ConsensusDocs Guidebook

ConsensusDocs 305 – Lean Construction Addendum

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Permissions
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Introduction to the ConsensusDocs Guidebook

ConsensusDocs is the product of leading construction associations, dedicated to identifying and utilizing best practices in the construction industry for standard construction contracts. The more than 40 participating associations represent Design Professionals, Owners, Constructors, Subcontractors, and Sureties that literally spell the Docs in ConsensusDocs. ConsensusDocs contracts and forms attempt to fairly and appropriately allocate risks to the Party in the position to manage and control the risk. The practices articulated in the documents are forward-thinking, and may not always represent the status quo, but rather a better path forward to achieve project results. The goal of the multi-disciplined drafters was to create documents that best place the Parties to a construction contract in a position to complete a project on time and on budget with the highest possibility of avoiding claims.

By starting with better standard documents that possess buy-in from all stakeholders in the design and construction industry, you reduce your transaction time and costs in reaching a final Agreement. By using fairer contracts helps eliminate unnecessary risk contingencies and thereby better pricing. In addition, “fill-in-the-blanks” are intended to lead to productive discussions about how particular risks should be allocated on specific projects before a contract is finalized.

This Guidebook you will find comments by individual associations regarding particular contract documents. These comments are organized by numeric sequence. Association comments are expressions by an association to its association membership only to highlight issues of particular interest.

Lastly, the ConsensusDocs coalition organizations and ConsensusDocs staff are deeply indebted to the hard work of the many the seasoned professionals who contributed countless hours in the creation of the ConsensusDocs contracts as well as this Guidebook. Their collective experience represents hundreds of years of practical experience in the construction field.

Comments for ConsensusDocs 305 Lean Construction Addendum

Overview

The ConsensusDocs Lean Construction Addendum is most applicable for parties that are interested in getting the benefits of lean methods, tools and techniques, but are not ready or able to use an integrated project delivery (IPD) agreement, like the ConsensusDocs 300, which is also known as an integrated form of agreement (IFOA). The underlying prime agreement that the Lean Construction Addendum would coordinate best with is a Construction Manager (CM) At-Risk agreement, such as the ConsensusDocs 500 CM At-Risk agreement. The ConsensusDocs 500 coupled with this Lean Construction Addendum would be considered an "IPD-lite" or "IPDish" agreement. Using the Lean Construction Addendum helps remove contractual obstacles to lean practice and better aligns the contractual liabilities and responsibilities of lean practitioners with the team's desire to operate in a collaborative fashion.

Many of the lean methods adopted in the Lean Construction Addendum are antecedents to the development of IPD. They were developed beginning in the 1990s through the pioneering work of Greg Howell, Glenn Ballard, and others, who were trying to solve the problem of rampant waste in construction. The last 20 years have seen a substantial refinement in these methods, and their extension into design. While most of the headlines these days center on IPD, there has been a much more rapid assimilation of lean methods within the industry. The purpose of the Lean Construction Addendum is to provide a tried and tested framework for teams seeking to implement lean methods. This standardization will promote best practices more broadly and anchor those practices in the parties' contracts.

Certain modifications would need to be made to the Lean Construction Addendum for use with a design-build agreement or a design-bid-build agreement. ConsensusDocs plans to publish a design-build Lean Construction Addendum in the future. Also, the forthcoming ConsensusDocs Design-Assist Addendum draws from this Lean Construction Addendum and there are many specific sections which are optionally incorporated into that document through a check-the-box approach.

Article 1 - General Principles

Unlike an IPD agreement, the Lean Construction Addendum anticipates separate contracts between the Owner and Design Professional (which is the architect or engineer of record) and Constructor (may also commonly be referred to as a General Contractor or Construction Manager) respectively. Article 1 mandates the incorporation of the Addendum in the prime contracts with those team members and their respective contracts with subcontractors and consultants. This requires that the Owner, Design Professional and Constructor jointly negotiate the Addendum so that the same final version is incorporated into everyone's contracts so that everyone is aligned on the same terms. If the Owner has already contracted with the Design Professional prior to determining the Constructor for the project, then the Design Professional's agreement will need to add the final, jointly negotiated Addendum by an amendment. Article 1 will require modification if the design team will not be participating in the lean methods and incorporating the Addendum. Importantly, Article 11 does provide that the Lean Construction Addendum controls over conflicting provisions in whatever contracts incorporate it.

Article 2 – Definitions

The Lean Construction Addendum reflects, and helps standardize, a common lexicon for the industry. By formalizing currently used words and expressions, it anchors a standard for expressing terms and concepts. In doing so it helps eliminate uncertainty that can grow through conflicting terms and uses that would otherwise inevitably occur. This common understanding of critical terms will provide a better foundation for continued growth of effective lean construction.

2.1 A description of an A-3 report can be found at: https://bit.ly/2Qanf9L.

Article 3 - Project Fundamentals

Project Fundamentals set forth both the objectives and practical requirements in which the lean process is rooted. It establishes as fundamental principles (a) collaboration among all team members; (b) avoiding working in silos, but rather through a network of commitments; (c) focusing on and optimizing the whole, as opposed to individual components; and (d) promoting continuous improvement. Each level of the team, Owner, Constructor – Design Professional, and other team members, make tangible commitments to cooperate. Owner involvement is express.

The concept of reliable commitments arose out of a seminal insight of the early pioneers of lean construction. In studying Toyota's lean manufacturing, Greg Howell and Glen Ballard discovered the construction analogue to "just in time" delivery in manufacturing - the work that is delivered from one trade to another on a construction site. They found that reliable handoffs of work between trades was the single most important indicator of a successful project. They determined reliable handoffs to be work that is delivered in the condition promised at the time promised. To facilitate these handoffs, the concept of reliable commitments was developed. This was one of the first lean construction methods developed. Its articulation has changed very little since it first appeared in the early 2000s. This and its continued endurance are a testament to its power and effectiveness, which are only enhanced by its elevation to a contractual requirement.

Article 4 - Project Team Leadership

One of the first tasks upon initiating a lean project is to build a high-performance team capable of managing in a challenging, fast-paced environment. While the concept of building project teams is nothing new, for lean project management there are additional considerations that reflect not only team member characteristics but also the underlying organizational structure. Many of the team traits that need to be considered for success with Lean are similar to the traits that are relevant for IPD and include the ability to quickly adapt to solve problems and keep focused on the next challenge. In addition to problem solving and focused attention, other important team traits include resiliency, collaborative skills, mutual trust, respect of team members and their firms, clear communication, accountability, and transparency[i].

The project leadership team or Core Group, as noted in the Addendum, builds and manages all other project teams, and is responsible for developing a positive team culture. The Core Group is comprised of representatives from the Owner, Designer, and Constructor who have authority from their company to make day-to-day project management decisions. Each of these individuals must be a good fit for a lean project: they must be well trained in lean principles and capable of promoting positive working relationships amongst all teams within the group. If there is not a positive working relationship and changes need to be made for this or any other reasons, the team needs to ensure the new project team member is equally qualified and will support a positive team culture. The Core Group is not necessarily limited to the primary three representatives, and can be expanded, as appropriate. As the project progresses, additional qualified individuals who are a positive fit for the Core Group can be added and may represent subcontractors, suppliers, and other key firms or stakeholders participating in the project. These individuals will also play important roles in the functional teams that support smaller tasks within the project and that make the day-to-day decisions necessary to manage the work flow processes and scheduling. In all cases, the functional teams also need to have clear communication both within their functional team, and to coordinate with other functional teams. Communication is key to identify areas for continuous improvement and the elimination of waste.

The Core Group guides the project and meets regularly to review the project progress and make key decisions. As noted in Integrated Project Delivery by the Pankow Foundation, one key to successful decision-making is to ensure everyone is aware of their roles and responsibilities. A well-documented process for decision-making includes an outline of all reasonable options, an analysis of the pros and cons for each option, and documentation of the final decision. This process provides a structured framework and helps to remove emotions from key decisions. The Core Group should work to have consensus on all decisions and avoid disputes. If there is a dispute, the group needs to work through the issues within the Core Group; the dispute resolution process included in the contract documents should be considered a last resort.

The Core Group serves as leaders and need to develop and sustain high performance teams. While the Core Group members need to stimulate excellence amongst all employees, it is important to recognize that employees are under the direct supervision of their own firm, and do not typically report to the Core Group as a whole. The Core Group doesn't command and control specific employees.

The Core Group will evaluate the project's team performance as a whole and work for continuous improvement under Lean principles. Additional information about the performance improvement program is detailed under the §4.4.3. Note that the performance improvement program could be a vehicle for incentive compensation for the project team. The Addendum doesn't directly address incentive compensation, but it certainly is possible for a project team to develop a performance improvement program that gets tied in some way to incentive compensation. For example, the performance improvement program will establish key performance metrics to gauge performance and stimulate continuous improvement. To incentive improvement performance against these performance metrics, the project team could enter into an amendment to their contracts that provides for Owner-funded award fees that the project team earns based on how well they meet the KPIs. If a project team mutually agrees upon some system of incentive compensation, then they would need to address that through an amendment to their respective project contracts.

Article 5 - General Team Responsibilities:

§**5.1 Project Planning & Schedule**: The Lean Construction Addendum specifies use of a planning system that incorporates pull planning principles in a structured way. Most, if not all, lean construction projects use a project planning process called the Last Planner® System of Production Control, and § 5.1 of the Addendum allows for the use of the Last Planner System or its functional equivalent in fulling the contractual requirements for planning and scheduling. The Last Planner System consists of five phases which are represented in §5.1.2 through §5.1.5 of the Addendum. The five phases are 1) a milestone schedule (also called "master planning"), 2) phase planning, 3), "make-ready" look ahead plans, 4) weekly work plans, and 5) methods for recording, measuring and improving the reliability of the plans. For more information on pull planning, see this 2014 paper by leading trainers on pull planning.

One of the key techniques used in lean construction is called "pull planning." Pull planning is an essential element of incorporating lean construction into the management of the project and is defined in §5.1.1. In pull planning, the "last planners" engage with each other to work out a plan for each project that includes the best of available alternatives that optimize the project as a whole rather than just for individual participants. These last planners should be those with a deep knowledge of what their staffs are good at and what they are not. They also must know the scope of the work for each phase. This includes the materials, hours planned for the work, and equipment or information that is available to them or is needed. In addition, each must know the work required of the other team members for the phase in question. Through this understanding, the last planners can make requests and negotiate handoffs during the pull planning conversation, leading to reliable commitments as to delivery of specific units of work.

Finally, to be successful, the last planners must know the conditions of satisfaction of the internal and external "customers" of their completed unit of work.

With this knowledge, the last planners collaborate to create a schedule for the project. This process is defined in §5.1.6. They start with each desired phase goal and work backward to define each task required of each participant to reach that goal. Often, project teams will create this schedule with sticky notes containing each day's tasks where each participant has a different color. The end-to-beginning planning process can involve a lot of movement of sticky notes on the calendar as trade-offs are negotiated to facilitate the best outcome. Handled properly, each delivery of work or material is "pulled" forward for performance just in time to allow the next performance to begin. In this fashion, work is delivered reliably from one participant to the next. This process is used to create each type of schedule identified above beginning with the milestone schedule, then phase planning, "make-ready" look ahead plans, and finally, the most detailed, weekly work plans.

The weekly work plans are the workhorses of the Last Planner System. As the name indicates, weekly work plans are prepared on a week by week basis. All assignments to be completed in a given week are contained on the weekly work plan. The project team determines whether an assignment has been completed as scheduled. For those that are not completed as scheduled a reason is assigned.

One of the most important tasks in the Last Planner System is calculating the Plan Percent Complete (PPC). The PPC is the percentage of activities completed as promised/scheduled and is used to track the reliability of the scheduling process. PPC can be broken down by geographic area on the project site, by subcontractor, by trade, or any number of other variables that the project team wishes to track. The Core Group monitors the PPC throughout the project. If the PPC drops or is less than the project team targeted, an analysis is performed to attempt to improve the accuracy of the scheduling process or, if necessary, to improve the performance of a certain trade or team actually performing the work. To help first-timers gauge PPC performance, it is typical for project commitments early in a project to have a PPC in the range of 40-60% and to improve to the 80-90% range when the team is implementing pull planning and lean methods well.

§**5.2 Project Team Communications**: The essential lean tool used for project team communications is the Project Communications Protocol, which is defined in §5.2.1. The Project Communications Protocol is intended to create detailed instructions for the project participants to use in all communications related to the project. The Communications Protocol will include a meeting matrix identifying who is required at which meetings and how frequently they are held. It will also include considerations for when project participants are permitted to communicate directly with one another and which parties should be contemporaneously copied on those communications. The Addendum does not explicitly address co-location of project team members, since the approach to that will vary greatly among different projects. The Communications Protocol, with its meeting matrix, is a good vehicle for the Core Group to define the co-location approach for project team members. Co-location (a/k/a the "big room") is an effective strategy to streamline communications, improve effective decision-making, optimize team performance (especially in the design process), and strengthen the relationships of team members. Co-location can range from full-time co-location of key personnel for the duration of the project, to part-time co-location during specific time frames, to periodic co-location events, depending (ideally) on what works best for that project.

This section also addresses how to determine a protocol on electronic data sharing. The Addendum references the ConsensusDocs 200.2 Electronic Communications Protocol Addendum (CD 200.2) for this purpose, but the team could create its own electronic communications addendum. The CD 200.2 facilitates the accurate and secure transmittal of electronic communications and data on the project.

Article 6 - Services Prior to Construction:

Checking-the-Boxes. To allow the Lean Construction Addendum to apply to a wide variety of project scenarios, Article 6 uses check-boxes to determine which sets of pre-construction lean features will apply to the parties. The Addendum does not require that a project team provide all of the services in Article 6 (that is, unless the parties check all the boxes in Article 6). Also, note that the Addendum doesn't have a check-box for Construction Phase activities. If a team is going to use the CD305, then they're certainly going to using it for the construction phase.

Let's illustrate with three examples. In this first example, the Owner desires a robust lean implementation from the beginning of the project. They determine that they don't need a joint worksite investigation because of the Owner's previous extensive site due diligence, so they don't check the box for §6.1 (Joint Worksite Investigation). However, the team wants to provide for the evaluation of the Owner's Program, developing a Validation Study, extensive cost modeling by Constructor throughout the project, an integrated design process using Target Value Design principles, and a major risk identification and management effort. So, they check the boxes for Sections 6.2 (Evaluation of Owner's Program), 6.3 (Validation Study), 6.4 (Cost Modeling), 6.5 (Integrated Design Process and TVD), and 6.6 (Risk Identification and Management).

In example 2, the Owner has passed the point of validation when it determines to pursue Lean project delivery. They bring on the Design Professional and Constructor from the beginning of design to engage in an integrated design process using Target Value Design, together with the continuous cost modeling of the constructor and the team's risk identification and management effort. Then they will continue on to deploy Lean methods during the construction phase. So, they check the boxes for Sections 6.4 (Cost Modeling), 6.5 (Integrated Design Process and TVD), and 6.6 (Risk Identification and Management).

For example 3, the Owner didn't discover lean construction until the project was mostly designed. The Design Professional is willing to participate in a lean project for the construction phase, and the Constructor is selected for its lean expertise. They negotiate a CD305 to incorporate into both the design and construction agreements that provides for an initial risk identification and management effort and then proceeds to the Construction Phase's lean deployment. So, they only check the box for §6.6 (Risk Identification and Management).

Each of these examples represents a very different type of Lean deployment, but each can be facilitated through the Lean Construction Addendum.

§**6.1 Joint Worksite Investigation**. One of the first collaborative acts between the Owner, Design Professional, Constructor and its key subcontractors is to engage in a joint worksite investigation. The purpose of the joint worksite investigation is to gain the necessary information for proper development of the project design. As part of the process, this cross-disciplinary team should: (i) review all of the existing site information available and verify observable existing conditions within any existing structures and at the site, and notify Owner of the need to view inaccessible spaces (e.g., spaces containing hazardous materials, hard lid ceilings, buried utilities, occupied spaces, etc.), (ii) determine whether additional testing and studies are required, and (iii) document site-related information necessary for development of the construction documents. The outcome of the joint investigation is a report to the Owner of the Core Group's findings and recommendations. Because the outcome of the joint worksite investigation impacts the overall development of the design, this investigation should occur as early as possible in the design process. Note that the outcome of the joint investigation will also influence decisions about the level of contingency to include in cost estimates and the contract price.

§**6.2 Evaluation of Owner's Program**. If the Project Team performed a joint worksite investigation, the information gained from the Project Team during joint worksite investigation should be reviewed and

vetted in conjunction with the Owner's Program. During this evaluation process, the Core Group and other key Project Team members will meet and confer on the project requirements, determine whether additional information, testing, or studies are necessary for proper development of design, and consider alternative design approaches, concepts, and technical requirements to help ensure that the approved Owner's Program will ultimately deliver best value to the Owner. At the conclusion of this process, the Project Team delivers a written evaluation of the Owner's Program to the Core Group identifying any recommended deviations from the Owner's Program.

§**6.3 Validation Study.** The purpose of the Validation Study is to determine whether the project as defined in the approved Owner's Program can be achieved for the Allowable Cost. The Validation Study must include a proposed Expected Cost jointly developed by the Design Professional and its consultants, Constructor and its key subcontractors, and a proposed project schedule that includes key milestone dates for design development and construction. The Validation Study, once approved by the Core Group, is presented to the Owner for review and approval. Through the Validation Study process, the Owner is able to make an informed decision on whether to move forward with the project based upon carefully vetted information gathered and formulated through the collaborative engagement of the key Project Team members before incurring costs for detailed design. At the conclusion of this process, the Owner will provide written notice to the Core Group indicating whether it accepts the Validation Study and desires to move forward with the project as contemplated in the Owner's Program. Alternatively, changes to the Owner's Program or Allowable Cost could be directed if the original program could not be validated.

§**6.4 Cost Modeling**. Earlier in the design process and before construction, the Constructor will collaborate with Owner's project manager and the Design Professional to establish a cost model that includes a line item for projected cost of design (developed by the Design Professional) and a breakdown for the cost of construction including contingency and allowance items (developed by Constructor and key subcontractors). Unless the Addendum does not check the box for §6.3 or §6.5, the initial cost model should total the approved Expected Cost. The cost model will be used throughout the design and construction process to track costs expended to date, indicate variances, and provide projections for completion of design and construction. During the design process, as part of preconstruction and design-assist services, the Constructor and its key subcontractors will provide rapid cost estimates for portions of the Work and systems and components under consideration for incorporation into the design. The Core Group will establish milestones for updating and reconciling the cost model to assure that the overall cost of design and construction is within the approved Expected Cost (if the box for either §6.3 or §6.5 was checked) or else another cost metric established by the Owner.

§**6.5 Integrated Design Process and Target Value Design.**

§**6.5.1 Goal.** Target Value Design (TVD) is a transformational approach to an integrated and collaborative design process. TVD is a design process that requires Project values, cost, schedule, and constructability to be basic components of the design criteria and uses cost targets to drive innovation in designing a project that provides best value to the Owner. Successful project teams engage in TVD to help ensure that (i) the Project design is progressing and may be completed within Owner's Program and approved Expected Cost and Project schedule, (ii) all Project Team members' understand the design requirements, including the design intent and all technical requirements of the Project, before construction, and (iii) field conflicts and requests for information or clarifications ("RFIs") after construction starts are substantially reduced.

§**6.5.2 Integrated Design Principles.** In order to accomplish the TVD goals, the design professionals must recognize that design should not occur in a silo and value, cost, schedule, and constructability are all basic components of an integrated design process. The Constructor and its key subcontractors must engage in meaningful constructability reviews and accurate, rapid, cost evaluation during the design

process as part of their respective preconstruction and design-assist services. TVD estimates should include life cycle cost analysis for systems being considered, design details as they are being developed, and portions and components of the construction work deemed necessary by the Core Group for accurate cost modeling. Also, the Project Team should determine the extent of design-assist or design-build services from key subcontractors so that the design effort is coordinated and seamless. As noted above, the cost model should be updated throughout the design process to demonstrate whether the design is proceeding within the Expected Cost or whether adjustment to the design are necessary to bring the project cost back within the Expected Cost. Having access to this information while the design is progressing eliminates cycles of design rework and waste because the constructability and cost information allows the Owner and Project Team to make informed decisions about design before incorporating details into the design documents, allowing the design to progress within the Expected Cost and Project schedule.

§**6.5.3 Pull-Based Design Production.** In order to accomplish TVD in an organized and timely fashion, the Project Team should engage in pull-based design production. Pull-based techniques require concurrent design amongst the various disciplines and management of workflow. Design Professional and its consultants, together with Constructor and its key subcontractors providing design-assist or design-build services, work backwards from the milestone dates established in the project Schedule, creating collaborative design phase schedules. As part of the collaborative phase schedules, design tasks and completion dates are set based upon requests from a Project Team member to others upon whom the requester's portion of design service is dependent, and receipt of reliable promises made by the upstream performer about when it will finish the portion of design or information needed (such as cost or constructability) to make an informed design decision, and the agreed upon hand-off criteria in order to enable the downstream designer or design-build subcontractor to begin their respective portions of the design. Often, Project Team members will create this schedule with sticky notes containing each day's tasks where each participant has a different color. The end-to-beginning planning process can involve a lot of movement of sticky notes on the calendar as trade-offs are negotiated to facilitate the best outcome. Handled properly, each delivery of service or work product is "pulled" forward for performance just in time to allow the next performance to begin. In this fashion, work product and design services are delivered reliably from one participant to the next. Direct communication and coordination during this process allow the Project Team members to make reliable promises to each other and discuss and negotiate the hand-off criteria. To help facilitate this, the Core Group establishes documentation standards for the Design Documents.

§**6.5.4 Building Information Modeling Approach.** Before commencement of design, the Core Group and other key Project Team members should meet and determine a Building Information Model ("BIM") protocol. The team should consider the following in developing the protocol: (i) what building components and systems should be modeled and the level of development that is appropriate for each based on the complexity of the Project, and what information is more efficiently developed and conveyed using 2D design tools; (ii) where and how the BIM will be maintained and identification of a BIM administrator; (iii) hardware and software requirements that will be used to develop the BIM; (iv) protocols for naming conventions, data structure, version control, gate keeping and archiving; (v) establishing a common coordinate system; (v) who will control the BIM and information within specific models or model elements; (vi) how existing site information will be incorporated; (vii) when and how information regarding constructability and cost will be derived; (viii) if and how RFIs, clarifications, shop drawings and submittal information will be incorporated; (ix) when and how clash detection will occur; (x) how the BIM will be updated; (xi) whether there will be a record model. If BIM is being utilized on the Project, the Project Team should consider conducting a BIM workshop after the Validation Study (if any) has been approved and before design services get very far along. The ConsensusDocs 301 BIM Addendum or other BIM protocol should be amended into the agreements of the Design Professional, design consultants, Constructor, and design-assist and design-build subcontractors.

§**6.5.5 Document Review.** Fundamental to the integrated design process and TVD is continuous document review. As the design is developing, the Design Professional and its consultants, Constructor, and key subcontractors should continuously review design documents for errors, omissions, coordination, constructability, and compliance with the approved Owner's Program. This review is done in the capacity for which each Project Team member is licensed. Having a cross-functional team review the documents will substantially reduce errors and omissions and help prevent constructability issues and field conflicts down the road, and also flush out whether additional testing or inspection of existing conditions is necessary, etc. Errors, omissions, and inconsistencies should be timely addressed by the parties most knowledgeable and capable of resolving. As part of this process, Project Team members will work with the Owner and end-users to evaluate design options and determine best design layout and solutions. Constructor and its key subcontractors will alert the Core Group and Project Team to design options or issues that will increase contingencies, allowances or the overall Expected Cost or duration of the Project schedule.

§**6.5.6 Value Analysis Strategy.** "Value engineering" (VE) is not the same as TVD and should not be confused. Traditional VE process assumes a non-integrated design approach in which design is produced by the design professionals in isolation after which the constructor and its key subcontractors review and offer VE comments or potential solutions due to cost overruns. Because traditional VE is provided after the design is produced, incorporation of VE items usually requires additional design services to incorporate or requires design rework in the case where the design has progressed too far without cost evaluation and the Project is overbudget. This kind of VE approach is inherently wasteful. In contrast, TVD requires the Design Professional and its consultants, the Constructor and its key subcontractors to work in tandem while the design is developing, taking into consideration value from multiple perspectives. Early involvement of the Design Professional and its consultants, Constructor and its key subcontractors is essential to the TVD process and should be included in the value analysis strategy. The strategy should also include carrying multiple design options forward and deferral of design decisions until the last responsible moment based on the pull scheduling requirements. The value analysis strategy should include each of the integrated design processes discussed in §6.5 to encourage deep collaboration, best value, and optimal design solutions into the design development.

§**6.5.7 Target Value Pricing**. Target value pricing is part of the TVD process and should be addressed in the Project Team's value analysis strategy. Through rapid cost evaluation during design development, the Constructor and key subcontractors are able to price design alternatives, options, and systems as well as the overall design as it progresses. The Owner's and Project Team's goal is for the design to progress at or below the Expected Cost and within the Target Cost and Project schedule. In order to achieve maximum value and drive innovation and creativity into the design, the Target Cost should be set below the Expected Cost and early during the design process (e.g., end of schematic design or before completion of design development documents); if the Project Team is providing a Validation Study, then it is established in the approved Validation Study. The cost model will be updated throughout this process to track cost and help ensure that the design is being developed at or below the Expected Cost or Target Cost (as applicable) and is still on schedule. If at any time during the design process, the Expected Cost or Target Cost (as applicable) is exceeded, the Owner and Project Team members will collaborate on design and construction solutions to bring the projected actual cost back within the Target Cost. §6.5.7.2 addresses how escalation is handled, and §6.5.7.3 provides a set of criteria for the Core Group to use in developing TVD protocols.

§**6.5.8 Value and Constructability Analyses.** Throughout the design process, the Project Team should engage in set-based design in order to drive innovation into the Project. Project Team members or TVD Clusters work to identify options for reducing capital or life cycle costs, improving constructability and functionality, or enhancing operational flexibility consistent with Owner's Program, and within the

Expected Cost or Target Cost (as applicable) and the overall Project schedule. Viable options or value analysis proposals (VAPs) are carried forward concurrently until eliminated through use of Choosing by Advantages or an alternative vetting process. During this time the design stays flexible while the Project Team tests assumptions and selects the best option for the Project. The VAPs are documented in an A-3 Report and should (i) evaluate various design options, create savings of time or money in designing, constructing, or operating and maintaining the Project, and (ii) increase quality, constructability, labor efficiencies or other measures of values that are cost-effective.

In §6.5.8.1, the reference to the "best interests of the Project" is a standard that would, for instance, discourage someone from over-designing a portion of the project to practice "defensive architecture."

§**6.6 Risk Identification and Management.** Early in the design process, the Project Team members will identify material Project risks. This is accomplished through one or more workshop sessions, and should involve all relevant Project Team members. These workshop sessions are to be led by a facilitator chosen by the Core Group. The process for identifying project risk may involve a number of approaches including matrix/mapping, brainstorming, check list, and other appropriate techniques. Most construction organizations rely on a combination of intuition, judgment, and experience to identify and manage construction risk. More structured risk assessment, whether it be in the form of decision analysis, sensitivity analysis, Monte Carlo simulation, or other recognized approaches, are also grounded in the Project Team member's experience and intuition. Collaborative approaches recognize that there is value in the collective experience and intuition of all relevant Project Team members. Upon identification of project risks, the Core Group ranks and scores the risks, paying particular attention to potential cost and time impacts to the Project. Once project risks have been ranked, the Core Group develops a risk management plan or risk registry for addressing the identified risks subject to Core Group approval. Through-out the design and construction process, the risk management plan or risk registry is updated to address newly discovered risks. Contingency plans are developed for addressing identified risks and responsibilities for managing specific risks are assigned.

Article 7 – Construction Phase

§**7.1 Quality Assurance and Quality Planning:** One of the most important steps in achieving lean construction's primary goal of minimizing inefficiencies is to ensure that the work is performed properly the first time. As with most other lean construction functions, planning is the key. In order to accomplish that objective, the Lean Construction Addendum requires two quality-related plans, the Built-in Quality Plan and the 5S Plan. §7.1.2 describes the Built-in Quality Plan. The primary participants in preparing this plan are the Design Professional and the Constructor with participation of certain Subcontractors as needed. The Built-in Quality Plan is intended to address issues such as the following: (1) a process for ensuring the contract documents clearly communicate conditions of satisfaction; (2) a process for standardizing work practices and associated training; (3) identifying agreed levels of quality, using efforts such as mockups, first run studies, and early completion of standard work units; (4) a method for managers to review early work product; (5) a process to integrate quality review and scheduling; (6) a process to ensure quality when handing off work; (7) procedures to immediately address quality failures; and (8) standards for measuring and tracking quality performance.

The 5S Plan is prepared by the Constructor and Subcontractors and focuses on site operations. This plan is submitted to the Core Group for approval prior to the construction phase. The Plan is meant to apply the lean principle of "5S" to construction operations. Applying 5S helps to minimize inefficiencies in construction activities. The 5 S's are Sort, Set in Order, Shine, Standardize, and Sustain. The first step in the process, Sort, contemplates removing unnecessary tools, materials, and equipment to allow workers

to be as efficient as possible. Set in Order involves clearly labeling and organize the work space so that needed items are easily found and close to the place they are used. The third, Shine, is to remove trash, dirt, dust, or other impediments to efficient work spaces on a continual basis. Standardize, the fourth S, promotes standardizing as many tasks as possible. Finally, Sustain is the process of empowering workers to take responsibility for their space and to continue to improve their efficiency.

§**7.2 Logistics Plan:** Another important aspect of lean construction is "just in time" delivery. The Constructor must prepare a logistics plan in which materials are ordered and delivered in an effort to minimize handling costs, obstructions on the site, and the use of the space on site for storage.

§**7.4 Requests for Information:** The Lean Construction Addendum seeks to revolutionize traditional methods of addressing requests for information (RFIs). First, the very need for RFIs is minimized when the Owner brings the Constructor and key subcontractors into the project during the design phase so that they have a high level of understanding of the design. When the need for a clarification does arise, §7.4 provides for those seeking clarification to attempt to resolve the issue first by face-to-face or telephone communications. If the clarification can be made at that time, the clarification is documented and communicated to the rest of the Project Team. If the clarification can not be made at that time, the participants agree on how the issue will be resolved by identifying the tasks required, who is responsible for completing the task, and a schedule for completion of the tasks. The goal is for RFIs to be issued to document solutions rather than raise questions. Requests are also made directly from the requesting team member to the team member that is best able to answer, rather than having to route through the contractual "chain-of-command."

§**7.5 Planning for Completion and Close-out:** The Project Team must prepare a phase plan for project completion that addresses completion, commissioning, and close-out activities. The goal is to eliminate the traditional punch list process. The purpose of the plan is to ensure that the Project satisfies the conditions of satisfaction established in the Contract Documents at the time of Substantial Completion. The plan may include methods for completion of minor incomplete items, control of personnel movement through certain areas of the Work, photos or video recording of completed work, and methods for logging and tracking completed and minor incomplete items.

The Core Group inspects the completed project to determine Substantial Completion and approves the Constructor's draft of the Certificate of Substantial Completion that is submitted to the Owner for acceptance.