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APPLICATION OF POST-TENSIONING IN MULTI-STOREY BUILDINGS

Rahul Choat*, Dr.Om Prakash
* B.Tech Scholar, Department of Civil Engineering, Suresh Gyan Vihar University, India
Head of Department, Department of Civil Engineering, Suresh Gyan Vihar University, India

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ABSTRACT

In spite of the fact that post-tensioning frameworks require specific learning and mastery to create, collect and introduce, the idea is anything but difficult to clarify. Envision a progression of wooden pieces with openings penetrated through them, into which an elastic band is strung. In the event that one holds the finishes of the elastic band, the squares will hang. Post-tensioning can be shown by setting wing nuts on either end of the elastic band and winding the elastic band so that the squares are pushed firmly together. In the event that one holds the wing nuts subsequent to winding, the pieces will stay straight. The fixed elastic band is practically identical to a post-tensioning tendon that has been extended by pressure driven jacks and is held set up by wedge-sort securing gadgets. To completely welcome the advantages of post-tensioning, it is useful to know a tiny bit about concrete. Concrete is exceptionally solid in pressure however frail in strain, i.e. it will break when strengths act to force it apart. In ordinary RCC development, if a load, for example, the autos in a parking carport are acting on a section or beam, the beam will have a tendency to sag or deflect. This deflection will bring about the base of the beam to stretch somewhat. Indeed, even a slight stretching is typically enough to bring about breaking. Steel strengthening bars ("rebar") are ordinarily inserted in the solid as ductile reinforcement to confine the cracks. Rebar is what is called "passive" support anyway; it doesn't convey any drive until the concrete has as of now deflected enough to break. Post-tensioning tendons, then again, are viewed as "dynamic" fortifying. Since it is prestressed, the steel is successful as fortification despite the fact that the concrete may not be broken. Post-tensioned structures can be intended to have insignificant redirection and splitting, even under full load.

INTRODUCTION

Post-tensioning is a technique for fortifying (reinforcing) concrete or different materials with high-quality steel strands or bars, ordinarily alluded to as tendons. Post-tensioning applications incorporate office and loft structures, parking structures, slab-on-ground, spans, sports stadiums, soil anchors, and water-tanks. Much of the time, post-tensioning permits development that would somehow or another be outlandish because of either site limitations or structural prerequisites. There are post-tensioning applications in all features of development. In building development, post-tensioning permits longer clear traverses, more slender sections, less beams and more thin, dramatic components. More slender slabs mean less concrete is required. Also, it implies a lower general building stature for a similar floor-to-floor height. Post-tensioning can in this way permit a huge lessening in building weight versus a traditional RCC building with a similar number of floors. This diminishes the establishment expenses and can be a noteworthy favorable position in seismic territories. A lower building height can likewise mean extensive investment funds in mechanical frameworks and façade costs. Another preferred standpoint of post-tensioning is that beams and sections can be constant, i.e. a solitary beam can run ceaselessly from one end of the working to the next. Fundamentally, this is significantly more effective than having a beam that just goes starting with one section then onto the next.

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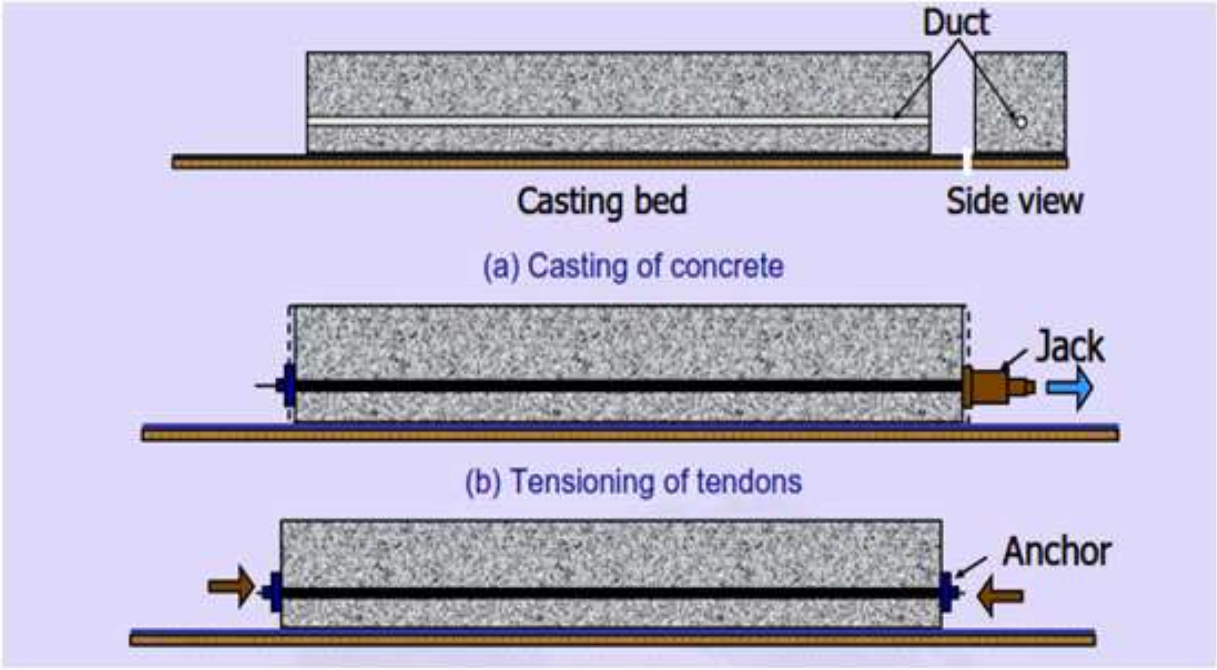

Fig1: Schematics of post-tensioning

(Source: Google.com)

METHODOLOGY

A post-tensioning "tendon" is characterized as a total get together comprising of the anchors, the prestressing strand or bar, the sheathing or pipe and any grout or consumption hindering covering (oil) encompassing the prestressing steel. There are two primary sorts of post-tensioning: unbonded and bonded (grouted). An unbonded tendon is one in which the prestressing steel is not really attached to the solid that encompasses it aside from at the anchorages. The most regular unbonded frameworks are monostrand (single strand) tendons, which are utilized as a part of pieces and beams for structures, parking structures and slab-on-ground. A monostrand tendon comprises of a seven-wire strand that is covered with a corrosion hindering oil and encased in an expelled plastic defensive sheathing. The anchors comprises of an iron wedge and are funnel shaped, two-piece wedge which grasps the strand.

In reinforced frameworks, at least two strands are embedded into a metal or plastic conduit that is implanted in the concrete. The strands are stressed with an expansive, multi-strand jack and tied down in a typical dock gadget. The channel is then loaded with a cementitious grout that gives insurance to the strand and bonds the tendon to the concrete encompassing the pipe. Reinforced frameworks are all the more usually utilized as a part of scaffolds, both in the superstructure (the roadway) and in cable-stayed-spans, the link stays. In buildings, they are typically only used in heavily loaded beams such as girders and landscaped decks where the large number of strands required makes them more practical. Soil anchors are likewise reinforced frameworks yet the development succession is to some degree diverse. Regularly, a cased gap is bored into the side of the slope or the tunnel wall. A tendon is embedded into the casing and after that the system is grouted. Once the grout has achieved adequate quality and strength, the tendon is stressed. In slopes and tunnel walls, the anchors hold free soil and rock together; in deep excavations they hold the wood slacking and steel piles in place. There are a few basic components in a post-tensioning framework. In unbonded development, the plastic sheathing goes about as a bond breaker between the solid and the prestressing strands. It likewise gives assurance against harm by mechanical dealing with and fills in as a hindrance that keeps dampness and chemicals from achieving the strand. The strand covering material lessens friction between the strand and the sheathing and gives extra consumption security. Anchors are another basic component, especially in unbonded frameworks. After the concrete has cured and gotten the vital quality, the wedges are embedded inside anchor housing and the strand is hydraulically stressed. At the point when the jack discharges the strand, the strand withdraws somewhat and maneuvers the wedges into the grapple. This makes a tight bolt on the strand. The wedges in this manner keep up the connected constrain in the tendon and exchange it to the encompassing cement. In destructive situations, the anchors and uncovered strand tails are generally

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secured with a lodging and top for additional assurance. In building and slab-on-ground development, unbonded tendons are normally pre-assembled at a plant and conveyed to the development site, prepared to introduce. The tendons are laid out in the structures as per establishment drawings that demonstrate how they are to be separated, what their profile (stature over the shape) ought to be, and where they are to be hydraulically stressed.

After the concrete is set what's more, has achieved its required quality, more often than not in the vicinity of 3000 and 3500 psi ("pounds per square inch"), the tendons are focused and tied down. The tendons, similar to elastic groups, need to come back to their unique length however are kept from doing as such by the anchors. The reality the tendons are kept in a for all time stressed (extended) state causes a compressive compel to follow up on the concrete. The pressure that outcomes from the post-tensioning checks the pliable strengths made by resulting (dead load, live load when the shoring is removed). This significantly increases the load-carrying capacity of the concrete). This essentially builds the load-carrying limit of the concrete. Since post-tensioned concrete is used in civil engineering, there is no restriction to the shapes that can be framed. Bended arches, curves and complex decks and spans, edge formats are frequently a trademark of post-tensioned solid structures. Post-tensioning has been utilized to advantage in various planned extensions.

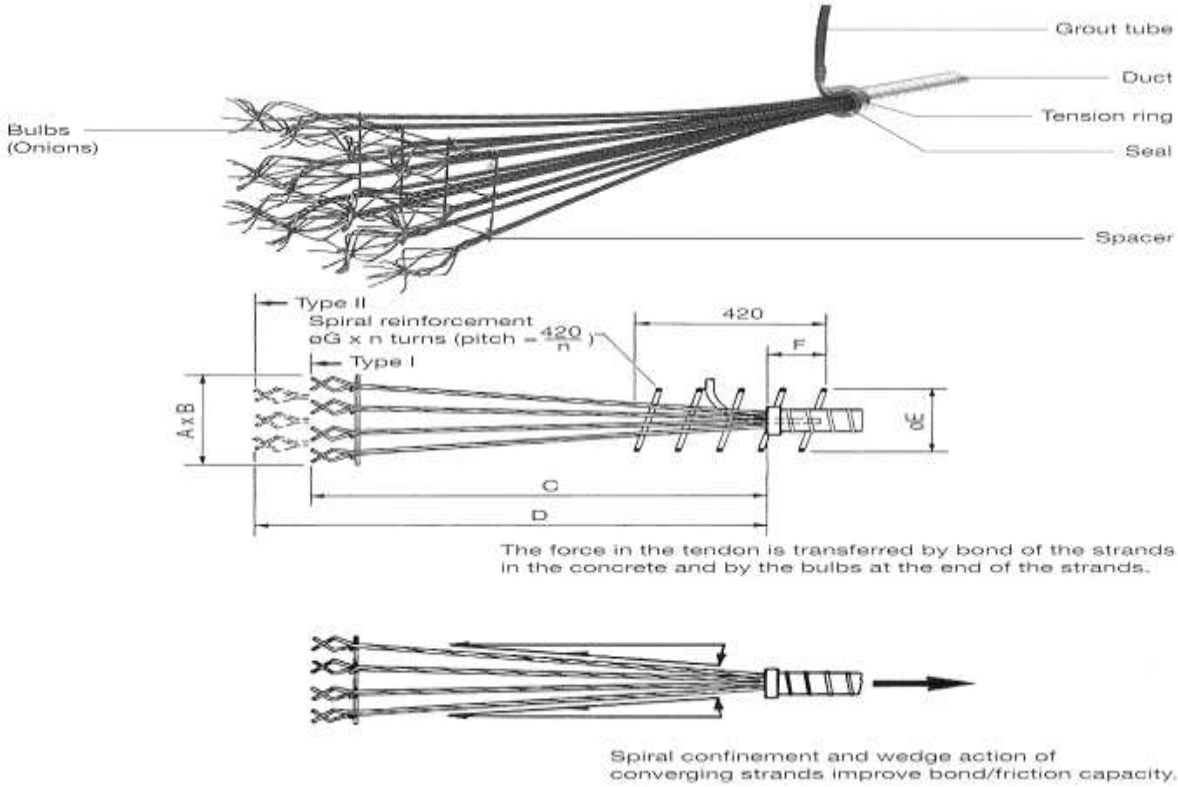

Fig 2: VSL Type H anchorage (Source: REPORT SERIES DETAILING FOR POST-TENSIONED General Principales Local Zone Design General Zone Design Examples from Pratice PUBLISHED BY VSL INTERNATIONAL LTD. Bern, Switzerland

ADVANTAGES OF POST-TENSIONED BUILDINGS

1. Longer Spans: Longer traverses can be utilized diminishing the quantity of coloumns. This results in bigger, coloumn free floor regions which incredibly increment the adaptability of utilization for the structure and can bring about higher rental returns.
2. General Structural Cost: The aggregate cost of materials, work and formwork required to develop a story is lessened for spans more prominent than 7 meters, along these lines giving unrivaled economy.
3. Lessened Floor to Floor Height: For the same forced load, more slender sections can be utilized. The lessened area profundities permit least building stature with resultant investment funds in facade expenses. On the other hand, for taller structures it can permit more floors to be developed inside the original building envelope.
4. Deflection Free Slabs: Undesirable deflections under service loads can be for all intents and purposes killed.

5. Waterproof Slabs: Post-tensioned slabs can be intended to be crack free and along these lines waterproof sections are conceivable. Accomplishment of this goal relies on cautious outline, itemizing and development. The decision of concrete matrix and curing techniques alongside quality workmanship additionally assume a key part.
6. Early Formwork Stripping: The prior stripping of formwork and decreased backpropping necessities empower quicker development cycles and speedy re-utilization of formwork. This expansion in speed of development is clarified promote in the segment on financial aspects.
7. Materials Handling: The lessened material amounts in cement and reinforcement translates into significant advantage in number of labourers on site. The strength of post-tensioning strand is roughly 4 times that of ordinary tensile reinforcement. In this way the aggregate weight of tensile material is extraordinarily decreased.

CONCLUSION

Post-tensioned story sections are presently all around viewed as the most financially successful development for strip malls, office structures, and parking where spans surpass 7.5 meters. The favored post-tensioning framework utilized is the well demonstrated `bonded' tendon using from 3 to 5 individual prestressing strands housed in oval ducting and tied down in level fan formed safe anchor castings. A question regularly asked of post-tensioned section frameworks is the thing that happens in the event that we wish to make a penetration in the section after development. Every once in a while it has been conveyed to our consideration that experts from the building calling see this question as a noteworthy obstruction and are hesitant to acknowledge the utilization of post-tensioning in a few sorts of structures. This is frequently because of an apparent absence of adaptability in the structure with regards to the arrangement of openings through the slabs some time after development. This segment will diagram the choices accessible to empower the designer to deliver a building which is both financial to build and simple to change later on.

It is normal for post-tensioning to be dismissed in specific types of building projects due to an apparent absence of flexibility. This, in the lion's share of cases, is related more with respect to a dread of the obscure than on sound specialized information. With a little thinking ahead it can be seen that post-tensioning need not mean a thick slab of tendons running in all possible directions. Tendons are generally separated adequately far separated to permit entrances of sensible size to be made later, without slicing through the tendons. Where there is a sensible probability that an entrance might be required later on, slabs can be worked with `soft zones' to permit later aperture by voids without cutting tendons. Should it be important to cut tendons this can undoubtedly be accomplished utilizing entrusted techniques and to put it plainly, while the adjustment of a post-tensioned section may require more planning than different types of development, its utilization will give the customer a building which is both economical to build and adaptable for its life.

Moreover, the measure of post-tensioning strand being used in civil engineering has practically multiplied in the most recent years and the post-tensioning industry is keeping on developing quickly. To guarantee quality development, the Post-Tensioning Institute (PTI) production certification program and a field personnel certification intern course. By determining that the plant and the installers be PTI guaranteed, designers can guarantee the level of value that the proprietor will anticipate. PTI additionally distributes specialized records and instructional booklets covering different parts of post-tensioned plan and development.

REFERENCES

[1] CARES. "Post-Tensioning Systems". www.ukcares.com. CARES. Retrieved 7 September 2016.
[2] Federation Internationale du Beton (Feb 2005). fib Bulletin 31: Post-tensioning in Buildings (PDF). FIB. ISBN 978 2 88394 071 0. Retrieved 26 August 2016.
[3] *Aalami, Bijan O. (February 2001).* "Nonprestresed Bonded Reinforcement in Post-Tensioned Building Design" *(PDF). ADAPT Technical Publication (P2-01).* Retrieved 25 August 2016.
[4] Bondy, Kenneth B. (December 2012). "Tow way post-tensioned slabs with bonded tendons" (PDF). PTI Journal. US: Post-Tensioning Institute. **8** (2): 44. Retrieved 25 August 2016.
[5] "Post-Tensioning Institute website", Post-Tensioning Institute.
[6] "External Post-Tensioning", VSL International, Bern Switzerland, 1990, 31
[7] REPORT SERIES DETAILING FOR POST-TENSIONED General Principales Local Zone Design General Zone Design Examples from Pratice PUBLISHED BYVSL INTERNATIONAL LTD. Bern, Switzerland