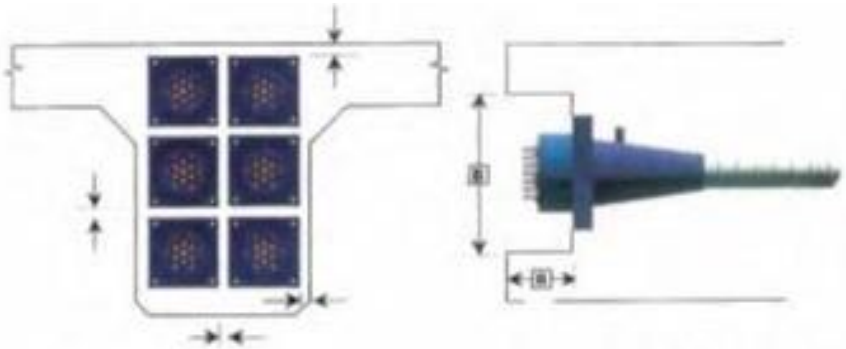
No. of Strands	7	13	19	31	37	43	55
A	200	350	450	550	600	700	800
B	200	300	350	475	550	550	600
C	800	1000	1000	1100	110	1200	1200

SWAGED DEAD END 12.7

No. of Strands	7	13	19	31	37	43	55
A	150	200	250	300	350	380	450
B	150	200	250	300	350	380	450
C	300	400	500	700	900	1000	1000

SWAGED DEAD END 15.2

No. of Strands	7	13	19	31	37	43	55
A	200	250	300	350	400	425	550
B	200	250	300	350	400	400	500
C	350	500	500	650	900	950	1000



MUTLISTRAND EDGE GAPS

Tendon 12.7mm	A (mm)	Tendon 15.2mm	A (mm)
7 - 5	30	7 - 5	50
13 - 5	50	13 - 5	50
19 - 5	50	19 - 5	80
27 - 5	50	27 - 5	80
31 - 5	60	31 - 5	80
37 - 5	60	37 - 5	80
43 - 5	65	43 - 5	100
55 - 5	65	55 - 5	100

ANCHOREAGE RECESS 12.7

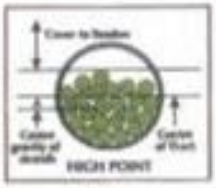
No. of Strands	7	13	19	27	31	37	43	55
B	250	300	350	400	425	450	475	550
C	100	115	130	150	150	175	200	250

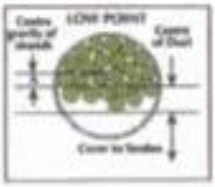
ANCHOREAGE RECESS 15.2

No. of Strands	4	7	9	13	19	27	31	37	43	55
B	250	300	300	350	425	450	475	550	750	900
C	100	115	115	130	150	175	200	200	200	220

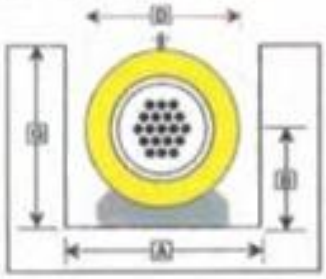
STRAND OFFSET IN DUCT

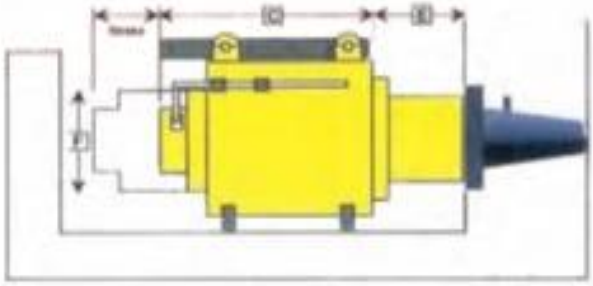
Tendon 12.7mm	A (mm)	Tendon 15.2mm	A (mm)
7 - 5	8	7 - 5	10
13 - 5	10	13 - 5	13
19 - 5	13	19 - 5	17
27 - 5	13	27 - 5	13
31 - 5	14	31 - 5	22
37 - 5	23	37 - 5	25
43 - 5	25	43 - 5	33
55 - 5	23	55 - 5	27





NOTE:
The nominal **draw-in** is approximately 6mm at lock off.
- Anchorage Friction Losses = 2% to 4 %
- Duct Friction Losses μ = 0.20
- Wobble Factor = 0.02





MULTISTRAND JACK CLEARANCE

Jack Type (t)	No. of Strands (Max.)	Strand Length mm	Nominal Mass kg	Stroke (Max.)	A (Min.) mm	B (Min.) mm	C mm	D mm	E mm	F mm	G mm
110	7-5 & 4-6	850	130	150	535	200	310	235	80	140	460
150	7-5 & 7-6	850	210	200	596	200	390	296	80	190	460
200	7-5 & 7-6	850	360	200	622	200	400	322	80	220	460
250	13-5 & 7-6	1000	470	300	665	300	525	365	190	229	530
300	19-5 & 13-6	1230	570	300	704	350	570	404	300	280	710
500	31-5 & 19-6	1400	980	300	808	40	650	508	365	343	815
1000	55-5 & 37-6	1550	2180	300	1050	475	690	750	450	520	1000

For enquiries or information please contact on the below:

info@bpt-bh.com

Bahrain Post-Tension Contracting
P.O. Box 5999, Manama, Kingdom of Bahrain
Tel: 17008458 Fax: 17009314
Website: www.bpt-bh.com