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# Front End Planning Tool: PDRI – Small Industrial Projects

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# **Front End Planning Tool: PDRI–Small Industrial Projects**

**Prepared by  
Construction Industry Institute  
Research Team 314, PDRI–Small Industrial Projects**

**Research Summary 314-1  
December 2015**

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The University of Texas at Austin

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Printed in the United States of America.

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## Executive Summary

Past Construction Industry Institute (CII) research has found that tools that measure project scope definition and alignment among project participants are essential to facilitating good front end planning. These tools, developed by a number of research teams over more than two decades, help owners and contractors better meet their business, operational, and project objectives. While this earlier research addressed front end planning (FEP) for large industrial, building, and infrastructure projects, it did not focus on the unique challenges and characteristics associated with small projects, or more particularly, small industrial projects.

CII formed Research Team (RT) 314, Project Definition Rating Index for Small Industrial Projects, to identify obstacles to successful delivery of small industrial projects and to produce an effective, easy-to-use scope definition tool for these projects. This research summary provides an overview of the research and development of the PDRI–Small Industrial Projects (PDRI-SIP), the newest iteration of the PDRI tool, which is a cornerstone of the CII FEP Toolkit. The PDRI-SIP is a risk management tool that consists of 41 elements presented in a weighted checklist format. The tool provides a method for measuring the completeness of project scope development on small industrial projects. It is similar to the three other PDRI front end planning tools CII has produced: PDRI–Buildings; PDRI–Infrastructure; and PDRI–Industrial. It is a focused derivative of the PDRI–Industrial tool, quickly allowing project participants to assess the scope of small industrial projects. The tool's weighted index, based on the input of 65 experienced projects planners, enables users to measure the level of scope definition and to compare scope definition to anticipated project success.

In addition to introducing the PDRI–SIP, this research summary also presents the research team's findings on the efficacy of the tool, based on a data sample of small industrial projects. For this research, the team defined small industrial projects as those generally of less than \$10 million (U.S. Dollars) in expenditure, of three to six months in construction

duration, and of less overall complexity than large projects (based on several indicators discussed below). Small industrial projects annually comprise more than 70 percent of all completed projects by number in most organizations' portfolios.

Users of the PDRI-SIP tool assess the level of scope definition of their projects, generating a weighted score for each that can reach up to 1,000 points—with a lower score being better. An analysis of 40 completed small industrial projects representing more than \$150 million of constructed cost showed that projects scoring lower than 300 (out of the 1,000 total points) were significantly more successful than those that scored above 300. These projects saw 16 percent and 15 percent differences between average and targeted cost and schedule, respectively.

Also, eight different organizations used the PDRI-SIP tool on 14 projects during the front end planning process. Data from these projects showed that the tool provided the project teams with an understanding of risk and helped identify scope gaps. These exercises also proved the value, completeness, and capability of the tool, in each case helping project team members identify critical planning issues. The time needed to perform an assessment using the PDRI-SIP was typically 75 minutes or fewer (as opposed to 150 minutes typically needed for the other PDRI tools). These test uses further showed that the tool can improve front end planning of small industrial projects while reducing the time necessary to complete an assessment, and that it is fully ready for use. This summary provides guidance on how best to use the PDRI-SIP tool for project planning.

## Introduction

Data captured during this research investigation showed that, in most owner organizations, 70 to 90 percent of projects by number are considered small. This finding is consistent with those of past CII investigations, which showed that these small projects are handled differently than large projects and pose unique risks. By definition, a small industrial project has the following characteristics:

- total installed cost less than U.S. \$10 million
- construction duration between three and six months
- project funding approval at a regional or corporate level
- moderate project visibility to owner management
- seven to nine core team members (i.e., project managers, project engineers, and owner representatives)
- part-time management availability of core team members
- minimal or no external permitting required
- minimal or no local/state permits required
- three to four separate trade contractors.

To develop the tool, the team extended the research and development thread of the three previous PDRI tools, particularly the PDRI–Industrial Projects, a resource now widely used as a planning tool in the industrial sector.

Since most previous CII research efforts were not focused on small projects directly, little research has been performed in the area of FEP for small industrial projects. Therefore, minimal attention has ever been given to FEP for these small projects. Yet, the cumulative effect of poorly planned small industrial projects can have a major impact on an organization's bottom line. RT 314 developed the PDRI–Small Industrial Projects (PDRI-SIP) specifically to address this highly important and common project type.

Many research studies have proven the importance of the FEP phase of the project life cycle (CII 2006; CII 2012). Specifically, the findings have shown that a complete scope definition improves project performance in the areas of cost, schedule, quality, and operational characteristics. However, because this past research focused on large projects, CII established RT 314 to ensure improved performance of the industrial sector's small projects. The team set forth the following objectives:

1. Produce a user-friendly, less time-consuming tool for appropriately measuring project scope development with the following characteristics and functions:
  - based on the PDRI—Industrial Projects, yet tailored to small industrial projects
  - easy to use, yet detailed enough to be effective
  - supports reduced total project costs
  - supports improved schedule performance
  - serves as a communication and alignment tool
  - supports decision-making
  - identifies risks
  - reliably predicts project performance
  - flexible for use on several industrial facility types.
2. Validate the tool through testing on sample projects, by measuring the level of project scope definition during the FEP phases

The PDRI-SIP offers project teams a method for measuring the completeness of scope definition at any point prior to detailed design and construction. It identifies and describes in detail each critical element in a scope definition package. Using it, project teams can quickly identify project risk factors and scope definition gaps related to project performance. Users can then mitigate these gaps.

The PDRI-SIP was developed to assess both process- and non-process-related projects. A process-related project is any project in an industrial facility related to constructing or refurbishing the systems, equipment, utilities, piping, and/or controls that directly affect the production rate, efficiency, quantity, or quality of the product being produced. A non-process-related project is any project in an industrial facility that is ancillary to production processes, but does not directly affect the quantity or quality of the product being produced. (For more detailed definitions of process- and non-process-related projects, see CII Implementation Resource 314-2, *PDRI—Small Industrial Projects*.)

The central premise of the PDRI-SIP research effort was that project teams must work collaboratively (i.e., achieve alignment) on the right projects and perform the right work (i.e., define scope) during FEP.



## PDRI Development Methodology

The initial work to develop the PDRI-SIP was based on the three existing PDRI tools. Early on, the research team conducted a detailed literature review to identify issues unique to small industrial projects. The team also surveyed CII member organizations involved in industrial construction projects as one of the initial steps of its investigation.

### Small Industrial Project Front End Planning Survey

In its initial survey of CII members, RT 314 sought a better understanding of the following questions: Why are small projects are so prevalent in the industrial construction sector?; How do organizations plan for such projects?; and How do organizations define a small industrial project? The team developed the survey in an electronic format and distributed it to all CII data liaisons. Ninety of these 191 survey recipients responded.

The respondents were asked to consider seven typical FEP procedures and select those used in their organizations to plan for small industrial projects. There was also an option to select “other” and describe a procedure that they used, but that was not listed. Figure 1 shows the categories of all survey responses; overall, these responses indicate that the organizations depended mostly on a structured stage gate approach and on internally developed scope definition tools. When the respondents chose “Other,” they offered comments such as “all of the above can apply, depending on specific scope and complexity,” and “for small projects, different business units have their own procedures that may or may not be consistent across all areas.” From these results, the research team recognized that the planning processes for small industrial projects vary greatly across the industrial construction sector, and even within organizations.

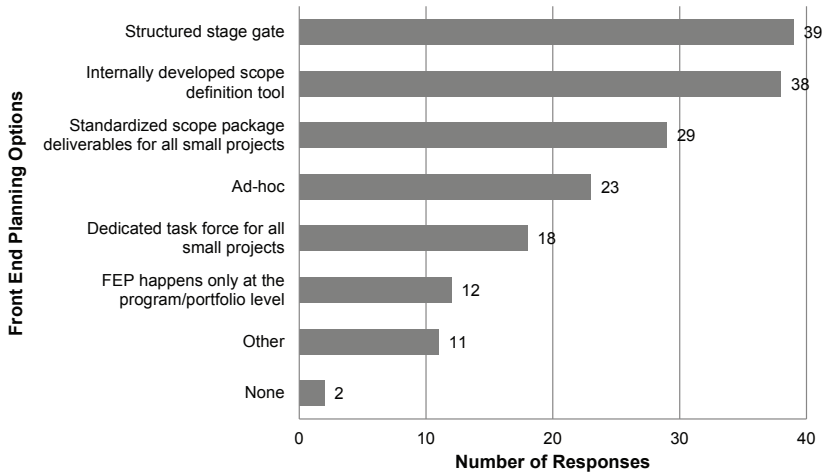


**Figure 1. Survey Responses Regarding Typical FEP Processes Used in Industry**

Figure 2 presents the categories of the responses to questions on the cost and count of small projects in the survey respondents' organizations during the prior fiscal year. As shown, a majority felt that their organizations considered 70-90 percent of their projects (on a count basis) small. These projects accounted for 11-30 percent of expenditure during the fiscal year. These responses confirmed CII's assertion that 50 percent of projects completed in the industrial sector were small. They also illustrated that small projects make up a majority of completed projects, and account for a considerable amount of the capital expenditure in the industrial construction sector each year.