

WHAT “MAKES” THE LAST PLANNER? A TYPOLOGY OF BEHAVIORAL PATTERNS OF LAST PLANNERS

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ABSTRACT

This paper explains the role of the Last Planner and behavioral patterns observed in Last Planner meetings. We focus on the Last Planner as the person who serves as the coupling point between planning and production, whose key to success lies in the fine art of balancing what he or she really wants with the ways and means actually available for achieving it. We apply a sociological approach by introducing and discussing a typology of four types of planning behavioral patterns, the *Game Player*, *Gang Pusher*, *Yes Man*, and *Last Planner*. These types are derived from observing Last Planners on many projects and categorizing their behavior according to (1) the observed individual’s apparent level of commitment to using the Last Planner planning process vs. (2) the degree of conceptual understanding of the Last Planner System that they appear to exhibit. We conclude that no matter how good (or bad) the upstream planning is the real-time adaptation of and commitment to a plan strongly depends on the judgment, communication skills, and choices made by the Last Planner. Knowing what “makes” the Last Planner can be fundamental to the success of system implementation. By assessing patterns of planning behavior, focused training can be offered to help individuals and teams become more knowledgeable and fully-committed Last Planners.

KEYWORDS

Production planning and control, Last Planner[®] System, people, culture and change.

INTRODUCTION

Over the years, more than 200 papers have been written on the Last Planner[®] System (LPS) of production control in IGLC conference proceedings and elsewhere, too many to cite here. This paper sheds light on the role Last Planners play in planning meetings. According to Ballard’s (1993, p. 4) first publication on the concept he invented, what “makes” the

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Last Planner is the ability to produce “directives that drive direct work processes, and not other planning processes.” Research papers on the LPS have shed light, e.g., on commitment planning, trust-building and behaviors that emerge from LPS implementation (Seymour and Rooke 2000, Fauchier and Alves 2013, Smith and Rybkowski 2013), linguistic actions and human concerns related to implementation (Macomber et al. 2005, Slivon et al. 2010), implementation barriers (Brady et al. 2011), learning and changes in behavior (Tillmann et al. 2014), and experiences of project managers and foremen using the LPS (Skinnarland 2012). However, the role Last Planners play appears to not have been the focus. One might find that to be paradoxical because, when applying the LPS, the priority is to bring all work processes under control. The strategy for achieving that control is to identify Last Planners, clarify their role and expectations, and enable them to be successful (Ballard 1993, p. 4). Indeed, whereas research in this area can be credited for describing efforts to enable the planner last in a chain of planners to act as a Last Planner, we find the main character somewhat hidden.

Our contribution in this paper is to explain the role of the Last Planner and characterize behavioral patterns based on observed practices. We view him/her as the coupling point between planning and production, whose key to success lies in the fine art of balancing what s/he really wants with the ways and means actually available for achieving it. We conclude that no matter how good (or bad) the upstream planning is, the real time adaptation of a plan greatly depends on judgments, communication skills, and choices made by the Last Planner. Knowing what “makes” the Last Planner can, in this way, be fundamental to succeeding with implementation of the system.

METHODOLOGY

We have found little in the literature that describes how Last Planners behave in certain ways at planning meetings and why their behavior may be so, yet each of our 10+ years of experience in deploying the LPS have provided us the opportunity to observe different behaviors. We have conducted numerous field observations by joining construction project teams both as planning facilitators as well as process observers at weekly planning meetings. At times having two researchers on our team made it possible for one to focus on facilitation and the other on observation. Post-meeting debriefs with planning team members (when we were coaching them to learn the Last Planner process) and between the two of us, offered richness in observation that would have been hard to capture so fully if a single researcher had attempted to do so. In addition, we also spoke with subcontractors (trade partners) before or after the planning meetings and checked in with them on site to hear how their plan got executed. That said, the characterization we here propose of Last Planners is but the first step on a path of research inquiry with many questions that demands more formal investigation and validation.

THEORETICAL BACKGROUND

SHIELDING PROCESS IN THE LAST PLANNER SYSTEM

In 1993, Ballard published his first Last Planner concept paper. In it, he expressed concern with the so-called “conversion” process model. Through his examples, one comes to understand that conversion model as depicting a way of managing construction projects based on sequential thinking. Ballard argued that the conversion model is outdated, in regards to projects in which engineering, procurement, and construction overlap in time. His apprehension derived from the observation that although so-called “fast-track” projects now are the norm in construction, project management practices are still very much dominated by the conversion process model. Ballard looked at what the consequences are for performance improvement strategies if the conversion process model is to be displaced with lean construction concepts and principles. A fundamental part of the strategy to make that happen is, in Ballard’s view, to improve the production planning and control of construction projects. It is against this background that he outlined the basic elements of the Last Planner concept (later renamed and trademarked as the Last Planner®).

Why focus on planning? Ballard’s response was that current standards for scheduling and budgeting construction projects assume poor performance and therefore include a tremendous amount of waste (Ballard 1993, p. 3). From a rational point of view, it seems to make little sense to plan in a way that makes projects less off. At the same time, why bother if projects get completed on time, on budget, and to the satisfaction of the customer? It is this particular reasoning that Ballard wanted to stamp out in the industry. He did so by pointing to the planners last in a chain of planners, named the Last Planners. Why the Last Planners? Ballard accentuated the Last Planner because s/he is the key to producing good assignments, yet the erratic delivery of resources to the construction site disables him/her from doing so. Instead, these planners spend a large amount of the time hustling resources and fighting fires (Ballard 1993, p. 5). This is not to say that it is the Last Planner’s business alone to produce those assignments. Quite the opposite! Ballard advocated for “the deliberate creation of inventory surge piles” to shield the Last Planner “from an erratic flow of resources” (op. cit. p. 4-5). This “shielding” consists essentially of distinguishing what “should” be done, from what “can” be done, and what “will” be done. The Last Planner’s job in this process is to approximate “should” within the limits of “can” (Ballard 1993, p. 3). The shielding process leads us to formulate the following first assumption:

1. What makes the Last Planner is the shielding process. The Last Planner’s ability to produce good assignments is determined by the quality of this process.

ROLE OF THE LAST PLANNER

Ballard and Howell (1998) subsequently described the shielding process as the essential step in production control. Now, let us dwell a bit on the role that the Last Planners are there to fulfill, namely to produce good assignments. In Ballard and Howell’s view, to make so-called “quality assignments” involves that certain requirements are met: i.e., that assignments are specific enough; that all prerequisites are in place such as materials, tools, design drawings, prerequisite work, space, manpower and other external conditions; that assignments have the right sequence and size; and, that learning takes place by tracking

assignments not completed and identifying the reasons (op. cit. p. 3). Due to the existence of a shielding process, one may come to think of the Last Planner's role as being straightforward. Here too, quite the opposite is true if we follow Ballard and Howell's (1998 p. 7) substantial list of planning steps the foreman must follow on a weekly basis.

The plan where work orders or directives are released to the production units, often called a weekly work plan, is in Ballard and Howell's view a Commitment Plan (1998, p. 2). Committing here relates to the principle of producing only quality assignments. It goes back to the "will" in the shielding process and exposes the production units to the risks of not using available productive capacity and of failing to meet scheduled dates (op. cit. p. 3). Now, why would they do that? It is not certain that they will. This is probably why Ballard (1993 p. 3) is quite clear that the Last Planner's job is to produce assignments that are practical and to provide reliable input for the planning of interdependent work processes. Thus, a Last Planner's concern should be, not only with the practical feasibility of the assignment per se, but also with how that work relates to other work. This leads us to the second assumption:

2. What defines the Last Planner is his/her ability of judging what is possible and knowing how to achieve it. The level of commitment from the production units will depend on this.

COMMITMENT PLANNING, TRUST, AND MANAGING PROMISES

By using the term Commitment Plan, Ballard and Howell (1998) indicate that there are human concerns as part of doing production planning related to the social construction of trust and promises. A common problem or challenge with these human concerns is that they are so obvious they tend to be overlooked (Seymour and Rooke 2000, p. 1). A series of IGLC papers stress the human elements involved in making production plans. A substantial contribution is Slivon et al.'s (2010) paper that proposes a framework for situating the construction process in the world of human concerns. It does so by considering activities taking place on the construction site as expressions of human concerns or "interests," and not merely physical movements (op. cit. p. 3). In line with several other related contributions, the paper takes a language or linguistic action view to explain how the physical activity on site is a result of requests and promises having been made in the planning stage to align interests into a network of commitments (op. cit. p. 4).

A question then is: How do you manage to align interests into a coherent network of commitments? Macomber et al.'s (2005) answer is: By understanding the planning process as being about managing promises, and using the LPS to close in on the uninterrupted flow. Their paper further details how to achieve reliable promises in the construction context. What is not so much stressed in this paper, but which is a clear topic for another series of IGLC papers, is that of competitive tendencies appearing within the group of planners resulting in sub-optimization on relational sustainability. In one such paper, Smith and Rybkowski (2013) introduce the Maroon-White Game to illustrate the impact of trust, both earned and broken, as a way of teaching participants about the consequences of their actions in situations where cooperation is a possibility. The game makes evident that, given the option to cooperate with another party vs. look out for their own best interests the

selection of a cooperative move is unlikely (op. cit. p. 990). This leads us to the third and final assumption:

3. Being the Last Planner is about making and receiving promises. Benefits from the planning process stem from the ability to make decisions based on a broader perspective than one individual’s.

TYPOLOGY OF BEHAVIORAL PATTERNS OF LAST PLANNERS

The LPS provides a certain “programmable” pattern of action to reduce work flow variability as well as to complete the work. However, people are not easily programmable. Last Planners, last in a chain of planners, act in different ways for many reasons. In the following, we generalize their patterns of behavior by singling out 4 type descriptions. We crafted these, inspired by behaviors observed of Last Planners in planning meetings, but like movie producers we add the disclaimer: “The descriptions, all names, characters, and incidents portrayed in this paper are fictitious. No identification with actual persons, places, buildings, and products is intended or should be inferred.” None of these types will be found in their pure form in real life. We made these types to help conduct useful analyses of how planning is performed in projects.

The types are categorized along two dimensions: (1) the apparent level of commitment of the planner to using the Last Planner planning process, and (2) the level of conceptual understanding of the LPS that the planner appears to exhibit. Regarding commitment, our focus is on the level of dedication or engagement shown by planners in the process of developing a plan. Regarding conceptual understanding, our concern is with the apparent aptitude these planners have in grasping the essence of what planning (and in particular the LPS) is. Figure 1 shows our four types, denoted in italics in the text: (1) the *Game Player* (high conceptual understanding, low commitment), (2) the *Gang Pusher* (low conceptual understanding, low commitment), (3) the *Yes Man* (low conceptual understanding, high commitment), and (4) the *Last Planner* (high conceptual understanding, high commitment).

Figure 1: Typology of behavioral patterns of Last Planners

		<i>Level of Commitment</i>	
		Low	High
<i>Level of Conceptual Understanding</i>	High	<i>Game Player</i>	<i>Last Planner</i>
	Low	<i>Gang Pusher</i>	<i>Yes Man</i>

What inspired the naming of each type? *Game player* is a term influenced by game theory (dating back to the 1920s) applied to social interaction in sociology, where attempts to explain how people interact are based on seeing their actions as strategies, involving winners and losers, punishment and rewards, profits and costs (Swedberg 2001). *Gang pusher* is a term Ballard (1993) used to refer to the front line supervisor or leader of a work crew. *Yes Man* is a term inspired by director Peyton Reed’s 2008 movie by that name, about a guy who challenges himself to say “yes” to everything for an entire year. Finally,

Last Planner is a term used in Ballard and Howell's (1998 p. 6-7) description of the planner involved in shielding and commitment planning. Next, we further distinguish these types.

Game Player: The *Game Player* is self-interest driven. S/he has a strong sense of what planning is about and comes well-prepared to meetings, yet strategically avoids committing fully to the planning process. S/he might indeed take an active part whenever planning touches upon issues that relate directly to his/her interests or concerns, but s/he will most likely also be passive for longer periods of time in the meetings. His/her self-interest may be driven by economic concerns. Have in mind here that a planner produces directives that drive direct work. Thus, decisions s/he makes, whether related to the use of labor, materials, or other resources, can have crucial impact on the outcome of the project for the contractor. Furthermore, self-interest as a quality might be misleading, since there is often a project manager standing behind him/her ("in the office", as they say) who follows up on the budget and whose role is to see to that all things go as planned and agreed on in the contract. This situation can work to limit the planner's propensity to participate actively in the meetings and instead disconnects him/her from the planning process, especially if s/he is also inexperienced in the planner role. We speculate—and suggest as a future research question—that the *Game Player* may be found in trades that use relatively long-lead time (e.g., fabricated) and costly materials and that have relatively little flexibility in terms of how they work, such as for instance plumbing or duct work, where the consequences of wrong decisions can be substantial.

Gang Pusher: The *Gang Pusher* is push oriented, and here understood figuratively-speaking as the archetypical foreman who shoves or pushes his/her crew around for work or pushes work onto his/her crew. S/he is the type of planner who operates with a short-term planning horizon only, and for that reason typically thinks of the shielding process as unnecessary or superfluous as the assignments in his/her opinion can be derived directly from the master schedule. This planner checks the quality of assignments in real time, while the work is ongoing, rather than beforehand as part of the planning process. The assignments s/he is used to are often poorly defined, decided opportunistically, typically including chunks of work rather than broken down pieces of work. As a result, s/he will find it hard to define assignments in a LPS's weekly work plan. Besides, when questioned about status or level of completion of tasks in the weekly work plan meetings, s/he will tend to give a blurred response as starts and ends of assignments are not always very clear to him/her. Being a pusher of work, this planner's focus is on getting things done to the point that work cannot wait for quality assignments to be produced. His/her dedication to the planning process is therefore low. His/her conceptual understanding of the planning process also being low has probably less to do with intellectual capacity and more with the kind of work s/he performs. We speculate that the *Gang Pusher* may be found in trades that are flexible in terms of which work can be done where, such as framing, dry walling, tiling, or painting, where the "push of work" or "push to work" thinking can be a quite logical approach—at least from that single-trade's perspective only.

Yes Man: The *Yes Man* is, as the name indicates, flexibility-driven. S/he is highly committed to the planning process to the point that s/he involves strongly in the meetings and is eager to contribute to a good plan. However, s/he has a hard time seeing what it

actually implies to put an assignment *in* the plan, both when it comes to first making sure that all prerequisites are in place (materials, engineering drawings, etc.) and to agreeing that setting the start and finish dates for assignment really is the same as making a promise to the rest of the organization that the work will actually happen within this time frame. Failure or lack of willingness to understand this promise typically has as outcome that his/her assignments are taking longer than originally planned and even keep reappearing in weekly work plans until they are finally done (possibly weeks later). For reasons related to interdependence of work processes, a *Yes Man* may cause trouble in a project, but the extent of that misery depends on the nature of the work s/he does. For instance, if s/he happens to be an electrician whose work is pretty much everywhere in a building, but who at the same time can be quite flexible and used to working around others, the unreliability of his/her actions does not need to affect the other trades that much. This notwithstanding, being an electrician who experiences for example an unscheduled late delivery of light fixtures is likely to cause problems for other trades as well as the project.

Last Planner: The *Last Planner* is pull oriented. S/he is highly committed to the planning process based on being convinced that coming up with a reliable plan will benefit him/herself, the contractor, all the other trades and the project in general. Pull oriented here means using the planning process to build up a backlog of sound assignments (including all necessary prerequisites) that s/he can pull from, down to the weekly work plan level and further out to the production units. Having that pull orientation usually involves considerable preparation ahead of meetings to make sure everything is in place for the upcoming week(s), as well as performing regular quality checks on site to control status and be certain that completed tasks really are 100 % done (done-done). When a *Last Planner* puts an assignment in the plan, s/he knows s/he is making a promise to the rest of the organization. For that reason, s/he will not hesitate to hold back an assignment that is not made ready, even though the overall plan dictates that the task should be done in the upcoming week. In the planning meetings s/he is also likely to point out if other *Last Planners* report falsely on the status of their work. Following the “go slow to go fast,” a *Last Planner* is inclined to sacrifice some of his/her own unit’s progress (as originally planned) for the sake of other units’ progress—as long as it benefits the project. While we speculated earlier about planning behaviors possibly correlating with the nature of a trade’s work, note that a *Last Planner* can be anyone on the team, independently of the nature of work s/he does. Ideally, everyone on the team should be a *Last Planner*. Note however that one does not become a *Last Planner* overnight. It takes time to learn LPS concepts and become skilful at using them. It is not unusual for a *Last Planner* to have had training and practice using the LPS on earlier projects. At the same time, success in planning in construction relies on more than an individual’s mastering of certain concepts and skills; project context plays a huge role as well.

DISCUSSION

WHAT “MAKES” THE LAST PLANNER IS THE SHIELDING PROCESS

The output of the shielding process is a buffer of sound assignments (workable backlog), that shields production and not least the Last Planners from uncertainty. When such a

shielding process does not exist, as was the case in more than one case study, one might expect various strategies appearing among the Last Planners to cope with the situation. The pull-oriented *Last Planner* is likely to establish his/her own lookahead plan. Furthermore, s/he will be eager to involve or otherwise communicate his/her plan to the other trades, in an attempt to make sure all interdependent work processes are coordinated before they “hit” the floor. However, to the point that some trades will lack a lookahead window in their plan, as may be the case for the *Yes Man* and the *Gang Pusher*, the *Last Planner* will get only vague or unreliable promises based on unsteady interpretations. Like the *Last Planner*, the *Game Player* may develop his/her own lookahead plan in a situation where no lookahead window exists that includes all the trades. His/her way of communicating the plan to the other trades is less based on involvement and more motivated by pushing them to finish the necessary, preceding work and “knocking them down” whenever s/he finds them to be in the way of his/her work. For the *Yes Man*, lacking a shared lookahead plan may lead to an intolerable situation, because s/he has no clear sight of what will go on, on site, in the near future and therefore will be much less able to know how s/he should work around the other trades’ work. In contrast, for the *Gang Pusher*, working with no lookahead plan is more or less “business as usual”. This is not to say that the situation will favor him/her or his/her production unit any more than others. On the contrary, it is likely that all trades will suffer in one way or the other from not having a shared look ahead plan.

JUDGING WHAT IS POSSIBLE AND KNOWING HOW TO ACHIEVE IT

We assume that the Last Planners’ key to success lies in judging what is possible and knowing how to achieve it. The shielding process is crucial in this sense as it helps support assessments by determining what “will” be done against “can” and “should”. In two case studies, lookahead planning was supported using a computer program. We will not go into the various functionalities included in such programs, but instead focus on how their use may affect the Last Planners in different ways. On the positive side, using a program to produce quality assignments enhances the standardization of processes and information input. For a *Yes Man* or a *Gang Pusher* that struggle to “take in” the planning principles and procedures, a program may offer a standardized structure for them to follow in order to provide more accurate information than they otherwise would. Also for the *Game Player* and the *Last Planner*, a program designed to facilitate the lookahead planning can work positively to improve the process, amongst others related to the structured information-gathering and not least for the fact that it can make planning meetings more efficient. As they normally meet up well-prepared and know the “drill” of the meeting, the use of a program can help reduce the risk of over-complicating matters that could be dealt with simply. At the same time, for all the Last Planners no matter the type, a potential problem in using programs is that one ends up seeing them as some sort of “calculus” that produces quality assignments for you, based on an optimum formula. In such a situation, *Last Planners* might end up as *Yes Men* in meetings, automatically replying “will” to all activities in the schedule without giving due concern to “can.”

DECISION-MAKING BASED ON A BROADER PERSPECTIVE

We assume that being a Last Planner is about being prepared, continuously monitoring what is happening, improving, and being ready to adjust plans as needed. That being ready to adjust and improve almost inevitably is about making decisions based on a broader perspective than one individual’s job. For example, one project had three pull plan sessions to hammer out one phase plan. The process failed all three times, to the point that no *complete* plan was ever developed for that particular phase. Nevertheless, several important clarifications were made during these sessions and tactics were agreed upon on how to approach the technically demanding and logistically challenging building process. For a *Game Player* with a self-interested approach to planning, the act of taking part in sessions like these with no outcome in the form of a concrete plan can be quite frustrating to the point that s/he is inclined to see it as a waste of time. For the *Yes Man*, however, the same sessions might be considered very valuable for the fact that more time than usual is spent defining the work which in turn may make it easier for him/her to understand his/her own obligations. A *Gang Pusher*, being focused on getting things done, spending time like this is really of no use as they perceive problems to be solvable as they turn up. Quite typically, this is also what keeps him/her busy during the planning meetings, being regularly interrupted by phone calls to “fix things.” Finally, the *Last Planner* knows that planning as such is not only about issuing directives; it is as much about human and social dynamics. For complex work, multiple factors might intervene, which can be hard to even predict and put down in a schedule. Then, securing consensus among the involved parties for a solution or a tactic can be more appropriate than trying to nail the whole thing in one plan.

CONCLUSIONS

In this paper, we introduced a typology of 4 different behavioral patterns of Last Planners: the *Game Player*, *Yes Man*, *Gang Pusher*, and *Last Planner*. Each type addresses a certain pattern of behavior that might be found in a team of Last Planners on a project, depending on their apparent level of commitment to the planning process and the level of conceptual understanding of the LPS. What the typology explains, maybe more than anything else, is that there is not just one way to approach planning; people are driven by different motivations and exhibit various patterns of behavior.

The ideal situation is to have a project team of Last Planners behaving as *Last Planners*. All too often, we suspect, an implementation process starts by describing this ideal, future state. This is not to say that one should not strive to reach it, however, the reality at any time on a project may be far from it. Thus, ongoing training is needed to achieve greater in-depth use of the LPS depends on the patterns of behavior exhibited by Last Planners throughout the project. Furthermore, it is important to have in mind, when designing a training program that Last Planners may have good reasons to behave as they do: e.g., if a project suffers from a poor supply of drawings that creates work flow uncertainty, then behaving like a *Game Player* or a *Gang Pusher* can be about trying to make-do on a project that is not going well. For the very same reason, the types described in this paper should not be used to stereotype persons, as they address apparent behavioral patterns (rather than innate personal characteristics) that might very well be “symptoms” of a project run badly.

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REFERENCES

- Ballard, G. (1993). "Lean Construction and EPC Performance Improvement." *Proc. 1st Ann. Meeting of the Int'l. Group for Lean Construction*, Espoo, Finland, August.
- Ballard, G. and Howell, G. (1998). "Shielding Production: Essential Step in Production Control." *J. Construction Eng. and Mgmt.*, ASCE, New York, NY, 124 (1) 11-17.
- Brady, D., Tzortopoulos, P., and Rooke, J. (2011). "An Examination of the Barriers to Last Planner Implementation." *Proc. 19th Ann. Conf. International Group for Lean Construction*, Lima, Peru, 13-15 July.
- Cartwright, T.J. (1987). "The Lost Art of Planning." *Journal of Long Range Planning*, Great Britain, 20 (2) 92-99.
- Fauchier, D. and Alves, T.D.C.L. (2013). "Last Planner® System is the Gateway to Lean Behaviors." *Proc. 21st Ann. Conf. International Group for Lean Construction*, Fortaleza, Brazil, pp. 559-568.
- Macomber, H., Howell, G. and Reed, D. (2005). "Managing Promises with the Last Planner System: Closing in on Uninterrupted Flow." *Proc. 13th Ann. Conf. International Group for Lean Construction*, Sydney, Australia.
- Seymour, D. and Rooke, J. (2000). "Commitment Planning and Reason Analysis". *Proc. 8th Ann. Conf. International Group for Lean Construction*, Brighton, UK.
- Skinnarland, S. (2012) "Norwegian Project Managers and Foremen's Experiences of Collaborative Planning". *Proc. 20nd Ann. Conf. International Group for Lean Construction*, San Diego, CA, USA.
- Slivon, C., Howell, G., Koskela, L. and Rooke, J. (2010). "Social Construction: Understanding Construction in a Human Context". *Proc. 18th Ann. Conf. International Group for Lean Construction*, Haifa, Israel.
- Smith, J. and Rybkowski, Z. (2013). "The Maroon-White Game: A Simulation of Trust and long-term Gains and Losses". *Proc. 21st Ann. Conf. International Group for Lean Construction*, Fortaleza, Brazil.
- Swedberg, R. (2001). "Sociology and game theory: Contemporary and historical perspectives." *Theory and Society*, 30: 301-335.
- Tillmann, P., Ballard, G. and Tommelein, I. (2014). "A Mentoring Approach to Implement Lean Construction." *Proc. 22nd Ann. Conf. International Group for Lean Construction*, Oslo, Norway, 25-27 June, pp. 1283-1293.