

AWP Data Requirements Implementation Guideline



Special Report 19-01
Version 1.4

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AWP Data Requirements Implementation Guideline

Working Group 19-01, AWP Data Requirements

Construction Industry Institute

Special Report 19-01

Version 1.4

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The University of Texas at Austin

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Executive Summary

Advanced Work Packaging (AWP) has become a necessary best practice for stakeholders on capital projects. AWP facilitates a more productive and progressive construction project through the identification, categorization, and information sharing of work process flows. By standardizing the information-sharing process and components, capital project stakeholders are more transparent and proactively plan and adapt to the inherent challenges of construction projects. This information sharing fosters alignment across stakeholders who reduce risk on a capital project.

Prior to the completion of this *AWP Data Requirements Implementation Guideline*, both CII's Body of Knowledge and the construction industry at large lacked a vetted, comprehensive set of data requirements for AWP. To address this need, CII's AWP Community for Business Advancement formed CII Working Group 19-01, AWP Data Requirements, to develop a comprehensive set of AWP data requirements for capital project stakeholders.

In an attempt to maximize the extent to which these AWP data requirements were leveraged and implemented by the construction industry, the AWP Working Group invited several academics to join some of its members to create a project team. This project team refined, reviewed, and published this implementation guideline. (Team members who contributed to the guideline development are listed in the Appendix.)

The project team intends for this guideline to accomplish several objectives:

- To support efforts to implement the assembled AWP data requirements.
- To encourage companies to standardize information flow for work processes on capital projects.
- To serve as a critical reference as companies create contracts that include data to support AWP.

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Chapter 1: Introduction

The primary objective of this project was to create this AWP Data Requirements Implementation Guideline. In August 2019, the CII AWP Community for Business Advancement identified this project objective. In September 2019, CII formed an AWP Working Group to identify the AWP data requirements detailed in this guideline. The Working Group created and vetted the AWP data requirements for stakeholders on capital projects. The Working Group then assembled a project team to develop implementation guidelines for these requirements, an owner-led initiative that worked in partnership with contractors and service providers. In 2021, the AWP Working Group stewarded an activity related to keeping the data requirements evergreen, resulting in the first revised version of AWP data requirements based on industry feedback.

1.1. Work Packaging for Capital Projects

In 2013, a study completed by CII Research Team 272 found that 70 percent of industrial construction projects surpassed 10 percent variation from anticipated project cost and schedule. RT-272 also identified a lack of standardization for information sharing on capital projects (CII/COAA 2013).

Project stakeholders have found it challenging to plan and manage project controls as the complexity of industrial projects increases (Bosch-Rekvelde et al. 2011). As industrial projects become more complex and have increasing budgets, construction planning must adapt to remain continually effective. A variety of work package methods have been implemented attempting to maximize efficiencies (Isaac et al. 2017). One such method was WorkFace Planning (WFP), which is the process of organizing and informing site personnel about work items a considerable time before the work is scheduled to begin (Halala and Fayek 2019). Another method was Advanced Work Packaging (AWP).

A study showed that AWP practices on the capital project delivery process obtained the following benefits (Ponticelli et al. 2015; CII/COAA 2015):

- Up to 25% increase in field productivity
- Up to 10% decrease in total installed cost (TIC), with expanded reserve funds for owners and contractors
- Improved schedule performance with project delivered on schedule
- Improved safety performance with zero lost-time accident records
- Increased quality with decreased rework
- Improved forecast for cost and schedule estimation

1.2. CII Advanced Work Packaging

In 2015, CII officially designated AWP as a CII Best Practice. CII currently defines AWP as, “The overall process flow of all the detailed work packages including construction, engineering, and installation work packages” (CII 2020). CII’s Body of Knowledge that pertains to AWP indicates that it is a planned and executable process that exists during the inception through the final construction execution of a project. Several research teams within CII have investigated various aspects of AWP for capital projects:

- The integration of the supply chain with AWP practices (RT-363)
- Supply chain integration of materials planning and work packaging (RT-344)
- The value quantified in integrating supply components to front end planning efforts (RT-272)
- Making the case for AWP as a standard practice (RT-319)
- AWP “Digital Threads” to enable supply chain visibility on capital projects (RT-TC-03)

The need for the *AWP Data Requirements Implementation Guideline* was essentially a culmination of the findings from these previous CII research teams and the implementation experience of CII member companies. Figure 1 provides a framework for past and current CII AWP research. This figure shows how this project fits with the current CII Body of Knowledge.

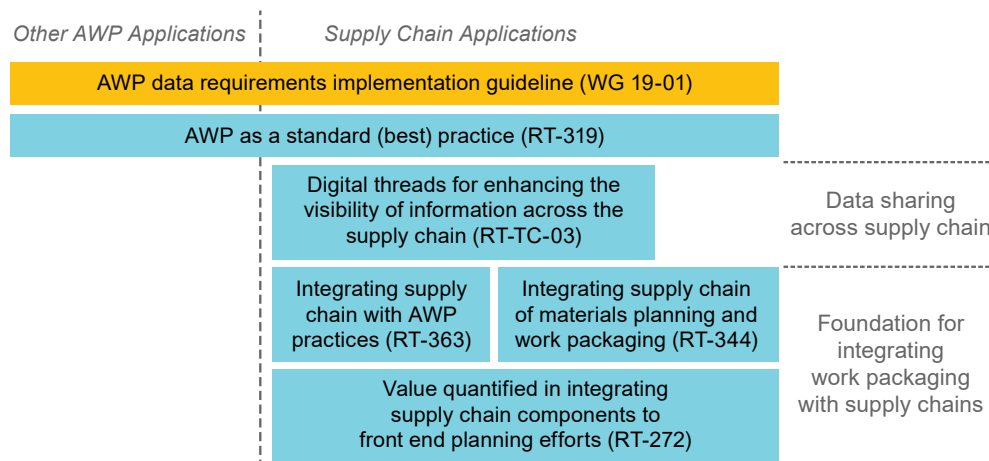


Figure 1. Framework for CII Research of AWP

1.3. Project Guideline

The remainder of this guideline details the project framework and presents the AWP data requirements. Chapter 2 discusses the framework this project implemented to produce its findings. Chapter 3 contains the industry-vetted AWP data requirements. The final section presents the project’s conclusions, including recommended practices.

Chapter 2: Project Framework

This project was started by the CII AWP Community of Business Advancement and executed by CII Working Group 19-01. CII's Technology & Innovation Committee provided funding for this publication, and two academic faculty members were added to the working group to create a project team that conducted meetings through in-person workshops, virtual platforms, and email in the process of writing this guide. The goal of this project was that the published Implementation Guidelines will orient organizations to successfully implement AWP data requirements for capital projects. (The contributors to this project are listed in an appendix.)

After this section, the survey offered two questions to support other CII research teams contemporaneously working on AWP topics, Research Teams 364 and 365. These questions addressed barriers related to the integration of AWP with procurement and supply chain management, and its integration with commissioning and startup.

2.1. Purpose, Objective, and Scope

The primary purpose of this project was to refine, review, and publish the *AWP Data Requirements Implementation Guideline*. The objectives of the project were to refine the AWP data requirements and to publish the *AWP Data Requirements Implementation Guideline*. The original scope of this project focused on the data required to enable implementation of AWP, as defined by the CII Best Practice formulated by CII RT-272 (CII/COAA 2013). Original project results were obtained by leveraging inter-team coordination to capture evolving practices, including supply chain and completions research teams.

The scope of this revision focused on refining, reviewing, and publishing the first revision of the AWP Data Requirements Guideline. Its scope remained aligned to the original approach by including primary feedback from the industry, in addition to keeping consistent with the documents now published by RT-363, Integrating the Supply Chain with AWP Practices, and RT-364, AWP-integrated Practices for Construction Completions, Commissioning, and Startup.

The unique contribution of the group that created the original *AWP Data Requirements Implementation Guideline* was the format, structure, and description of the data requirement content, and coordination with other related ongoing AWP projects. This approach allowed for a more cohesive, consistent, and technical document. Questions about data requirements were answered by members of the team and external resources, as needed.

The project team IS NOT:

- Creating an international standard
- Defining acceptable values or required units
- Creating a reference data library
- Developing data requirements for full digital project execution
- Overlapping its scope with other existing data initiatives

The project is also not building a toolset, but rather is software-agnostic and is publishing common data requirements. Lastly, the project team did not create a fully inclusive database set, but included fields thought to be instrumental in a successful AWP program.

2.2. Project Framework

The project team had weekly virtual meetings as well as face-to-face workshops in Houston, Texas. During these meetings, project team members on the AWP Working Group spent the majority of their time vetting AWP data requirement content, discussing progress, and updating this guideline. Some Working Group members shared their internal work products, and those became some of the fundamental building blocks for this project.

The project team selected the data requirements shown in Table 1 to further refine and develop the *AWP Data Requirements Implementation Guideline*.

Table 1. AWP Data Requirements Specified in this Project

| | |
|-------|-------------------------------------|
| DR010 | AWP Master Index |
| DR020 | Project Schedule |
| DR050 | Equipment Design |
| DR070 | Piping Design |
| DR080 | 3D Modeling |
| DR090 | Civil-Structural Design |
| DR100 | Electrical & Instrumentation Design |
| DR120 | Document Control |
| DR140 | Estimating and Cost |
| DR150 | Procurement |
| DR170 | Structural Detailing |
| DR180 | Steel Fabrication |
| DR190 | Pipe Detailing |
| DR200 | Pipe Fabrication |
| DR230 | Contractor Scope Items |
| DR260 | Constraints |
| DR270 | Site Materials |
| DR290 | Site Progress |
| DR310 | Completions |

The project team mapped the existing digital threads to the flowcharts in IR272-2, Volume I (CII/COAA 2013), then prioritized the digital threads for further investigation to determine the scope of the publication. RT-364 had updated the original AWP flowchart developed by RT-272, expanding its three AWP stages by adding a fourth stage for Energization and Commissioning (CII 2020a). Figure 2 shows the graphic that resulted.

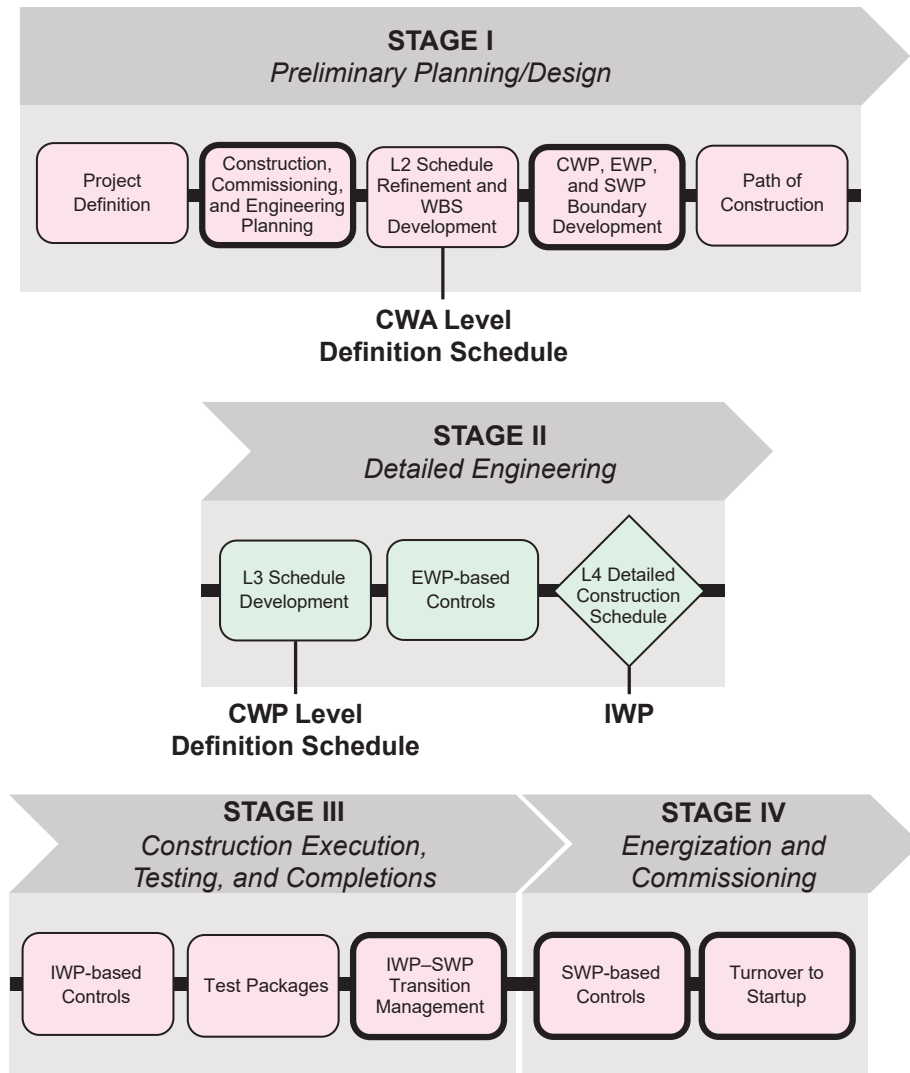


Figure 2. Overview of CSU-Integrated AWP Flowchart (Adapted from CII 2020a)

Figure 3 shows the same map updated with detailed data requirements developed from this study.

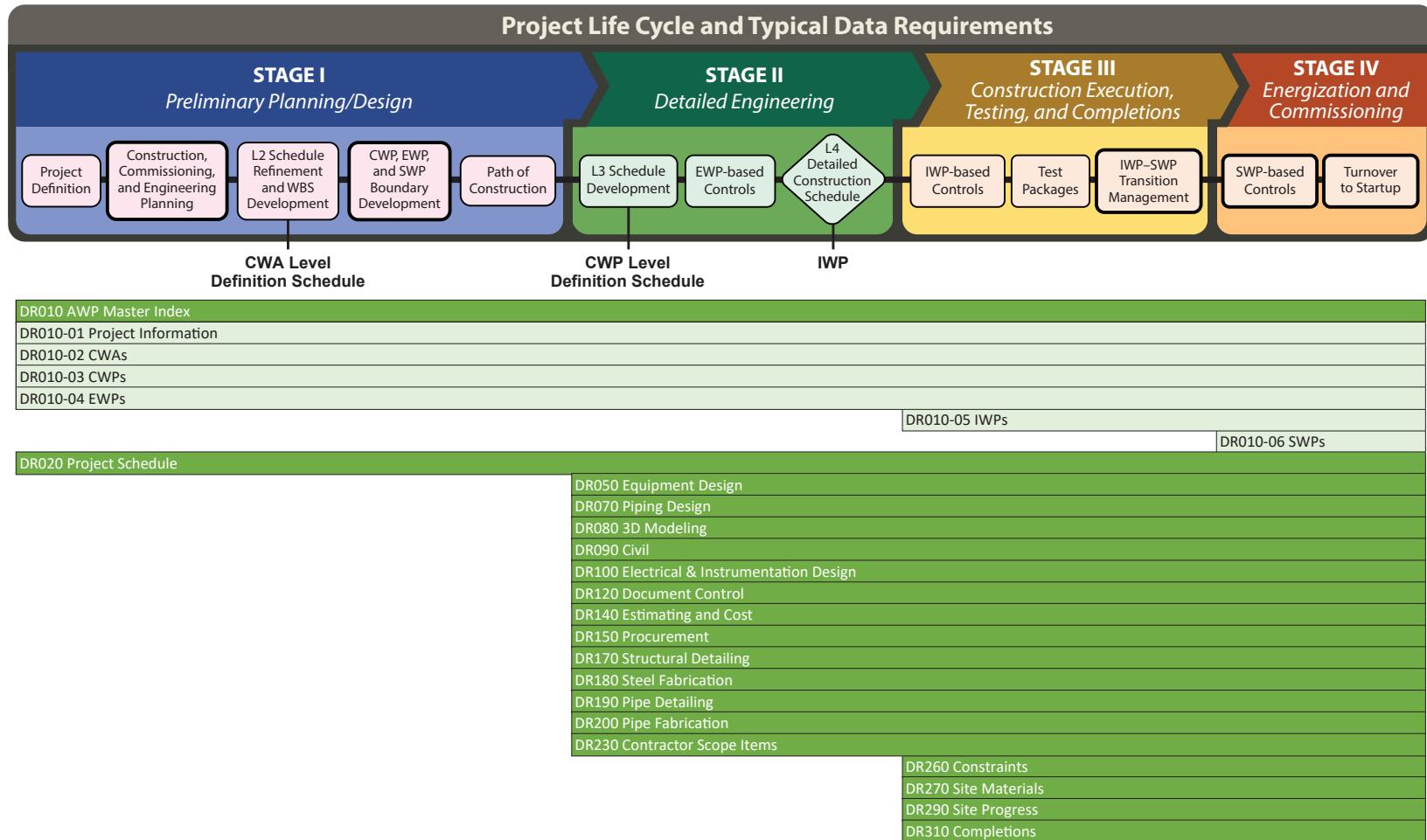


Figure 3. AWP Data Requirements Flow Chart

Chapter 3: Data Requirements

The project team created a set of general conditions to guide the rationalization efforts through all the selected data requirements. These general conditions are shared in this section to inform the user and frame the narrative.

- The project team created specifications for assessing existing requirements when singular relationships were not apparent.
- Detailed implementation recommendations address how these relationships will be handled for specific projects.
- The project team included an optional revision field for use with future AWP integration.
- Designated field names are descriptive and listed with the intent to allow companies to rename however they deem appropriate.
- Fields designated as “required” indicate that the data is required to support Advanced Work Packaging and WorkFace Planning. This is not a full digital enablement specification.
- The project team did not cover normal procurement data sets, as those are assumed by the project stakeholders.
- When accessing the data requirements, one should assume common definitions for the following field names:

Plan – the unchanging contract or original baseline.

Forecast – the updated or reissued future completion date through estimations and adjustment.

Actual Date – the calendar date when work actually started or finished.

- Lastly, standard attributes and metadata fields should be added as necessary based on the source of information, including variables such as timestamps, date created, and refresh date.

Sample Entries for Data Requirements

This guideline provides “sample entries” for each field within the data requirements. In most cases, the sample entries provide actual project data that would be appropriate for the given field. In all cases, the sample entries reflect information – either actual project data or simulated data – which would satisfy the specification for a particular field entry. The diversity of sample entries is intentional to be more illustrative of the variability of individual project data. The sample entries were generated by members of the project team who used their professional experience with project data to populate the fields. The initial data was reviewed by members of the team to validate that the provided data was appropriate for the suggested field.

Excel Workbook for Data Requirements

A downloadable Excel workbook of the data tables in this report has been developed and is available in the CII Knowledge Base page for Working Group 19-01, AWP Data Requirements.

How Are Data Requirements Interpreted

Figure 4 shows how the 60 data requirements follow a consistent format across all 19 categories. The structure is the same, but the details vary from data requirement to data requirement. The particular data requirement shown in Figure 4 is relatively brief.

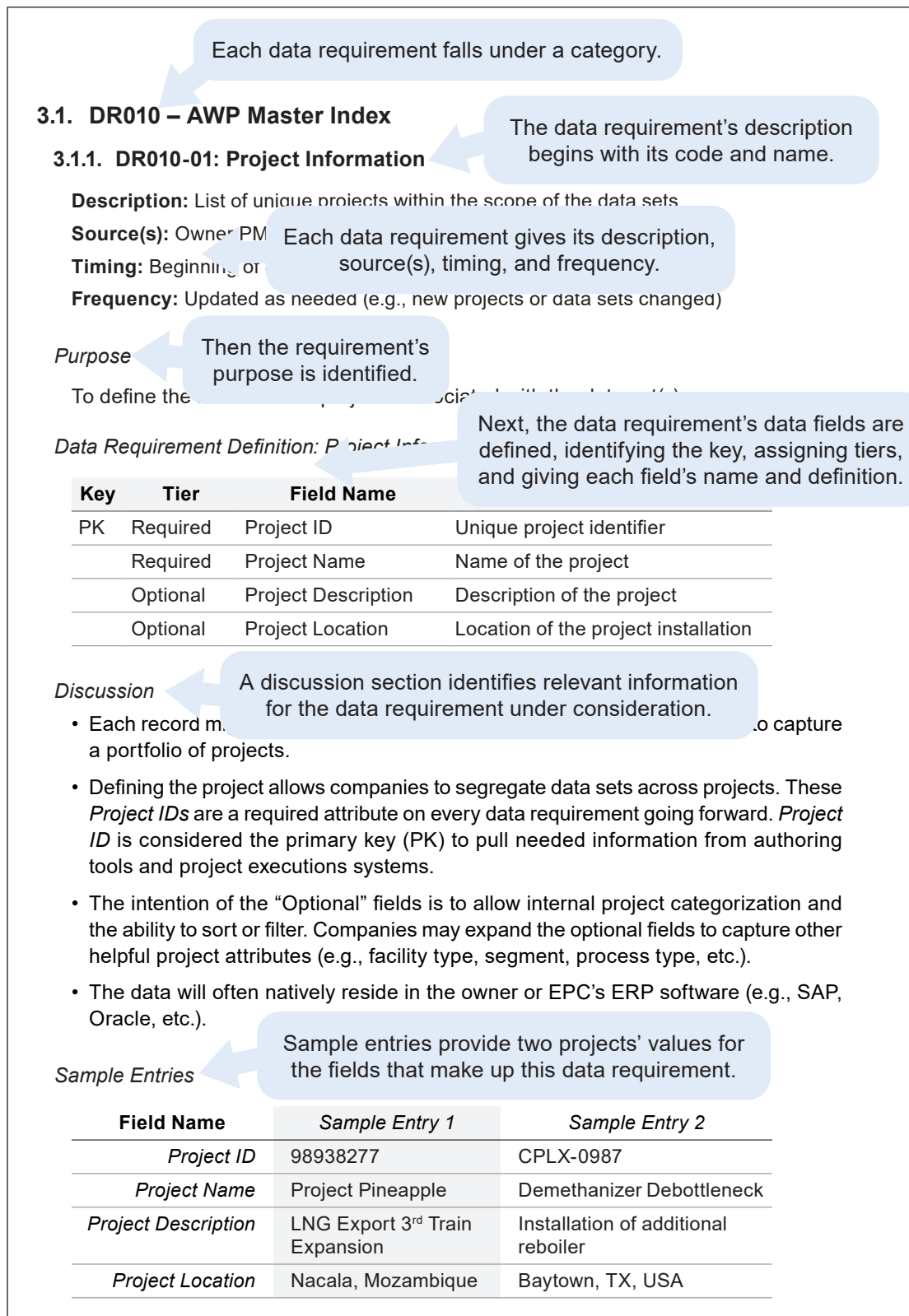


Figure 4. The Elements of a Data Requirement

3.1. DR010 – AWP Master Index

3.1.1. DR010-01: Project Information

Description: List of unique projects within the scope of the data sets

Source(s): Owner PM organization

Timing: Beginning of Stage 1 (Preliminary Planning & Design)

Frequency: Updated as needed (e.g., new projects or data sets changed)

Purpose

To define the master list of projects associated with the data set(s).

Data Requirement Definition: Project Information

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------|--------------------------------------|
| PK | Required | Project ID | Unique project identifier |
| | Required | Project Name | Name of the project |
| | Optional | Project Description | Description of the project |
| | Optional | Project Location | Location of the project installation |

Discussion

- Each record might be a single entry for a large project, or multiple entries to capture a portfolio of projects.
- Defining the project allows companies to segregate data sets across projects. These *Project IDs* are a required attribute on every data requirement going forward. *Project ID* is considered the primary key (PK) to pull needed information from authoring tools and project executions systems.
- The intention of the “Optional” fields is to allow internal project categorization and the ability to sort or filter. Companies may expand the optional fields to capture other helpful project attributes (e.g., facility type, segment, process type, etc.).
- The data will often natively reside in the owner or EPC’s ERP software (e.g., SAP, Oracle, etc.).

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------|--|-------------------------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Project Name</i> | Project Pineapple | Demethanizer Debottleneck |
| <i>Project Description</i> | LNG Export 3 rd Train Expansion | Installation of additional reboiler |
| <i>Project Location</i> | Nacala, Mozambique | Baytown, TX, USA |

3.1.2. DR010-02: CWAs

Description: List of unique construction work areas (CWAs) within a given project

Source(s): Construction management team

Timing: Early Stage 1 (Preliminary Planning & Design) after project definition

Frequency: Continuous as revised – at a minimum weekly through Stage 1 (Preliminary Planning & Design) until the Path of Construction is defined

Purpose

To define the master list of construction work areas (CWAs) for a project.

A CWA is a geographical designation of areas on a plot plan that has been defined by construction as being logical areas of work. The CWA includes all disciplines with work in that geographical area.

Data Requirement Definition: CWAs

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | CWA | Unique construction work area identifier |
| | Required | CWA Description | CWA description |
| | Optional | CWA GIS Boundary | GIS information defining the CWA |
| | Optional | CWA Ground Level | CWA above ground, below ground, or mixed |
| | Optional | CWA Plot Plan Drawing | Drawing number capturing the CWA plot delineation |

Discussion

- Typically, areas do not overlap, but underground (UG) is often separated as unique CWAs and only appears overlapping with the above ground (AG) on a 2D plot plan.
- The key relationship with CWAs is to construction work packages (CWPs), which are at the third level in the AWP hierarchy below the project (i.e., first level: Project; second level: CWA; third level: CWP)
- Similar to *Project ID*, many data tables capture *CWA*.
- CWAs can be determined via the CWP.
- *CWA GIS Boundary* is meant to be a set of GIS coordinates to define the bounds of a CWA independent of a drawing. Alternatively, the CWA coordinates could be in model space.
- *CWA Ground Level* – often there is a need or desire to quickly sort CWAs by UG or AG, or to understand if they are mixed.
- CWA delineation usually natively lives on a plot plan, but it is ideally captured in the 3D model.

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|------------------------------|---|---|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>CWA</i> | FZABD001 | Area 2 |
| <i>CWA Description</i> | Furnace Block | Cold Train |
| <i>CWA GIS Boundary</i> | (29.757061, -95.006500), (29.756915, -95.005135), (29.757425, -95.005087), (29.757558, -95.006463) | (450.058, 378.382, 33.224), (450.058, 410.562, 33.224), (436.863, 378.382, 33.224), (436.863, 410.562, 33.224) |
| <i>CWA Ground Level</i> | AG | AG |
| <i>CWA Plot Plan Drawing</i> | PLT-PLN-001-04 | 009-382-BZ-0910890 |

3.1.3. DR010-03: CWPs

Description: Contains the project's construction work package (CWP) definitions

Source(s): Construction management team

Timing: During Stage 1 (Preliminary Planning & Design) after CWP boundary development

Frequency: Continuous as revised – at a minimum, weekly through Stage 2 (Detailed Engineering) Detailed Construction Schedule development

Purpose

To define the master list of construction work packages (CWPs) for a project. All CWPs for the project must be listed in this table.

A CWP defines a logical and manageable division of work within the construction scope (typically 10k to 40k craft hours). CWPs are aligned with the project execution plan (which includes the construction plan) and the WBS. The division of work is defined such that CWPs do not overlap within a discipline. CWPs are to be measurable and in alignment with project controls. CWPs are the basis for the development of detailed installation work packages (IWP).

Data Requirement Definition: CWPs

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | CWP | Unique construction work package identifier |
| | Required | CWP Contract | Unique identifier of contract responsible for CWP execution |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP Description | CWP description |
| | Required | CWP Status | Status of the construction work package |
| | Required | CWP Discipline | Discipline responsible for CWP execution |
| | Optional | CWP Type | Construction work package type (e.g., install, insulate, fabricate, etc.) |
| | Optional | CWP Estimate Hours | Current control budget construction workhours of the CWP (aligned to schedule) |
| | Optional | CWP Revision | Current revision of the CWP |
| | Optional | CWP Sequence | Sequence of the CWP within the CWA (i.e., represents the path of construction) |

Discussion

- Consistent with standard industry guidance, this data model operates on the assumption that CWPs do not cross disciplines, companies, or contract types. If this is so, the existing CWPs should be further split such that they do not cross discipline or contractual boundaries. They may also contain more than one engineering work package.
- CWPs are subsets of CWAs. Subsequent data requirement tables assume that CWA can be extracted from CWP as needed.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------|---------------------------------|-------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>CWA</i> | FZABD001 | 002 |
| <i>CWP</i> | FZABD001-PIP | 002P |
| <i>CWP Contract</i> | PIP-001 | GEN-ABC |
| <i>CWP Description</i> | Furnace Block Pipe Installation | Cold Train Piping |
| <i>CWP Status</i> | Issued for Construction | On Hold |
| <i>CWP Discipline</i> | Piping | Piping & Pipeline |
| <i>CWP Type</i> | Install | Fabricate |
| <i>CWP Estimate Hours</i> | 15000 | 28000 |
| <i>CWP Revision</i> | 01 | A |
| <i>CWP Sequence</i> | 1 | 3/5 |

3.1.4. DR010-04: EWPs

Description: List of unique engineering work packages (EWPs) within a given project

Source(s): Engineering management team

Timing: During Stage 1 (Preliminary Planning & Design) after CWP definitions

Frequency: Continuous as revised – at a minimum, weekly through Stage 2
(Detailed Engineering) Detailed Construction Schedule development

Purpose

To define the master list of engineering work packages (EWPs) for a project.

An EWP is an engineering deliverable that is used to develop CWPs and define a scope of work to support construction in the form of drawings, procurement deliverables, specifications, and vendor support. The EWP is released in an approved sequence that is consistent with the CWP schedule and the path of construction. An EWP scope of work is typically defined by discipline and area.

Data Requirement Definition: EWPs

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | EWP | Unique engineering work package identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP Description | Engineering work package description |
| | Required | EWP Discipline | Discipline responsible for EWP execution |
| | Required | EWP Status | Status of the engineering work package |
| | Required | EWP Contract | Unique identifier of contract responsible for EWP execution |
| | Optional | EWP Owner | Name responsible for EWP (typically the discipline lead) |
| | Optional | EWP Revision | Current revision of the EWP |

Discussion

- IR272-2 specifies that any given EWP relates only to a single CWP. Often EWPs and CWPs are 1:1, but IR272-2 does allow for multiple EWPs to be related to a single CWP (e.g., primary steel and secondary steel as separate EWPs) (CII/COAA 2013).
- Some EPCs create “common” EWPs for common deliverables (e.g., plot plans, pipe support detail, etc.). In this case, the *CWP* attribute would be intentionally left blank.
- This table captures the relationship of EWPs to CWPs.
- The *EWP Contract* field captures which engineering contractor is responsible for the development of deliverables for the EWP. This is useful for large projects where there may be multiple engineering contractors or where vendors are responsible for developing deliverables for the EWP.
- Originating data source – typically live in some sort of master index for the project and are mapped to engineering deliverables in the MDL/MDI and/or the engineering progress database.
- *EWP Discipline* is redundant to the related CWP discipline but allows for testing of data consistency.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|------------------------|----------------------|-------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>EWP</i> | EWP-0012-00A1-Pipe | EWP-DA02-Equip-01 |
| <i>EWP Description</i> | North Rack LB Piping | Pumps P9101A/B |
| <i>EWP Discipline</i> | Piping | Equipment |
| <i>EWP Status</i> | Issued | Working |
| <i>EWP Contract</i> | Acme Engineers, Inc. | 89655312 |
| <i>EWP Owner</i> | Smith | Jones |
| <i>EWP Revision</i> | 0 | 2 |

3.1.5. DR010-05: IWPs

Description: List of unique installation work packages (IWPs) within a given project

Source(s): Construction management team

Timing: Stage 3 (Construction)

Frequency: Continuous as revised – at a minimum, weekly through Stage 3

Purpose

To define the master list of installation work packages (IWPs) for a project.

An IWP is a detailed execution plan that describes all elements necessary to complete a scope of work. This detailed planning document enables craft persons to perform high-quality work in a safe, effective, and efficient manner without constraints. Generally, the scope of work associated with the IWP is small enough that it could be completed by a single-foreman team, typically in a one- or two-week timeframe.

Data Requirement Definition: IWPs

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | IWP | Unique installation work package identifier |
| | Required | IWP Description | IWP description |
| | Required | IWP Discipline | IWP discipline |
| | Required | IWP Contract | Unique identifier of contract responsible for IWP execution |
| | Required | CWP | Unique construction work package identifier |
| | Required | IWP Planner | WorkFace Planner responsible for the IWP |
| | Optional | IWP Foreman | Foreman responsible for executing the IWP |
| | Optional | IWP General Foreman | General foreman responsible for overseeing execution of the IWP |
| | Optional | IWP Superintendent | Superintendent responsible for overseeing execution of the IWP |
| | Required | IWP Status | Status of the IWP (e.g., in development, in execution, completed, etc.) |
| | Required | IWP Forecast Start | Forecast schedule start date of the IWP |
| | Required | IWP Forecast Completion | Forecast schedule completion date of the IWP |
| | Required | IWP Actual Start | Actual schedule start date of the IWP |
| | Required | IWP Actual Completion | Actual schedule completion date of the IWP |

Data Requirement Definition: IWPs (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------|---|
| | Optional | IWP Estimate Hours | Current control budget construction workhours of the IWP |
| | Optional | IWP Revision | Current revision of the IWP |
| | Optional | IWP Sequence | Sequence of the IWP within the CWP (i.e., represents the path of construction) |
| | Optional | IWP Type | Installation work package type (e.g., install, insulate, fabricate, etc.) |
| | Optional | IWP Key Quantity | Sum up of main quantity to install as part of the IWP |
| | Optional | IWP Key Quantity UOM | Unit of measurement for IWP key quantity (e.g., linear feet of pipe, tons of steel, etc.) |

Discussion

- IWP disciplines are expected to be the same as their parent CWP, but may be further broken down. For example, the “piping” discipline may be further broken down into “welding” and “pipe fitting.”
- IWP relates to the rest of the WBS through its CWP.
- An IWP master list typically resides in the construction contractor’s WorkFace Planning software.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--------------------------------|-----------------------------|-----------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>IWP</i> | IWP-0012-00A1-Pipe-003 | IWP-DA02-Equip-01-001 |
| <i>IWP Description</i> | Set and Connect 5 LB Spools | Set P9101A |
| <i>IWP Discipline</i> | Piping | Equipment |
| <i>IWP Contract</i> | Acme Contractors, Inc. | K-200-896 |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>IWP Planner</i> | Johnson | Williams |
| <i>IWP Foreman</i> | Brown | Garcia |
| <i>IWP General Foreman</i> | Miller | Davis |
| <i>IWP Superintendent</i> | Martinez | Wilson |
| <i>IWP Status</i> | QA/QC | Closed |
| <i>IWP Forecast Start</i> | 29/05/2020 | 10-15-2019 |
| <i>IWP Forecast Completion</i> | 15/06/2020 | 10-21-2019 |

| Field Name | Sample Entry 1 | Sample Entry 2 |
|------------------------------|-----------------------|-----------------------|
| <i>IWP Actual Start</i> | 30/05/2020 | 10-20-2019 |
| <i>IWP Actual Completion</i> | 14/05/2020 | 10-30-2019 |
| <i>IWP Estimate Hours</i> | 892 | 112 |
| <i>IWP Revision</i> | 0 | A |
| <i>IWP Sequence</i> | 003 | 001 |
| <i>IWP Type</i> | Install | Install |
| <i>IWP Key Quantity</i> | 20 | 5 |
| <i>IWP Key Quantity UOM</i> | m | ft |

3.1.6. DR010-06: SWPs

Description: List of unique system work packages (SWPs) within a given project

Source(s): Construction management team

Timing: Stage 4 (Energization and Commissioning)

Frequency: Continuous as revised – at a minimum, weekly through Stage 4

Purpose

To define the master list of system work packages (SWPs) for a project.

An SWP is a deliverable that enables a commissioning work crew to perform work in a safe, predictable, measurable, and efficient manner. An SWP is associated with a system or part of a system that the plant wants turned over to commissioning or startup. In this respect, it may pertain to part of a system, a whole system, or an entire unit, but it must include some work (including work hours) and not just represent a turnover milestone.

Data Requirement Definition: SWPs

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | SWP | Unique system work package identifier |
| | Required | SWP Description | SWP description |
| | Required | SWP Discipline | SWP discipline |
| | Required | SWP Contract | Unique identifier of contract responsible for SWP execution |
| | Optional | Commissioning Zone ID | Unique commissioning zone identifier |
| | Required | System ID | Unique turnover system identifier |
| | Required | Sub-System ID | Unique turnover sub-system identifier |
| | Required | SWP Construction Manager | Construction Manager responsible for the SWP |
| | Required | SWP Commissioning Manager | Commissioning Manager responsible for executing the SWP |
| | Required | SWP Status | Status of the SWP (e.g., in development, in execution, completed, etc.) |
| | Required | SWP Forecast Start | Forecast schedule start date of the SWP |
| | Required | SWP Forecast Completion | Forecast schedule completion date of the SWP |
| | Required | SWP Actual Start | Actual schedule start date of the SWP |
| | Required | SWP Actual Completion | Actual schedule completion date of the SWP |
| | Optional | Related CWP | Related construction work package |

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------|--|
| | Required | Related IWP | Related installation work package |
| | Optional | Related Tag | Related tag for the SWP |
| | Optional | SWP Estimate Hours | Current control budget construction workhours of the SWP |
| | Optional | SWP Revision | Current revision of the SWP |
| | Optional | SWP Sequence | Sequence of the SWP within the sub-system |

Discussion

- An SWP should also be mapped to predecessor IWPs in order to ensure that the path of construction enables an efficient startup sequence.
- IWPs, including their test packages, are compiled into turnover documentation that collectively triggers the Ready for Commissioning milestone. Thereafter, commissioning and energization efforts should be managed and controlled via SWPs.
- An SWP should be scoped to be manageable and “progressable,” and is typically scoped in a way that maps to existing commissioning zones, systems, sub-systems, or sub-system components.
- Typically, multiples entries are expected for related Tags, CWP, and IWPs in a single SWP.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------------|----------------|-----------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>SWP</i> | GS-AC-001-001 | 41-AS-A-001 |
| <i>SWP Description</i> | Pump #1 | Gas Detector |
| <i>SWP Discipline</i> | Mechanical | Instrumentation |
| <i>SWP Contract</i> | ACC-A | K001 |
| <i>Commissioning Zone ID</i> | GS | 41 |
| <i>System ID</i> | GS-AC | 41-AS |
| <i>Sub-System ID</i> | GS-AC-001 | 41-AS-A |
| <i>SWP Construction Manager</i> | P. Parker | B. Johnson |
| <i>SWP Commissioning Manager</i> | B. Diaz | S. Stone |
| <i>SWP Status</i> | Draft | Closed |
| <i>SWP Forecast Start</i> | 12-01-2021 | 01/10/2021 |

Sample Entries (continued)

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-------------------------|------------------------------------|-----------------------------|
| SWP Forecast Completion | 12-11-2021 | 21/10/2021 |
| SWP Actual Start | 12-01-2021 | 05/10/2021 |
| SWP Actual Completion | 12-10-2021 | 18/10/2021 |
| Related CWP | 400AS01 | 410EDS, 510AU |
| Related IWP | 400AS01-01, 400AS01-02, 400AS01-10 | 410EDS01, 410EDS11, 510AU03 |
| Related Tag | 41-PU-001 | 41-G-A, 41-G-B |
| SWP Estimate Hours | 200 | 400 |
| SWP Revision | A | 1 |
| SWP Sequence | 1 | 2 |

3.2. DR020 – Project Schedule

3.2.1. DR020-01: Schedule Activities

Description: List of unique project schedule activities

Source(s): Project controls team

Timing: End of Stage 1 (CWP/EWP boundaries preliminarily developed).
IWP and data feeds back at Stage 3 (Construction)

Frequency: Continuous as revised – at a minimum, monthly through Stage 3

Purpose

To define the master list of level 3 schedule activities for the project and their associated key attributes (e.g., dates)

Data Requirement Definition: Schedule Activities

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Activity ID | Unique identifier for the schedule activity |
| | Required | Activity Name | Descriptive name for the schedule activity |
| | Required | WBS | Work breakdown structure code for the activity |
| | Required | Baseline Start Date | Baseline schedule start date of the activity |
| | Required | Baseline Completion Date | Baseline schedule completion date of the activity |
| | Optional | Current Re-baselined Start | Current re-baselined schedule start date of the activity |
| | Optional | Current Re-baselined Completion | Current re-baselined schedule completion date of the activity |
| | Required | Forecast Start | Forecast schedule start date of the activity |
| | Required | Forecast Completion | Forecast schedule completion date of the activity |
| | Required | Actual Start | Actual schedule start date of the activity |
| | Required | Actual Completion | Actual schedule completion date of the activity |
| | Required | Early Start | Early schedule start date of the activity |
| | Required | Early Completion | Early schedule completion date of the activity |
| | Required | Late Start | Late schedule start date of the activity |
| | Required | Late Completion | Late schedule completion date of the activity |
| | Required | Total Float | Total float of the activity in days |

Data Requirement Definition: Schedule Activities (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------|--|
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Optional | IWP | Unique installation work package identifier |
| | Required | Estimate Hours | Current control budget construction workhours of the activity (CWA, CWP, EWP, IWP) |
| | Optional | Contract Reference | Contract information (e.g., contract identifier, contract release, etc.) |
| | Optional | Parent Activity ID | Unique identifier for the schedule parent activity |
| | Optional | Percent Complete | Percentage complete for the work activity |

Discussion

- The primary intent of these requirements is to relate schedule dates to packages.
- It is expected that schedule activities are tagged to EWPs or CWPs via a mechanism such as activity codes.
- Scheduling software can capture a wide range of attributes. The intent here is to capture the core data needed to analyze AWP planning and execution (e.g., package dates, path of construction, critical packages, etc.).
- For integrated schedules that span contractual boundaries, the *Contract Reference* field captures which contractor is responsible for executing an activity.
- This data is intended to capture a level 3 schedule. It is expected that detailed level 4 schedules with IWP detail will be prepared in planning tools that align back to the bounds of a parent CWP in the level 3 schedule and will feed the schedule back as needed.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--|---|--|
| <i>Project ID</i> | 566985 | 9988854-236 |
| <i>Activity ID</i> | ENJ100011980 | CNKCGNRL12256 |
| <i>Activity Name</i> | EWP-1190-90-2200 Chiller Structure Elev. 0-3 | CWP-T1P0-88-1900 Duct Banks Train 1 |
| <i>WBS</i> | NP-JE-CN-1-2.EWP.11.90.22.00 | NP-KC-C-1-2.CWP.88.19.00 |
| <i>Baseline Start Date</i> | 01-Oct-19 | 20200307 |
| <i>Baseline Completion Date</i> | 09-Feb-20 | 20200519 |
| <i>Current Re-baselined Start</i> | 11-Oct-19 | 20200407 |
| <i>Current Re-baselined Completion</i> | 09-Feb-20 | 20200619 |
| <i>Forecast Start</i> | 11-Oct-19 | 20200409 |
| <i>Forecast Completion</i> | 21-Feb-19 | 20200709 |
| <i>Actual Start</i> | 11-Oct-19 | 20200409 |
| <i>Actual Completion</i> | 21-Feb-19 | – |
| <i>Early Start</i> | 11-Oct-19 | 20200409 |
| <i>Early Completion</i> | 21-Feb-19 | 20200708 |
| <i>Late Start</i> | 11-Oct-19 | 20200410 |
| <i>Late Completion</i> | 21-Feb-19 | 20200710 |
| <i>Total Float</i> | 36d | -2d |
| <i>CWA</i> | 1190-90 | P0-88-1900 |
| <i>CWP</i> | – | CWP-T1-P0-88-1900 |
| <i>EWP</i> | EWP-1190-90-2200 | – |
| <i>IWP</i> | – | IWP-1-P0-88-1900-001 |
| <i>Estimate Hours</i> | 10000 | 1820 |
| <i>Contract Reference</i> | – | ACME INC |
| <i>Parent Activity ID</i> | – | CNKCGNRL1566 |
| <i>Percent Complete</i> | 100% | 46% |

3.3. DR050 – Equipment Design

3.3.1. DR050-01: Equipment List

Description: List of major mechanical equipment

Source(s): Engineering management team

Timing: Stage 2

Frequency: Continuous as revised – at a minimum, weekly through Stage 2
(Detailed Engineering) Detailed Construction Schedule development

Purpose

To control project scope identification in the virtual construction model and assign equipment to appropriate CWP.

Data Requirement Definition: Equipment List

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | Equipment Type | Type of equipment |
| | Optional | Fireproof Code | Code that specifies the type of fireproofing required |
| | Optional | Insulation Class – Channel | Type of insulation on tube side of tube exchanger |
| | Optional | Insulation Class – Shell | Type of insulation on shell side of tube heat exchanger |
| | Required | Manufacturer | Manufacturer of tagged item |
| | Optional | Motor | Tag of the motor on equipment (e.g., pump compressor) |
| | Optional | Paint Code | Code that provides the paint color and mill thickness requirements |
| | Required | PID | Piping and instrumentation diagram drawing number |
| | Required | PO | Purchase order number |
| | Optional | Requisition | Requisition number |

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------------|--|
| | Optional | Equipment Revision | Current revision |
| | Required | Skid | Skid tag number the equipment is part of |
| | Required | Sub-System ID | Unique turnover sub-system identifier |
| | Optional | Test Package ID | Unique test package identifier (e.g., hydrotest package) |
| | Optional | Tracing Code | Code that specifies the type of heat tracing required |
| | Required | Module | Module the component belongs to, when applicable |
| | Optional | Equipment Location Plan | Number of location drawing (e.g., B01-xxxx-yyyyy) |
| | Optional | Responsible Discipline | Discipline responsible for the equipment |
| | Optional | Specification | Equipment specification number |
| | Optional | Weight | Weight of the item |
| | Optional | Weight UOM | Unit of measurement for weight of the item (e.g., TN, Lbs, MT, Kg, etc.) |

Discussion

- *Weight* is necessary if AWP project planning includes advance crane and rigging planning.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------------|-----------------------------|---------------------------------|
| <i>Project ID</i> | PR001 | AN.9892 |
| <i>Tag</i> | KD-1007A1 | 280-E-10092 |
| <i>Construction Status</i> | New | NEW CONSTRUCTION |
| <i>CWA</i> | CWA-1000 | 280X510A-01 |
| <i>CWP</i> | CWP-1001 | 280X510A-01-01 |
| <i>EWP</i> | EWP-1001-001 | 280X510A-01-01-E |
| <i>Equipment Type</i> | Vessel – Knockout Drum | CHILLER |
| <i>Fireproof Code</i> | – | FPC-01 |
| <i>Insulation Class – Channel</i> | – | – |
| <i>Insulation Class – Shell</i> | 2" Polyisocyanurate | 4" FLEXIBLE EASTOMERIC CELLULAR |
| <i>Manufacturer</i> | Tate | TRANE |
| <i>Motor</i> | – | 280-M-10092 |
| <i>Paint Code</i> | GRN-0008 | – |
| <i>PID</i> | APX-200-PX-2365-0170002-001 | SCO-280-9T-90084 |
| <i>PO</i> | PO-00121 | PO-1225674 |
| <i>Requisition</i> | RQ-00121 | RQ-8443785 |
| <i>Equipment Revision</i> | Approved for Construction | ISSUED FOR APPROVAL |
| <i>Skid</i> | SKD-1000 | – |
| <i>Sub-System ID</i> | OWO-01 | CHILLED WATER |
| <i>Test Package ID</i> | HT-00001 | TP-280X510A-01 |
| <i>Tracing Code</i> | – | – |
| <i>Module</i> | MOD-SKD-1000 | – |
| <i>Equipment Location Plan</i> | UPDK-976-007 | SCO-280-1A-0943 |
| <i>Responsible Discipline</i> | Mechanical | MECHANICAL |
| <i>Specification</i> | PT-RSMT-0011 | – |
| <i>Weight</i> | 1234 | 18922 |
| <i>Weight UOM</i> | Kg | Lbs |

3.4. DR070 – Piping Design

3.4.1. DR070-01: Line List

Description: Piping line list

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, weekly through the end of Stage 2

Purpose

To identify test package relationships and track key attributes per unique line identifier and inform requirements for work package relationships built with the isometric list (DR070-02).

Data Requirement Definition: Line List

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Line Number | Unique pipeline identifier per segment |
| | Required | AG-UG | Is the pipeline above ground (AG) or underground (UG)? |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Optional | From Tag | Tag number that this specific Tag is connected from |
| | Optional | Insulation Spec | Insulation specification of the item |
| | Optional | Insulation Thickness | Insulation thickness of the item |
| | Optional | Insulation Thickness UOM | Unit of measurement for insulation thickness (e.g., In, MM, etc.) |
| | Required | Nominal Size | Nominal size of the pipe |
| | Required | Size UOM | Unit of measurement for size of the pipe (e.g., EA, LF, M, In, etc.) |
| | Optional | Paint Code | Code that provides the paint color and mill thickness requirements |
| | Optional | PID Drawing Number(s) | Related piping and instrumentation diagram drawing number |
| | Optional | PWHT | Is the pipeline post-weld heat treated (i.e., yes or no)? |
| | Optional | Service | Fluid code associated to the item |
| | Required | Spec | Piping specification |
| | Optional | To Tag | Tag number that this specific Tag is connected to |

Data Requirement Definition: Line List (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------|---|
| | Optional | Tracing Code | Code that specifies the type of heat tracing required |
| | Required | Sub-System ID | Unique turnover sub-system identifier |
| | Optional | Test Pressure | Testing pressure |
| | Optional | Test Pressure UOM | Unit of measurement for testing pressure (e.g., PSI, Bar, Pa) |
| | Optional | Test Temperature | Testing temperature |
| | Optional | Test Temperature UOM | Unit of measurement for testing temperature (e.g., F°, C°) |
| | Optional | Design Pressure | Design pressure |
| | Optional | Design Pressure UOM | Unit of measurement for design pressure (e.g., PSI, Bar, Pa) |
| | Optional | Design Temperature | Design temperature |
| | Optional | Design Temperature UOM | Unit of measurement for design temperature (e.g., F°, C°) |
| | Optional | Operating Pressure | Operating pressure |
| | Optional | Operating Pressure UOM | Unit of measurement for operating pressure (e.g., PSI, Bar, Pa) |
| | Optional | Operating Temperature | Operating temperature |
| | Optional | Operating Temperature UOM | Unit of measurement for operating temperature (e.g., F°, C°) |
| | Optional | Line Status | Status of the line (e.g., released to construction, etc.) |
| | Optional | Line Revision | Current revision |

Discussion

- Several attributes on the line list will logically flow into the isometric drawing list.
- Optional attributes can be used for a fully data-integrated AWP process.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------------|--------------------------------------|---|
| <i>Project ID</i> | 90000801 | 1684972 |
| <i>Line Number</i> | 32-6"-O-CS150-IH-2" | 0-SYNP-28"-1201-001-SCFR94-R2.2-WS150 |
| <i>AG-UG</i> | Above Ground | Underground |
| <i>Construction Requirement</i> | New | Existing |
| <i>From Tag</i> | TK-100 | P-101 |
| <i>Insulation Spec</i> | Insulated for Heat Conservation (IH) | WS |
| <i>Insulation Thickness</i> | 2 | 150 |
| <i>Insulation Thickness UOM</i> | Inch | MM |
| <i>Nominal Size</i> | 6 | 28 |
| <i>Size UOM</i> | Inch | Inch |
| <i>Paint Code</i> | Green (14-E-53) | Signal Red (04-E-53) |
| <i>PID Drawing Number(s)</i> | PD-01-1658-001 | &AA-12-P-FP 0010 (EN) |
| <i>PWHT</i> | Yes | No |
| <i>Service</i> | O | SYNP (SynGas) |
| <i>Spec</i> | CS150 | SCFR94 |
| <i>To</i> | P-101 | TK-100 |
| <i>Tracing Code</i> | ET | ST |
| <i>Sub-System</i> | 13-01 | AA |
| <i>Test Pressure</i> | 425 | 100 |
| <i>Test Pressure UOM</i> | PSI | Bar |
| <i>Test Temperature</i> | 75 | 30.00 |
| <i>Test Temperature UOM</i> | F° | C° |
| <i>Design Pressure</i> | 150 | 73.20 |
| <i>Design Pressure UOM</i> | PSI | Bar |
| <i>Design Temperature</i> | 75 | Design Temp 1: 265.00 Design Temp 2: 10.00 |
| <i>Design Temperature UOM</i> | F° | C° |
| <i>Operating Pressure</i> | 80 | 53.20 |
| <i>Pressure UOM</i> | PSI | Bar |
| <i>Operating Temperature</i> | 60 | 220.00 |
| <i>Operating Temperature UOM</i> | F° | C° |
| <i>Line Status</i> | Released for Review | Released for Construction |
| <i>Line Revision</i> | 0 | A |

3.4.2. DR070-02: Isometric List

Description: Piping isometric drawing list

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, weekly through the end of Stage 2

Purpose

To define the master list of isometric drawings for the project and their associated key attributes (especially CWP).

Data Requirement Definition: Isometric List

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Isometric Drawing | Piping isometric drawing number |
| | Required | Line Number(s) | Pipeline identifier(s) |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | Isometric Drawing Status | Status of issued isometric (e.g., issued for construction [IFC], IFI, IFR, etc.) |
| | Required | Isometric Drawing Revision | Current revision of isometric drawing |

Discussion

- Attributes from the Line List can be pulled into the Isometric List by the associated line numbers.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------------|----------------|---------------------------------------|
| <i>Project ID</i> | 90000801 | 1684972 |
| <i>Isometric Drawing</i> | LB-0900-01-010 | 0-1201-001-02 |
| <i>Line Number(s)</i> | 0900 | 0-SYNP-28"-1201-001-SCFR94-R2.2-WS150 |
| <i>CWA</i> | CWA-001 | 1A70 |
| <i>CWP</i> | CWP-PI-001 | 1A7001X |
| <i>EWP</i> | EWP-PI-001 | 1A7001X |
| <i>Isometric Drawing Status</i> | IFC | Approved |
| <i>Isometric Drawing Revision</i> | 0 | A |

3.4.3. DR070-03: Tie-in List

Description: List of unique piping tie-ins

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, weekly through the end of Stage 2

Purpose

To define the master list of piping tie-ins associated with the data set(s).

Data Requirement Definition: Tie-in List

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tie-in ID | Unique tie-in identifier from engineering |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | Downtime | Is downtime required (i.e., yes or no)? |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | Hot Tap | Is hot tap required (i.e., yes or no)? |
| | Required | Isometric Drawing | Piping isometric drawing number |
| | Required | New | Is new line or equipment being tied in (i.e., yes or no)? |
| | Required | PID | Piping and instrumentation diagram drawing number |
| | Required | Tie-In Type | Tie-in connection type (e.g., weld, flange, threaded, etc.) |
| | Required | Sub-System ID | Unique turnover system identifier |
| | Optional | Comments | Comment section |
| | Optional | Plant Coordinate East | Plant coordinates east |
| | Optional | Plant Coordinate Elevation | Plant coordinates elevation |
| | Optional | Plant Coordinate North | Plant coordinates north |
| | Optional | Real World East | Real-world coordinates east |
| | Optional | Real World Elevation | Real-world coordinates elevation |
| | Optional | Real World North | Real-world coordinates north |
| | Optional | Tie-In Category | Gross connection category (e.g., module to module, module to stick built, etc.) |

Discussion

- The intent of the *New* field is to flag when a tie-in is added after a certain agreed-upon milestone (e.g., IFC or Released to construction).

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------------|-----------------------|-----------------------|
| <i>Project ID</i> | 90000801 | 1684972 |
| <i>Tie-in ID</i> | T-401 | T-002 |
| <i>CWA</i> | CWA-001 | 1A70 |
| <i>CWP</i> | CWP-PI-001 | 1A7001X |
| <i>EWP</i> | EWP-PI-001 | 1A7001X |
| <i>Downtime</i> | Yes | No |
| <i>Construction Requirement</i> | Existing | New |
| <i>Hot Tap</i> | Yes | No |
| <i>Isometric Drawing</i> | LB-0900-01-010-X | 0-1201-001-02-TP |
| <i>New</i> | Yes | No |
| <i>PID</i> | PD-01-1658-001 | &AA-12-P-FP 0010 (EN) |
| <i>Tie-In Type</i> | Buttweld | Bolt-up |
| <i>Sub-System ID</i> | 13-01 | AA |
| <i>Comments</i> | sdfasdfsdf | asdfsdfsdf |
| <i>Plant Coordinate East</i> | E.1037-6" | E.1037-6" |
| <i>Plant Coordinate Elevation</i> | EL 27' 6" | EL 27' 6" |
| <i>Plant Coordinate North</i> | N.932-3" | N.932-3" |
| <i>Real World East</i> | -95°09'57.7"E | -95°09'57.7"E |
| <i>Real World Elevation</i> | 10' | 0' |
| <i>Real World North</i> | 29°28'08.8"N | 29°28'08.8"N |
| <i>Tie-In Category</i> | Module to stick built | New to existing |

3.4.4. DR070-04: Pipe Support List

Description: List of unique piping supports

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, weekly through the end of Stage 2

Purpose

To define the master list of piping supports associated with the data set(s).

Data Requirement Definition: Pipe Support List

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Support Group ID | Unique identifier for pipe support |
| PK | Required | Isometric Drawing | Piping isometric drawing number |
| | Required | CWP | Unique construction work package identifier |
| | Required | Support Quantity | Quantity of support |
| | Required | Support Type | Type of support |
| | Required | PO | Purchase order number |
| | Optional | Support Description | Description of the support |
| | Optional | Support Size | Size of the pipe support (or size of item being supported) |
| | Optional | Support Size UOM | Unit of measurement for pipe support size |
| | Optional | Support Tag | Unique tag number assigned to identify the project item |

Discussion

- Includes piping standard supports, while miscellaneous special supports might be treated as structures.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------|-----------------------|-----------------------|
| <i>Project ID</i> | 90000801 | 1684972 |
| <i>Support Group ID</i> | GS-20001-001-AS5C | 42-FW-10010-A01 |
| <i>Isometric Drawing</i> | GS-20001-001 | 42-FW-10010-A01 |
| <i>CWP</i> | 4102AS120A | 4202FS058A |
| <i>Support Quantity</i> | 2 | 1 |
| <i>Support Type</i> | Shoe | F17 |
| <i>PO</i> | PGS-SUPP-001 | TBD |
| <i>Support Description</i> | Shoe | Design Pipe Support |
| <i>Support Size</i> | 3 | 2 |
| <i>Support Size UOM</i> | In | In |
| <i>Support Tag</i> | AS5C-01, AS5C-02 | SH-1460-02 |

3.5. DR080 – 3D Modeling

General discussion for 3D modeling data requirements:

- The intent is for the 3D model components to be captured on two lists (Piping and Generic).
- Length and weight are required due to downstream use (e.g., lift plans, etc.).
- Some fields are required for AWP, but many are optional and may not natively live inside the model but can be related to component identifiers in other tools.

3.5.1. DR080-01: Pipe Components

Description: Piping component list

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, weekly through the end of Stage 2

Purpose

To define detailed piping design component data set(s).

Data Requirement Definition: Pipe Components

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Commodity Code | Commodity code |
| | Required | Type | Type of item (e.g., spool, weld, foundation, mechanical equipment, instrument, cable tray, etc.) |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Optional | Design System Path | Hierarchy placement of the model component in the design hierarchy or system breakdown structure (SBS) |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Optional | Fluid Code (Service) | Line service designation |
| | Required | Isometric Drawing | Piping isometric drawing number |

Data Requirement Definition: Pipe Components (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------------|--|
| | Optional | Module | Module the pipe component belongs to, when applicable |
| | Optional | Length | Length of the item |
| | Optional | Length UOM | Unit of measurement for length of the item (e.g., FT, M, etc.) |
| | Optional | Weight | Weight of the item |
| | Optional | Weight UOM | Unit of measurement for weight of the item (e.g., TN, Lbs, MT, Kg, etc.) |
| | Optional | Insulation Spec | Insulation specification of the item |
| | Optional | Insulation Thickness | Insulation thickness of the item |
| | Optional | Insulation Thickness UOM | Unit of measurement for insulation thickness (e.g., In, MM, etc.) |
| | Optional | Line No. | Unique line number sequence |
| | Optional | NPD – Size 1 | Nominal pipe diameter 1 – pipe size at a first connection |
| | Optional | NPD – Size 2 | Nominal pipe diameter 2 – pipe size at a second connection |
| | Optional | NPD – Size 3 | Nominal pipe diameter 3 – pipe size at a third connection (for a tee) |
| | Optional | Pipe Components Description | Description of the item in the 3D design model |
| | Optional | Pressure Rating 1 | Pipe pressure rating 1 – at a first connection |
| | Optional | Pressure Rating 2 | Pipe pressure rating 2 – at a second connection |
| | Optional | Pressure Rating 3 | Pipe pressure rating 3 – at a third connection (three-way valve) |
| | Optional | Pressure Rating UOM | Unit of measurement for pressure rating (e.g., PSI, bar, Pa) |
| | Optional | Temperature Rating 1 | Pipe temperature rating 1 – at a first connection |
| | Optional | Temperature Rating 2 | Pipe temperature rating 2 – at a second connection |
| | Optional | Temperature Rating 3 | Pipe temperature rating 3 – at a third connection (three-way valve) |
| | Optional | Temperature Rating UOM | Unit of measurement for temperature rating (e.g., F°, C°) |
| | Optional | Schedule 1 | Nominal pipe schedule 1 – schedule or thickness of pipe at a first connection |
| | Optional | Schedule 2 | Nominal pipe schedule 2 – schedule or thickness of pipe at a second connection |

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------|---|
| | Optional | Schedule 3 | Nominal pipe schedule 3 – schedule or thickness of pipe at a third connection (for a tee) |
| | Optional | Shop/Field Flag | Indicates shop or field material |
| | Optional | Spec | Piping specification |
| | Optional | Tie-In ID | Unique tie-in identifier from engineering |
| | Optional | Test Package ID | Unique test package identifier (e.g., hydrotest package) |
| | Optional | Train | Process train designation |
| | Optional | Sub-System ID | Unique turnover system identifier |
| | Required | PID | Piping and instrumentation diagram drawing number |
| | Required | Piping Material Type | Type of piping material |
| | Optional | Paint Code | Code that provides the paint color and mill thickness requirements |
| | Required | Weld Type | Type of weld |
| | Optional | Heat Trace | Heat trace |
| | Optional | Test Type | Type of test |
| | Optional | Inspection Test Plan | Inspection test plan |
| | Optional | From Tag | Tag number that this specific Tag is connected from |
| | Optional | To Tag | Tag number that this specific Tag is connected to |

Discussion

- *Tag Number* is considered the primary key to pull needed information from authoring tools and project executions systems; however, it is recognized that a tag item might be modeled as a group of components, where each component has a unique OID.
- Workforce planners will need to be able to build IWPs. Typically, they plan and construct by *Spool*, *Field/Field-Fit Welds*, and *Bolt Up*. They also need to know the *Valve Tags*, *Instrument Tags*, *SP Items*, and *Equipment Nozzles*. Such “Tags” shall be available in the 3D model to allow work packaging and to allow the data link with other project systems for visualization.
- *NPD – Size 1* is used for the primary size. *NPD – Size 2* and *NPD – Size 3* are used only when necessary.
- The model OID tag is different from the tag when represented elsewhere (e.g., on a P&ID), but this field is flexible. It can be the parent assembly tag or the object tag. This allows the 3D OID tag to be related to the Item tag as it is known elsewhere.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|------------------------------------|---|--|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Tag</i> | SP-P22L08-SN-784153-1-01 | UL08-JN784153-191-03 |
| <i>Commodity Code</i> | T02BCC24Z58 | F-9A-234Z44 |
| <i>Type</i> | Spool | Field Weld |
| <i>Construction Requirement</i> | New | New |
| <i>CWA</i> | CWA01 | A2 |
| <i>CWP</i> | CWP-0012-00A1-Pipe | A2-C-P-02 |
| <i>EWP</i> | EWP-0012-00A1-Pipe | A2-E-P-02 |
| <i>Design System Path</i> | P4019\CHEMICAL South – SPV\IVSU – SPV – OU\ Piping\S14S01\OH-7086005\ OH-7086895-6"-D3A-4HV | P890\Ref – HT\JNK – HT – STM\Piping\C115602\ BB-70546040\BB-08455-8"- DD2A-99B |
| <i>Discipline</i> | Piping | Piping |
| <i>Fluid Code (Service)</i> | CG | WCA |
| <i>Isometric Drawing</i> | P22L08-SN-784153-1 | UL08-JN784153-191 |
| <i>Module</i> | – | PAU-A2-P02 |
| <i>Length</i> | 14 | – |
| <i>Length UOM</i> | FT | – |
| <i>Weight</i> | 265.86 | 89.36 |
| <i>Weight UOM</i> | Lbs | Kg |
| <i>Insulation Spec</i> | – | FG-89-Z-12 |
| <i>Insulation Thickness</i> | 0 | 5 |
| <i>Insulation Thickness UOM</i> | – | MM |
| <i>Line No..</i> | O-70536001-6"-D1A-3TM | P-415641-8"-D22-002 |
| <i>NPD – Size 1</i> | 6 | 8 |
| <i>NPD – Size 2</i> | – | – |
| <i>NPD – Size 3</i> | – | – |
| <i>Pipe Components Description</i> | PIPE – A672-C60 PE EFW CL.22 T02BCC24Z58 S-STD | WN FLANGE ASME B16.5 300# A105 RFFE BE 125 – 250 AARH F-9A-234Z44 S-XS |
| <i>Pressure Rating 1</i> | 304 | 4510.87 |
| <i>Pressure Rating 2</i> | – | – |
| <i>Pressure Rating 3</i> | – | – |
| <i>Pressure Rating UOM</i> | PSIG | PSIG |

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-------------------------------|--------------------------|-------------------------|
| <i>Temperature Rating 1</i> | 302 | 662.00 |
| <i>Temperature Rating 2</i> | – | – |
| <i>Temperature Rating 3</i> | – | – |
| <i>Temperature Rating UOM</i> | F° | F° |
| <i>Schedule 1</i> | 40 | 40 |
| <i>Schedule 2</i> | – | – |
| <i>Schedule 3</i> | – | – |
| <i>Shop/Field Flag</i> | Shop | Shop |
| <i>Spec</i> | D1A-3 | U1-7A |
| <i>Tie-In ID</i> | – | TC-129 |
| <i>Test Package ID</i> | TP.ETH2.2A.029 | HT-A2-29-001 |
| <i>Train</i> | 1 | 2 |
| <i>Sub-System ID</i> | ET-00012-1 | HGT-DKD-2001 |
| <i>PID</i> | PID-001 | 42-PID-405000-011 |
| <i>Piping Material Type</i> | Carbon Steel | Stainless Steel |
| <i>Paint Code</i> | Green (14-E-53) | Signal Red (04-E-53) |
| <i>Weld Type</i> | – | FW |
| <i>Heat Trace</i> | HC | – |
| <i>Test Type</i> | Hydrotest | X-Ray |
| <i>Inspection Test Plan</i> | PLN-PIP-001 | 425-DFC-TTTT-0001 |
| <i>From Tag</i> | EQP-P22L08 | SP-UL08-JN784153-191-02 |
| <i>To Tag</i> | SP-P22L08-SN-784153-1-02 | SP-UL08-JN784153-191-03 |

3.5.2. DR080-02: Generic Components

Description: Generic component list

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, weekly through the end of Stage 2

Purpose

To define detailed generic design component data set(s).

Data Requirement Definition: Generic Components

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | Module | Module the tag belongs to, when applicable |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | Description | Description of the Tag function |
| | Required | Design System Path | Hierarchy placement of the model component in the design hierarchy or system breakdown structure (SBS) |
| | Optional | BOM Number | Bill of materials number |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Required | Type | Type of item (e.g., foundation, mechanical equipment, instrument, cable tray, etc.) |
| | Required | Commodity Code | Commodity code |
| | Required | Qty | Key quantity of the item |
| | Required | Qty UOM | Unit of measurement for key quantity of the item (e.g., FT, M, M ³ , PC) |
| | Optional | Length | Length of the item |
| | Optional | Length UOM | Unit of measurement for length of the item (e.g., FT, M, etc.) |
| | Optional | Width | Width of the item |
| | Optional | Width UOM | Unit of measurement for width of the item (e.g., FT, M, etc.) |
| | Optional | Height | Height of the item |
| | Optional | Height UOM | Unit of measurement for height of the item (e.g., FT, M, etc.) |

| Key | Tier | Field Name | Definition |
|-----|----------|---------------|--|
| | Optional | Weight | Weight of the item |
| | Optional | Weight UOM | Unit of measurement for weight of the item (e.g., TN, Lbs, MT, Kg, etc.) |
| | Optional | Parent Tag | Parent tag associated to the item, if applicable |
| | Optional | Tie-In ID | Unique tie-in identifier from engineering |
| | Optional | Train | Process train designation |
| | Optional | Sub-System ID | Unique turnover system identifier |
| | Optional | PID | Piping and instrumentation diagram drawing number |

Discussion

- The *Tag* number is considered the primary key to pull needed information from authoring tools and project executions systems; however, it is recognized that a tag item might be modeled as a group of components, where each component has a unique OID.
- The model OID tag is different from the tag when represented elsewhere (e.g., on a P&ID), but this field is flexible. If needed, it can be the parent assembly tag or the object tag. It allows the 3D OID tag to be related to the item tag as it is known elsewhere.
- Quantity varies depending on the type of item: for foundations, it can be the volume; for cable trays, the length; for equipment or a device, it is typically a piece.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------------|---|--|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Tag</i> | NW-E-3207 | ETH-D-3104 |
| <i>CWA</i> | CWA0A1 | B1200 |
| <i>CWP</i> | CWP-0012-00A1-Mechanical-E3207 | A2-C-E-02 |
| <i>EWP</i> | EWP-0012-00A1-Mechanical-E3207 | A2-E-E-02 |
| <i>Module</i> | – | PAU-A2-P02 |
| <i>Construction Requirement</i> | New | New |
| <i>Description</i> | R2 FEED Cooler | Junction Box |
| <i>Design System Path</i> | P4018\CHEMICALS NORTH – NW\IVSC – NW – Catalyst Prep and Polymerization\Equipment\0A01\0A01 | P4018\CHEMICALS NORTH – B1200\IVSF – JNK – Feeds\Equipment\B1200 |

Sample Entries (continued)

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------|-----------------|---------------------|
| <i>BOM Number</i> | NW-E-3207-TAG | A2-C-E-02-ELE |
| <i>Discipline</i> | Mechanical | Electrical |
| <i>Type</i> | Equipment | Devices & Fixtures |
| <i>Commodity Code</i> | NW-E-3207 | 526485987 |
| <i>Qty</i> | 1 | 1 |
| <i>Qty UOM</i> | Pc | Each |
| <i>Length</i> | 172-5/8 | 4.285 |
| <i>Length UOM</i> | Inch | M |
| <i>Width</i> | 12-5/8 | 2.85 |
| <i>Width UOM</i> | Inch | M |
| <i>Height</i> | 17-5/8 | 4.5 |
| <i>Height UOM</i> | Inch | M |
| <i>Weight</i> | 17,318 | 2,489.2 |
| <i>Weight UOM</i> | Lbs | Kg |
| <i>Parent Tag</i> | NW-E-32 | – |
| <i>Tie-In ID</i> | – | – |
| <i>Train</i> | – | 2 |
| <i>Sub-System ID</i> | DF-22-22-05 | HE-555-055-001 |
| <i>PID</i> | 51-DTI-50-00001 | 40-PID-000-000-0001 |

3.6. DR090 – Civil-Structural Design

3.6.1. DR090-01: Structures List

Description: Structures list

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the master list of structures.

Data Requirement Definition: Structures List

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Structure Tag | Unique tag number assigned to identify a project item |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | Structure Description | Description of structure (e.g., cylinder purging, purging platform, etc.) |
| | Required | Structure Type | Type of structure (e.g., building, process, rack, platform, MPS, etc.) |
| | Optional | Detailing Contract/PO | Detailing contract number or purchase order |
| | Optional | Fabrication Contract/PO | Fabrication contract number or purchase order |
| | Optional | Structure Revision | Current revision |

Discussion

- Optional fields (*Detailing Contract/PO* and *Fabrication Contract/PO*) may not be done by the same party, which the CWP may not capture; only include if necessary.
- Project to work through specific implementations where a single structure spans through multiple CWPs or even CWAs.
- Revision attributes are used when a fully data integrated AWP process is used.

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|---------------------------------|-----------------------|----------------------------|
| <i>Project ID</i> | DD 031779 | FF 357162 |
| <i>Structure Tag</i> | UR14-4 | STR-2709 |
| <i>Construction Requirement</i> | New | New |
| <i>CWA</i> | 40 | 60 |
| <i>CWP</i> | S1601B-2.5-40-02 | S1501C-2.5-60-01 |
| <i>EWP</i> | S1601B-2.5 | S1501C-2.5 |
| <i>Structure Description</i> | North/South Pipe Rack | Blending Structure Level 3 |
| <i>Structure Type</i> | Rack | Building |
| <i>Detailing Contract/PO</i> | 2802 | 2803 |
| <i>Fabrication Contract/PO</i> | 3512 | 3516 |
| <i>Structure Revision</i> | 01 | 02 |

3.6.2. DR090-02: Rebar

Description: Rebar

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the master list of rebar.

Data Requirement Definition: Rebar List

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Bar Mark | Mark of the bar |
| PK | Required | Related Foundation Tag | Related foundation tag |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | CWP | Unique construction work package identifier |
| | Required | Drawing Number | Location drawing number |
| | Required | Bar Quantity | Quantity of rebar required |
| | Required | Bar Quantity UOM | Unit of measurement for quantity of rebar required |
| | Required | Bar Diameter | Diameter of rebar required |
| | Required | Bar Diameter UOM | Unit of measurement for diameter of rebar required |
| | Required | Bar Length | Length of rebar required |
| | Required | Bar Length UOM | Unit of measurement for length of rebar required |
| | Required | Bar Weight | Weight of rebar required |
| | Required | Bar Weight UOM | Unit of measurement for weight of rebar required |
| | Required | Bar Type/Shape/Detail | Description of rebar required |
| | Required | PO | Purchase order number |

Discussion

- Typically, rebar is a fabricated item similar to steel or pipe. Each rebar has a mark number on the drawing. A mark number may be unique or there may be many with the same mark number. The drawings will be issued to a rebar fabricator responsible for the concrete work. Appropriate tagging information will ensure that the right rebar will be fabricated and delivered in the required sequence to support the path of construction.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------------|------------------|------------------|
| <i>Project ID</i> | DD 031779 | FF 357162 |
| <i>Bar Mark</i> | 20 | STR-2709-120 |
| <i>Related Foundation Tag</i> | UR14-4 | STR-2709 |
| <i>Construction Requirement</i> | New | New |
| <i>CWP</i> | S1601B-2.5-40-02 | S1501C-2.5-60-01 |
| <i>Drawing Number</i> | CSA-DWG-LAY-001 | S1-SSS-STR-010 |
| <i>Bar Quantity</i> | 13 | 38 |
| <i>Bar Quantity UOM</i> | each | pc |
| <i>Bar Diameter</i> | 1/2 | 20 |
| <i>Bar Diameter UOM</i> | in | m |
| <i>Bar Length</i> | 6-9 7/8 | 40 |
| <i>Bar Length UOM</i> | ft-in | ft |
| <i>Bar Weight</i> | 64 | 109.27 |
| <i>Bar Weight UOM</i> | lb | lb |
| <i>Bar Type/Shape/Detail</i> | 17.PNG | 32 |
| <i>PO</i> | DD-031779-030 | STR-2709-010 |

3.6.3. DR090-03: Anchor Bolts

Description: Anchor bolts

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the master list of anchor bolts.

Data Requirement Definition: Anchor Bolts List

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Structure Tag | Unique tag number assigned to identify a project item |
| PK | Required | Anchor Bolt ID | Unique identifier of the anchor bolt |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | CWP | Unique construction work package identifier |
| | Required | Drawing Number | Location drawing number |
| | Required | Anchor Bolts | Type of anchor bolts required |
| | Required | Bolt Dia | Diameter of bolts |
| | Required | Bolt Dia UOM | Unit of measurement for bolt diameter |
| | Required | No. of Anchor Bolts | Number of anchor bolts required |
| | Required | Bolt Length | Length of bolts required |
| | Required | Bolt Length UOM | Unit of measurement for bolt length |
| | Required | Projection Length | Projection length |
| | Required | Projection Length UOM | Unit of measurement for projection length |

Discussion

- N/A

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------------|-------------------|------------------------|
| <i>Project ID</i> | DD 031779 | FF 357162 |
| <i>Structure Tag</i> | UR14-4 | STR-2709 |
| <i>Anchor Bolt ID</i> | 01 | 10003 |
| <i>Construction Requirement</i> | New | New |
| <i>CWP</i> | S1601B-2.5-40-02 | S1501C-2.5-60-01 |
| <i>Drawing Number</i> | 40-STD-SSS-000101 | 51-001-0-SSSS-FND-0019 |
| <i>Anchor Bolts</i> | L-shaped | Headed |
| <i>Bolt Dia</i> | 3/8 | 1 |
| <i>Bolt Dia UOM</i> | in | in |
| <i>No. of Anchor Bolts</i> | 4 | 6 |
| <i>Bolt Length</i> | 1.78 | 4.69 |
| <i>Bolt Length UOM</i> | ft | ft |
| <i>Projection Length</i> | 2 | 5 |
| <i>Projection Length UOM</i> | in | in |

3.6.4. DR090-04: Foundations

Description: Foundations

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the master list of concrete foundations.

Data Requirement Definition: Foundations List

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Foundation Tag | Unique tag number assigned to identify a project item |
| | Required | Related Structure/ Equipment Tag | Related structure or equipment tag |
| | Required | CWP | Unique construction work package identifier |
| | Required | Drawing Number | Location drawing number |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | Concrete Volume | Volume of concrete |
| | Required | Concrete Volume UOM | Unit of measurement for the volume of concrete |
| | Required | Foundation Type | Type of foundation (e.g., foundation, pedestal, deck, elevated slab) |
| | Required | Concrete Strength | Strength of the concrete |
| | Required | Concrete Strength UOM | Unit of measurement for the strength of the concrete |

Discussion

- Typically, each foundation has a tag to clearly identify segments (e.g., footing, caps, piers, slabs, grout). All foundations are installed separately, so the craft must know the size, concrete volume, and rebar for each.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---|-----------------------|-----------------------|
| <i>Project ID</i> | DD 031779 | FF 357162 |
| <i>Foundation Tag</i> | UR14-4 | STR-2709 |
| <i>Related Structure/ Equipment Tag</i> | EQP-UR14-4 | PR-2709 |
| <i>CWP</i> | S1601B-2.5-40-02 | S1501C-2.5-60-01 |
| <i>Drawing Number</i> | 10-FND-1010-10002 | 3000-SSS-TTT-RR-00020 |
| <i>Construction Requirement</i> | New | New |
| <i>Concrete Volume</i> | 200 | 50 |
| <i>Concrete Volume UOM</i> | m ³ | m ³ |
| <i>Foundation Type</i> | Pier | Pad |
| <i>Concrete Strength</i> | 725 | 1087 |
| <i>Concrete Strength UOM</i> | psi | psi |

3.7. DR100 – Electrical & Instrumentation Design

3.7.1. DR100-01: Cable Schedule

Description: Cable schedule

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To capture master cable schedule data for the project.

Data Requirement Definition: Cable Schedule

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Cable Tag | Unique tag number assigned to identify a project item |
| | Required | Description | Description of the Tag function |
| | Required | Cable Status | Progress status of cable writing/routing process (e.g., written, checked, routed, route checked, released to construction) |
| | Required | Cable Type | Gives the engineered description of the type of cable (e.g., controls, high voltage, etc.) |
| | Required | Color Code | Industry color code for conductor designations |
| | Required | Conductors Config | Configuration of the conductors within the cable (e.g., single conductor, pairs, etc.) |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | Cable Route | List of what cable runs through (e.g., cable tray, conduit, etc.) |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | Cable Schedule | Cable schedule document number |
| | Required | Cable Schedule Revision | Current revision of the cable schedule document |
| | Required | Layout Drawing – From | Number of layout drawing where a user will be able to locate the “From Tag” |
| | Required | Layout Dwg From Rev | Layout drawing – from revision |

Data Requirement Definition: Cable Schedule (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------------|---|
| | Required | Layout Drawing – To | Number of layout drawing where a user will be able to locate the “To Tag” |
| | Required | Layout Dwg To Rev | Layout drawing – to revision |
| | Required | Length Engineered | Estimated design length of the cable |
| | Required | Length Pull | Actual length of the cable |
| | Required | Length UOM | Unit of measurement for length of the cable (e.g., F, IN, M, etc.) |
| | Required | Number | Number of actual conductors/pairs/triads within the cable |
| | Required | Shield | Shielding type (e.g., IS = inside shield and OS = outside shield) |
| | Required | Conductor Size | Size of the conductor cable |
| | Required | Conductor Size UOM | Unit of measurement for cable size (e.g., AWG/American wire gauge, metric mm, etc.) |
| | Required | Voltage Rating | Voltage rating of the cable’s jackets |
| | Required | From Equipment | Equipment tag that circuit originates from (e.g., junction box, etc.) |
| | Required | To Equipment | Equipment tag that circuit terminates at (e.g., pump, etc.) |
| | Required | From Equipment Termination Type | Type of connection for the “From Equipment” side (e.g., hard wire, plug and socket, etc.) |
| | Required | To Equipment Termination Type | Type of connection for the “To Equipment” side (e.g., hard wire, plug and socket, etc.) |
| | Optional | Discipline | Discipline responsible for the engineering design |
| | Optional | Comments | Any comments related to the cable from engineering |
| | Required | Cable Drum Number | Cable drum number |
| | Required | Cable Gland Size | Cable gland size |
| | Required | Cable Gland Size UOM | Unit of measurement for cable gland size |
| | Required | Cable Routing Drawings | Cable routing drawings |
| | Required | Cable Joint | Cable joint |
| | Required | Cable Installation Details | Cable installation details |

Discussion

- Cable schedule data requirements are expected to include data from electrical, instrumentation, and controls. It is up to the project on how to structure their data tables to support this.
- The *Shield* field is not intended to determine man-hours, but for identifying the right type of cable. This will affect the size of the connector for a cable.
- The *From Equipment* and *To Equipment* fields are used to track the equipment's electrical connections for filtering purposes.
- Conduit and raceway tags are typically included as a CSV list per cable for associating to all raceways and conduits that the cable touches.
- *Cable Status* should include "Released to Construction." Tracking when an engineer modifies a cable already released to construction is imperative.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------------|--|--|
| <i>Project ID</i> | 1234 | 5678 |
| <i>Cable Tag</i> | 111-000-ESM-61201-CMV100-3A | 111-000-ESM-61201-CEG100-3G |
| <i>Description</i> | Power cable for amine electrical building switchgear (111-000-ESM-61201) | Power cable for amine electrical building switchgear (111-000-ESM-61201) |
| <i>Cable Status</i> | Route Checked | Written |
| <i>Cable Type</i> | MV05-1C500 | GN06-1C4/0 |
| <i>Color Code</i> | EC2 (black) | EC1 (green) |
| <i>Conductors Config</i> | Single | Single |
| <i>Construction Requirement</i> | New | Existing |
| <i>Cable Route</i> | T1-1603-100 D52016 111-000-EPB-61004 D52116 111-000-EPB-61005 D52016 T1-1901-100 | T1-1603-100 D52016 111-000-EPB-61004 D52116 111-000-EPB-61005 D52016 T1-1901-100 |
| <i>CWA</i> | CWA-A2 | CWA-A2 |
| <i>CWP</i> | CWP-A2-ELE-01 | CWP-A2-ELE-01 |
| <i>EWP</i> | EWP-A2-ELE-01 | EWP-A2-ELE-01 |
| <i>Cable Schedule</i> | CX-100000-ELE-KXX-10000 | CX-100000-ELE-KXX-10000 |
| <i>Cable Schedule Revision</i> | 000 | 001 |
| <i>Layout Drawing – From</i> | CX-100000-ELE-SLN-KXX-21200-001 | CX-100000-ELE-SLN-KXX-21200-001 |

Sample Entries (continued)

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--|------------------------------------|------------------------------------|
| <i>Layout Dwg From Rev</i> | 000 | 001 |
| <i>Layout Drawing – To</i> | CX-100000-ELE-SLN-KXX-21200-002 | CX-100000-ELE-SLN-KXX-21200-002 |
| <i>Layout Dwg To Rev</i> | 000 | 001 |
| <i>Length Engineered</i> | 25 | 110 |
| <i>Length Pull</i> | 35 | 100 |
| <i>Length UOM</i> | FT | FT |
| <i>Number</i> | 1 | 1 |
| <i>Shield</i> | IS | OS |
| <i>Conductor Size</i> | 14 | 18 |
| <i>Conductor Size UOM</i> | AWG | AWG |
| <i>Voltage Rating</i> | 240 | 240 |
| <i>From Equipment</i> | 111-000-ESM-61001 | 111-000-ESM-61001 |
| <i>To Equipment</i> | 111-000-ESM-61201 | 111-000-ESM-61201 |
| <i>From Equipment Termination Type</i> | Hard Wire | Hard Wire |
| <i>To Equipment Termination Type</i> | Hard Wire | Plug and Socket |
| <i>Discipline</i> | ELE | ELE |
| <i>Comments</i> | 4.16KV FEED TO S. STORM SWGR 61201 | 4.16KV FEED TO S. STORM SWGR 61201 |
| <i>Cable Drum Number</i> | D-1000-01 | D-1010-01 |
| <i>Cable Gland Size</i> | 20 | 40 |
| <i>Cable Gland Size UOM</i> | MM | MM |
| <i>Cable Routing Drawings</i> | DWG-001, DWG-002, DWG-003 | DWG-101, DWG-002, DWG-030 |
| <i>Cable Joint</i> | CCSJ | CCSK |
| <i>Cable Installation Details</i> | IBS-001 | DX-528 |

3.7.2. DR100-02: Electrical Equipment

Description: List of electrical equipment

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To capture a master list of electrical equipment on the project.

Data Requirement Definition: Electrical Equipment

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Description | Description of the Tag function |
| | Required | Tag Status | Which engineering phase the tag is in |
| | Required | Equipment Type | Type of equipment (e.g., motor, junction box, etc.) |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | Manufacturer | Manufacturer of tagged item |
| | Optional | Supplier | Supplier of tagged item |
| | Required | Serial Number | Serial number of tagged item |
| | Required | Catalog Number | Model number |
| | Required | Equipment Layout Drawing | Electrical layout drawing |
| | Required | Equipment Layout Drawing Revision | Equipment layout drawing revision |
| | Required | PO | Purchase order number |
| | Required | Skid | Skid tag number the equipment is part of |
| | Required | Sub-System ID | Unique turnover sub-system identifier |
| | Optional | Test Package ID | Unique test package identifier (e.g., hydrotest package) |
| | Optional | Equipment Location Plan | Number of location drawing (e.g., B01-xxxx-yyyyy) |
| | Optional | Weight | Weight of the item |

Data Requirement Definition: Electrical Equipment (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|------------------------------------|---|
| | Optional | Weight UOM | Unit of measurement for item weight (e.g., TN, Lbs, MT, Kg, etc.) |
| | Required | Vendor Drawing | Vendor drawing |
| | Required | Vendor Drawing Revision | Vendor drawing revision |
| | Required | Equipment Standard Detail Drawing | Equipment standard detail drawing |
| | Required | Equipment Standard Detail Revision | Current revision of the equipment standard detail drawing |

Discussion

- The *Serial Number* is data that may not be available until after PO delivery to site, but it is crucial information for AWP through turnover.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--|---|---|
| <i>Project ID</i> | 1234 | 5678 |
| <i>Tag</i> | JB-12673 | 480-MCC-1A-10 |
| <i>Description</i> | Junction box in amine electrical building | Compressor auxiliary motor MCC for Propane Cryo Unit (1401-A) |
| <i>Tag Status</i> | In Design | Released to Construction |
| <i>Equipment Type</i> | Junction Box | Motor Control Center |
| <i>CWA</i> | CWA-A2 | CWA-A2 |
| <i>CWP</i> | CWP-A2-ELE-01 | CWP-A2-ELE-01 |
| <i>EWP</i> | EWP-A2-ELE-01 | EWP-A2-ELE-01 |
| <i>Manufacturer</i> | Crouse Hinds | Eaton |
| <i>Supplier</i> | McMaster | Eaton |
| <i>Serial Number</i> | 32164698789312 | 315598745 |
| <i>Catalog Number</i> | 1041N351 | FZ206EEASC12P57 |
| <i>Equipment Layout Drawing</i> | CX-100000-ELE-SLN-KXX-21200-001 | CX-100000-ELE-SLN-KXX-21200-001 |
| <i>Equipment Layout Drawing Revision</i> | 000 | 001 |
| <i>PO</i> | 1234-POA-00123 | 5678-POA-00123 |

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---|-----------------------------------|-----------------------------------|
| <i>Skid</i> | 123000-XXX | — |
| <i>Sub-System ID</i> | 12-01 | 14-08 |
| <i>Test Package ID</i> | TP-11111 | TP-11111 |
| <i>Equipment Location Plan</i> | CX-100000-ELE-SLN-KXX-21200-001 | CX-100000-ELE-SLN-KXX-21200-001 |
| <i>Weight</i> | 30 | 1500 |
| <i>Weight UOM</i> | lbs | lbs |
| <i>Vendor Drawing</i> | SUPP-100000-ELE-SLN-KXX-21200-101 | DCKS-100000-ELE-SLN-KXX-21200-001 |
| <i>Vendor Drawing Revision</i> | 1 | X01 |
| <i>Equipment Standard Detail Drawing</i> | EQP-100000-ELE-SLN-KXX-21200-001 | CX-SLN-KXX-21200-001 |
| <i>Equipment Standard Detail Revision</i> | 2 | W01 |

3.7.3. DR100-03: Instrument Index

Description: List of instruments

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, weekly through the end of Stage 2

Purpose

To capture a master list of instrumentation on the project.

Data Requirement Definition: Instrument Index

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Description | Description of the Tag function |
| | Required | Tag Status | Which engineering phase the tag is in |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | IWP | Unique installation work package identifier |
| | Optional | Related Tag | Equipment or line number tag associated with the item |
| | Optional | I/O Type | Input/output type |
| | Required | Instrument Type | Type of the instrument |
| | Required | Location | Location details of the instrument in the plant facility |
| | Optional | Manufacturer | Manufacturer of tagged item |
| | Required | PID | Piping and instrumentation diagram drawing number |
| | Optional | Instrument Revision | Revision number of instrument design |
| | Required | PO | Purchase order number |
| | Optional | Requisition Number | Material requisition number for the item |
| | Required | Service | Process service associated with the item |
| | Optional | Sub-System ID | Unique turnover sub-system identifier |
| | Optional | Test Package ID | Unique test package identifier (e.g., hydrotest package) |
| | Optional | Model Number | Manufacturer model number |
| | Optional | Remarks | Any remarks or notes |

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------------------|---|
| | Optional | Face to Face | For inline instruments |
| | Optional | Instrument Rating | Rating of the instrument |
| | Optional | Weight | Weight of the item |
| | Optional | Weight UOM | Unit of measurement for item weight (e.g., TN, Lbs, MT, Kg, etc.) |
| | Optional | Control System Type | Type of control system (e.g., SIS, BPCS) |
| | Optional | Instrument Range | Minimum and maximum |
| | Required | Data Sheet Number | Data sheet number |
| | Required | Data Sheet Number Revision | Data sheet number revision |
| | Required | Hook-up Drawing Number | Hook-up drawing number |
| | Required | Hook-up Drawing Number Revision | Hook-up drawing number revision |
| | Required | Installation Drawing Number | Installation drawing number |
| | Required | Installation Drawing Number Revision | Installation drawing number revision |
| | Required | Location Layout Drawing | Location layout drawing |
| | Required | Location Layout Drawing Revision | Location layout drawing revision |

Discussion

- Many key relationships tie the instruments to related drawings, IWP, PO, major equipment, etc.
- Originating data source – typically lives in some sort of master index for the project within the engineer's tools.
- The *Location* field is used to indicate a specific geographical location, in addition to system/unit number.
- The Optional field's *Model Number* may not be known until after POs are issued.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------------|--|--|
| <i>Project ID</i> | 1234 | 5678 |
| <i>Tag</i> | 123000-LT | 154856-FM |
| <i>Description</i> | Level transmitter for V-1246 Amine coalescer | Analog Flow meter for V-1246 Amine coalescer |
| <i>Tag Status</i> | In Design | Released to Construction |
| <i>CWA</i> | CWA-A2 | CWA-A2 |
| <i>CWP</i> | CWP-A2-ELE-01 | CWP-A2-ELE-01 |
| <i>EWP</i> | EWP-A2-ELE-01 | EWP-A2-ELE-01 |
| <i>IWP</i> | IWP-A2-ELE-01-001 | IWP-A2-ELE-01-001 |
| <i>Related Tag</i> | V-1246 | V-1246 |
| <i>I/O Type</i> | Digital | Analog |
| <i>Instrument Type</i> | Level Transmitter (GWR) | Flow Meter |
| <i>Tag Location</i> | North West side of vessel at ground level | East side of vessel at 2 nd deck |
| <i>Manufacturer</i> | Emerson Rosemount | Yokogawa |
| <i>PID</i> | CX-000000-PIP-PID-00001 | CX-000000-PIP-PID-00001 |
| <i>Instrument Revision</i> | 000 | 001 |
| <i>PO</i> | 1234-POA-00123 | 5678-POA-00123 |
| <i>Requisition Number</i> | 1234-FMR-00123 | 5678-FMR-00123 |
| <i>Service</i> | Amine | Amine |
| <i>Sub-System ID</i> | 12-01-011 | 12-01-003 |
| <i>Test Package ID</i> | TP-11111 | TP-11111 |
| <i>Model Number</i> | 5300 | D-79660 |
| <i>Remarks</i> | Guided Wave Radar | Stainless, 0-700 bar |
| <i>Face to Face</i> | 20 | 40 |
| <i>Instrument Rating</i> | 150 | 600 |
| <i>Weight</i> | 2 | 5 |
| <i>Weight UOM</i> | kg | kg |
| <i>Control System Type</i> | SIS | BPCS |
| <i>Instrument Range</i> | 300LB | 600LB |
| <i>Data Sheet Number</i> | DH-12100 | DHS-101 |
| <i>Data Sheet Number Revision</i> | 1 | S1 |
| <i>Hook-up Drawing Number</i> | HKP-010 | HKP-25-2555 |

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---|-----------------------|-----------------------|
| <i>Hook-up Drawing Number Revision</i> | 2 | SW1 |
| <i>Installation Drawing Number</i> | INS-5823 | DDSD-855 |
| <i>Installation Drawing Number Revision</i> | F1 | G4 |
| <i>Location Layout Drawing</i> | LAY-000-42555-0001 | DWG-LAY-LOC-252 |
| <i>Location Layout Drawing Revision</i> | 1 | B |

3.7.4. DR100-04: Conduit

Description: List of conduit

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To capture a master list of conduits on the project.

Data Requirement Definition: Conduit

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Description | Description of the Tag function |
| | Required | Tag Status | Which engineering phase the tag is in |
| | Required | % Filled | Calculation showing the percentage of the tray/conduit that has been used |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Optional | Fitting Style | Fitting style of a conduit fitting (e.g., EMT, rigid, LR 90, LL 90, etc.) |
| | Optional | Fitting Type | Fitting type of a conduit fitting (e.g., straight thread, tapered thread, etc.) |
| | Optional | Conduit Part No. | Manufacturer's part number for the conduit |
| | Optional | Manufacturer | Manufacturer of tagged item |
| | Optional | From Tag | Tag number that the specific conduit is connected from |
| | Optional | To Tag | Tag number that the specific conduit is connected to |
| | Required | Layout Dwg – Ref 1 | Number of layout drawing that shows the conduit |
| | Required | Drawing Revision – Ref 1 | Revision of layout drawing 1 |
| | Optional | Layout Dwg – Ref 2 | Number of second layout drawing that shows the conduit |
| | Optional | Drawing Revision – Ref 2 | Revision of layout drawing 2 |

Data Requirement Definition: Conduit (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------|---|
| | Required | Length | Length of the item |
| | Required | Length UOM | Unit of measurement for length of the item |
| | Required | Nominal Diameter | Nominal diameter of a conduit |
| | Required | Diameter UOM | Unit of measurement for diameter of the item |
| | Required | Material Type | Type of material the conduit is made of (e.g., rigid metal, electro-metallic tubing, etc.) |
| | Optional | Max Conduit Filled % | Maximum percent fill the conduit is allowed under code |
| | Required | Voltage Type | Compatible voltages for circuits run in the conduit (e.g., segregation level: control, instrument, low/medium/high voltage, etc.) |

Discussion

- The project team determines the best breakdown for conduit tag numbers as either section or at the component level.
 - *Fitting Style*, *Fitting Type*, and *Conduit Part No.* are only useful if tagged at the component level.
- *From* and *To* are intended to be the tag numbers of the conduit/tray that a particular conduit number is physically connected to.

Sample Entries

| Field Name | Sample Entry 1 (section tag) | Sample Entry 2 (component tag) |
|---------------------------------|--|---|
| <i>Project ID</i> | 1234 | 5678 |
| <i>Tag</i> | C-12382 (section) | C-12382-E01 (section component) |
| <i>Description</i> | Medium Voltage Conduit for amine pumps | Control Conduit for amine instrumentation |
| <i>Status</i> | In Design | Released to Construction |
| <i>% Filled</i> | 40% | 60% |
| <i>Construction Requirement</i> | New | Existing |
| <i>CWP</i> | CWP-A2-ELE-01 | CWP-A2-ELE-01 |
| <i>EWP</i> | EWP-A2-ELE-01 | EWP-A2-ELE-01 |
| <i>Fitting Style</i> | – | LL 90 |
| <i>Fitting Type</i> | – | Elbow |
| <i>Conduit Part No</i> | – | 65215465 |
| <i>Manufacturer</i> | American Conduit | Allied |

Sample Entries (continued)

| Field Name | Sample Entry 1 (section tag) | Sample Entry 2 (component tag) |
|---------------------------------|----------------------------------|-----------------------------------|
| <i>From Tag</i> | C-12381 (conduit section) | C-12382 (parent conduit section) |
| <i>To Tag</i> | JB-12673 (junction box) | C-12382 (parent conduit section) |
| <i>Layout Dwg – Ref 1</i> | CX-100000-ELE-SLN-KXX-21200-001 | CX-100000-ELE-SLN-KXX-21200-001 |
| <i>Drawing Revision – Ref 1</i> | 000 | 001 |
| <i>Layout Dwg – Ref 2</i> | CX-100000-ELE-SLN-KXX-21200-002 | CX-100000-ELE-SLN-KXX-21200-002 |
| <i>Drawing Revision – Ref 2</i> | 000 | 001 |
| <i>Length</i> | 30 | 13 |
| <i>Length UOM</i> | FT | Inch |
| <i>Nominal Diameter</i> | 4 | 3 |
| <i>Diameter UOM</i> | Inch | Inch |
| <i>Material Type</i> | Electrical Metallic Tubing (EMT) | Galvanized Rigid Conduit (GRC) |
| <i>Max Conduit Filled %</i> | 70% | 65% |
| <i>Voltage Type</i> | Medium Voltage | Control |

3.7.5. DR100-05: Cable Tray

Description: List of cable tray

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To capture a master list of cable trays on the project.

Data Requirement Definition: Cable Tray

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Description | Description of the Tag function |
| | Required | Tag Status | Which engineering phase the tag is in |
| | Optional | % Filled | Calculation showing the percentage of the tray that has been used |
| | Required | Tray Type | Type of bottom of a tray (e.g., ladder, solid, etc.) |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | Cover Type | Type of tray cover, if necessary |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Optional | Manufacturer | Manufacturer of tagged item |
| | Optional | Tray Part Type | Type of tray piecemark (e.g., straight run, elbow, T, cross, etc.) |
| | Optional | Tray Part No. | Manufacturer's part number for the tray |
| | Optional | Style | Type of raceway that represents the tag (e.g., tray, snap track, etc.) |
| | Optional | From Tag | Tag number that the specific tray is connected from |
| | Optional | To Tag | Tag number that the specific tray is connected to |
| | Required | Layout Dwg – Ref 1 | Number of layout drawing that shows the conduit |
| | Required | Drawing Revision – Ref 1 | Revision of layout drawing 1 |

Data Requirement Definition: Cable Tray (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|--|
| | Optional | Layout Dwg – Ref 2 | Number of second layout drawing that shows the conduit |
| | Optional | Drawing Revision – Ref 2 | Revision of layout drawing 2 |
| | Required | Length | Length of the item |
| | Required | Length UOM | Unit of measurement for length of the item |
| | Required | Siderail Depth | Depth of the side rail on a tray |
| | Required | Siderail Depth UOM | Unit of measurement for depth of the side rail |
| | Required | Width 1 | Width of a tray |
| | Required | Width 2 | Width of a tray if more than one is applicable |
| | Required | Width UOM | Unit of measurement for width of the item |
| | Required | Material Type | Material type of the tray |
| | Optional | Max Cable Tray Filled % | Maximum percent fill the tray is allowed under code |
| | Optional | Voltage Type | Compatible voltages for circuits run in the tray (e.g., segregation level: control, instrument, low/medium/high voltage, etc.) |

Discussion

- The project team determines the best breakdown for tray tag numbers as either section or at the component level.
 - *Tray Part Type* and *Tray Part No.* are only useful if tagged at the component level.
- *From* and *To* are intended to be the tag numbers of the conduit/tray that a particular tray is physically connected to.

Sample Entries

| Field Name | Sample Entry 1 (section tag) | Sample Entry 2 (component tag) |
|--------------------|--|-----------------------------------|
| <i>Project ID</i> | 1234 | 5678 |
| <i>Tag</i> | CT-11183 (section) | CT-11184-R01 (section component) |
| <i>Description</i> | Cable tray section between V-1146 control valves and Unit 11 electrical building | Cable tray reducer |

| Field Name | Sample Entry 1 (section tag) | Sample Entry 2 (component tag) |
|---------------------------------|---|---|
| <i>Tag Status</i> | In Design | Released to Construction |
| <i>% Filled</i> | 40% | 50% |
| <i>Tray Type</i> | Solid | Ladder |
| <i>Construction Requirement</i> | New | New |
| <i>Cover Type</i> | Solid Plain Cover | Ventilated Flanged Cover |
| <i>CWP</i> | CWP-A2-ELE-01 | CWP-A2-ELE-01 |
| <i>EWP</i> | EWP-A2-ELE-01 | EWP-A2-ELE-01 |
| <i>Manufacturer</i> | Atkor | Eaton |
| <i>Tray Part Type</i> | – | Reducer |
| <i>Tray Part No</i> | – | 1236545 |
| <i>Style</i> | Tray | Snap Track |
| <i>From Tag</i> | C-12381 (tray section) | C-12382 (parent snap track section) |
| <i>To Tag</i> | JB-12673 (junction box) | C-12382 (parent snap track section) |
| <i>Layout Dwg – Ref 1</i> | CX-100000-ELE-SLN-KXX-21200-001 | CX-100000-ELE-SLN-KXX-21200-001 |
| <i>Drawing Revision – Ref 1</i> | 000 | 001 |
| <i>Layout Dwg – Ref 2</i> | CX-100000-ELE-SLN-KXX-21200-002 | CX-100000-ELE-SLN-KXX-21200-002 |
| <i>Drawing Revision – Ref 2</i> | 000 | 001 |
| <i>Length</i> | 55 | 2 |
| <i>Length UOM</i> | FT | FT |
| <i>Siderail Depth</i> | 4 | 3 |
| <i>Depth UOM</i> | Inch | Inch |
| <i>Width 1</i> | 12 | 12 |
| <i>Width 2</i> | – | 6 |
| <i>Width UOM</i> | Inch | Inch |
| <i>Material Type</i> | Galvanized Steel | Aluminum |
| <i>Max Cable Tray Filled %</i> | 70% | 65% |
| <i>Voltage Type</i> | Low Voltage | Instrumentation |

3.7.6. DR100-06: Lighting & Devices

Description: List of lighting and devices

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the project list of lighting and miscellaneous devices.

Data Requirement Definition: Lighting & Devices

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Description | Description of the Tag function |
| | Required | Item Type | Accessories type (e.g., light receptacle, junction box, etc.) |
| | Required | Cable Size | Cable size |
| | Required | Circuit Number | Number of the circuit feeding lights and/or device |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | CWP | unique construction work package identifier |
| | Required | EWP | unique engineering work package identifier |
| | Optional | Manufacturer | Manufacturer of tagged item |
| | Optional | Supplier | Supplier of tagged item |
| | Optional | Catalog Number | Catalog number |
| | Optional | Mounting Style | Mounting style |
| | Optional | Operating Current Amp | Operating current amperage |
| | Optional | Panel Name Tag | Engineered tag of panel feeding light and or receptacle |
| | Optional | Terminals | Location and number of wire terminals |
| | Required | Panel Schedule | Panel schedule wiring drawing reference |
| | Required | Panel Schedule Revision | Revision of equipment design |
| | Required | Drawing Number | Drawing number of lighting or device |
| | Required | Equipment Revision | Current revision of equipment |

Data Requirement Definition: Lighting & Devices (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|--|
| | Required | Standard Detail | Standard installation detail drawing reference for light and/or receptacle |
| | Required | Standard Detail Revision | Revision of equipment design |
| | Required | Test Package ID | Unique test package identifier |
| | Required | Voltage | Voltage in operation |
| | Required | Power (Watts) | Wattage in operation |
| | Required | Usage | Type (e.g., emergency, general, etc.) |
| | Required | Single Line Diagram | Single line diagram |
| | Required | Single Line Diagram Rev | Revision of the single line diagram |

Discussion

- The device list contains many miscellaneous items not captured elsewhere (e.g., electrical heat trace panels, welding receptacles, small lighting panels and transformers, photo sensors, IO devices, etc.).

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------------|-----------------------------|-----------------------------|
| <i>Project ID</i> | 1234 | 5678 |
| <i>Tag</i> | WR-12837 | L-165-3 |
| <i>Description</i> | Welding Receptacle | Light |
| <i>Item Type</i> | Welding Receptacle | Light |
| <i>Cable Size</i> | 3/C 10 w/G | 3/C 14 |
| <i>Circuit Number.</i> | 111-000-ESM-61201-CMV100-3A | 111-000-ESM-61201-CEG100-3G |
| <i>Construction Requirement</i> | New | New |
| <i>CWP</i> | CWP-A2-ELE-01 | CWP-A2-ELE-01 |
| <i>EWP</i> | EWP-A2- ELE-01 | EWP-A2-ELE-01 |
| <i>Manufacturer</i> | Meltric | Eaton |
| <i>Supplier</i> | McMaster | Eaton |
| <i>Catalog Number</i> | PNHT | – |
| <i>Mounting Style</i> | Bolt | Stanchion |
| <i>Operating Current Amp.</i> | 20 | 2 |

Sample Entries (continued)

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------------|---------------------------------|---------------------------------|
| <i>Panel Name Tag</i> | LP-28747 | LP-74729 |
| <i>Terminals</i> | 4 | 3 |
| <i>Panel Schedule</i> | 1234-ELE-DEV-PNL-00001 | 5678-ELE-LGT-PNL-00001 |
| <i>Panel Schedule Revision</i> | 003 | 000 |
| <i>Drawing Number</i> | CX-100000-ELE-SLN-KXX-21200-001 | CX-100000-ELE-SLN-KXX-21200-001 |
| <i>Current Revision</i> | 002 | 000 |
| <i>Standard Detail</i> | 1234-ELE-DEV-STD-00001 | 5678-ELE-LGT-STD-00001 |
| <i>Standard Detail Revision</i> | 000 | 000 |
| <i>Test Package ID</i> | TP-22222 | TP-22222 |
| <i>Voltage</i> | 480 | 220 |
| <i>Power (Watts)</i> | 9,600 | 440 |
| <i>Usage</i> | Maintenance | Emergency |
| <i>Single Line Diagram</i> | SL-5255-5 | DWH-255-555-SL-0001 |
| <i>Single Line Diagram Rev</i> | A | A01 |

3.7.7. DR100-07: Electrical Heat Tracing

Description: List of electrical heat tracing (EHT)

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the project list of all electrical heat tracing.

Data Requirement Definition: Electrical Heat Tracing

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Heat Trace Description | EHT circuit description |
| | Required | Manufacturer | Manufacturer of tagged item |
| | Optional | Catalog Part Number | EHT cable manufacturer part number |
| | Required | Construction Requirement | Specifies whether it is new or existing and to be refurbished or modified |
| | Required | CWA | Unique construction work area identifier |
| | Required | CWP | Unique construction work package identifier |
| | Required | EWP | Unique engineering work package identifier |
| | Required | Length | Length of the item |
| | Required | Length UOM | Unit of measurement for length of the item |
| | Required | From Tag (Power) | Tag of a panel the circuit is connected from |
| | Required | To Tag (Customer) | Tag of equipment or piping line number the circuit is connected to |
| | Required | Typical Detail Drawing | Drawing of the EHT components used for the circuit |
| | Optional | Equipment Revision | Current revision of the EHT tag |
| | Required | Test Package ID | Unique test package identifier (e.g., megger test) |
| | Optional | Control Type | Type of protection this circuit protects against (e.g., freezing, process control, etc.) |
| | Optional | Cable Rating | Classification rating of the cable (e.g., Class 1 Division 2, etc.) |
| | Optional | Cable Joint | Cable joint |

Discussion

- The implementation team expects the EHT tag to be handled similarly to spools, where the tag is at the assembly level. Material takeoffs happen at the component level (e.g., controller, wire, end seal kit, power termination kit, temperature controller, pipe mounts, junction boxes, etc.).
 - Typically, each “EHT circuit” is per isometric drawing and may daisy chain several separate cables depending on power supply rating.
- The *Catalog Part Number* is determined by engineering calculations for process conditions.
- The *Cable Rating* is typically used to confirm that cable can be installed in certain hazardous locations.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------------|--|--------------------------------------|
| <i>Project ID</i> | 1234 | 5678 |
| <i>Tag</i> | 101-100-EHT-61002 | EHT-PS-129438 |
| <i>Heat Trace Description</i> | Cryo rack 1 heat trace on propane rack | Power supply to heat trace on V-1246 |
| <i>Manufacturer</i> | Protherm Industries | Chromalox |
| <i>Catalog Part Number</i> | 6852524 | 465892PS |
| <i>Construction Requirement</i> | New | New |
| <i>CWA</i> | CWA-A2 | CWA-A2 |
| <i>CWP</i> | CWP-A2-ELE-01 | CWP-A2-ELE-01 |
| <i>EWP</i> | EWP-A2- ELE-01 | EWP-A2-ELE-01 |
| <i>Length</i> | 50 | 10 |
| <i>Length UOM</i> | FT | Inch |
| <i>From Tag (Power)</i> | EHT-PS-129438 | SG17283 |
| <i>To Tag (Customer)</i> | LNG-100A-12-01SS-6.5CC | V-1246 |
| <i>Typical Detail Drawing</i> | 1234-ELE-DEV-STD-00001 | 5678-ELE-LGT-STD-00001 |
| <i>Equipment Revision</i> | 000 | 001 |
| <i>Test Package ID</i> | TP-33333 | TP-11111 |
| <i>Control Type</i> | Freezing | Process Control |
| <i>Cable Rating</i> | Class 1 Division 2 | Class 1 Division 3 |
| <i>Cable Joint</i> | RS PRO | CCE-03-CR |

3.8. DR120 – Document Control

3.8.1. DR120-01: Document Register

Description: Document register

Source(s): Document control team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define a list of all documents on the project.

Data Requirement Definition: Document Register

| Key | Tier | Field Name | Definition |
|-----|----------|------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Document Repository | Document repository identifier |
| PK | Required | Document Number | Document number |
| PK | Required | Version Number | Controlled version number |
| PK | Required | Revision Number | Revision number of the document |
| | Required | Document Discipline | Document discipline code (which discipline this document comes from) |
| | Required | Document File Name | Document filename (allows access to the file) |
| | Required | Document File Type | Document type (e.g., PDF, DOC, etc.) |
| | Required | Document Status | Document status values (e.g., IFD, IFA, IFC) |
| | Required | Document Title | Document title |
| | Required | Document Type | Document type (e.g., P&ID, arrangement, wiring diagram, data sheet, etc.) |
| | Required | Revision Date | Revision date |
| | Required | Transmittal Date | Receiving transmittal date |
| | Required | Transmittal Number | Receiving transmittal number |
| | Required | Vendor Document Number | Vendor's document number |
| | Required | Vendor Revision | Vendor's document revision number |
| | Required | Vendor Revision Date | Vendor's revision date |
| | Optional | Remarks | Any remarks or notes |

Discussion

- The implementation team expects *Version* to be separate from *Revision* and used for tracking version editions through review workflows (e.g., IFR routed through several iterative updates).

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------------|--|--------------------------------|
| <i>Project ID</i> | 90000801 | 1684972 |
| <i>Document Repository</i> | – | EDMS |
| <i>Document Number</i> | 985D | A-1-48104 |
| <i>Version Number</i> | 1 | 2 |
| <i>Revision Number</i> | 0 | B |
| <i>Document Discipline</i> | Piping | Instrumentation & Control |
| <i>Document File Name</i> | S5-1-985D.dwg | A-1-48104.pdf |
| <i>Document File Type</i> | DWG | PDF |
| <i>Document Status</i> | IFC | IFA |
| <i>Document Title</i> | Piping & Instrument Diagram Process Water | Temperature Valve Datasheet |
| <i>Document Type</i> | P&ID | Requisition |
| <i>Revision Date</i> | 10/25/19 | 01/10/20 |
| <i>Transmittal Date</i> | 10/26/19 | 01/20/20 |
| <i>Transmittal Number</i> | 001 | 053 |
| <i>Vendor Document Number</i> | R740278 | 5100001576 |
| <i>Vendor Revision</i> | 1 | 3 |
| <i>Vendor Revision Date</i> | 10/14/19 | 12/20/19 |
| <i>Remarks</i> | Issued for Construction | Issued for Bid |

3.8.2. DR120-02: Document to Entity

Description: Project document relationships

Source(s): Document control team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the relationships between a project's documents and any related "object" to create complex relationships between documents and components.

Data Requirement Definition: Document to Entity

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Document ID | Unique document identifier |
| PK | Required | Relationship Type | Type of related ID (e.g., EWP, CWP, equipment tag, PO, system, etc.) |
| PK | Required | Related Tag | Unique identifier of the related entity |

Discussion

- This is intended to be a relationship table for capturing any documents to tag relationships desired (e.g., document to equipment tag, CWP, PO, etc.).

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--------------------------|-------------------|---------------------|
| <i>Project ID</i> | 90000801 | 1684972 |
| <i>Document ID</i> | XAA53Y64XQF4-60-3 | DocID-H1L0FX1S |
| <i>Relationship Type</i> | EWP | Purchase Order (PO) |
| <i>Related Tag</i> | EWP-PI-001 | P0061500 |

3.9. DR140 – Estimating and Cost

3.9.1. DR140-01: EWP Estimate

Description: EWP cost estimate

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the key attributes of the project EWP estimate data.

Data Requirement Definition: EWP Estimate

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | EWP | Unique engineering work package identifier |
| | Required | Actual Expended Hours | Actual expended hours |
| | Required | Control Budget Hours | Construction hours allotted to the EWP per the control budget |
| | Required | Key Quantity | Sum total of key quantity for the EWP (e.g., 1000) |
| | Required | Key Quantity UOM | Unit of measurement for the key quantity (e.g., LF of pipe, etc.) |
| | Optional | Actual Expended Cost | Actual expended cost |
| | Optional | Total Estimated Cost | Total estimated construction cost of the EWP |

Discussion

- *Key Quantity* for EWP should be the same *Key Quantity* for related CWP.
- The *Actual Expended Hours* and *Actual Expended Cost* values may not be available initially, but they should be captured as EWP execution progresses to enable productivity analysis.
- *Actual Expended Cost* values may be sensitive in traditional lump-sum contracts, but allow useful internal analytics.

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|------------------------------|-----------------------|-----------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>EWP</i> | EWP-0012-00A1-Pipe | EWP-DA02-Equip-01 |
| <i>Actual Expended Hours</i> | 847 | Undisclosed |
| <i>Control Budget Hours</i> | 800 | 80 |
| <i>Key Quantity</i> | 2,248 | 3 |
| <i>Key Quantity UOM</i> | Linear Feet | EA |
| <i>Actual Expended Cost</i> | \$127,050 | Undisclosed |
| <i>Total Estimated Cost</i> | \$120,000 | Undisclosed |

3.9.2. DR140-02: CWP Estimate

Description: CWP cost estimate

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the key attributes of the project CWP estimate data.

Data Requirement Definition: CWP Estimate

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | CWP | Unique construction work package identifier |
| | Required | Actual Expended Hours | Actual expended hours |
| | Required | Control Budget Hours | Construction hours allotted to the CWP per the control budget |
| | Required | Key Quantity | Sum total of key quantity for the CWP (e.g., 1000) |
| | Required | Key Quantity UOM | Unit of measurement for the key quantity (e.g., LF of pipe, etc.) |
| | Optional | Actual Expended Cost | Actual expended cost |
| | Optional | Total Estimated Cost | Total estimated construction cost of the CWP |

Discussion

- *Key Quantity* for EWP should be the same *Key Quantity* for related CWP.
- The *Actual Expended Hours* and *Actual Expended Cost* values may not be available initially, but they should be captured as EWP execution progresses to enable productivity analysis.
- *Actual Expended Cost* values may be sensitive in traditional lump-sum contracts, but allow useful internal analytics.

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|------------------------------|-----------------------|-----------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>Actual Expended Hours</i> | 11,997 | 1,190 |
| <i>Control Budget Hours</i> | 12,364 | 980 |
| <i>Key Quantity</i> | 2,248 | 3 |
| <i>Key Quantity UOM</i> | Linear Feet | EA |
| <i>Actual Expended Cost</i> | \$515,871 | \$57,002 |
| <i>Total Estimated Cost</i> | \$494,560 | \$60,000 |

3.10. DR150 – Procurement

General discussion for shipment model:

- Define common definitions of DR150 and DR270 – more narrative on shipment, container, etc.
- The data requirements establish a standard hierarchy to track material logistics, consisting of a shipment, load, container, and finally, material. This model is implemented in the relevant tables of DR150 (Procurement) and DR270 (Site Materials).

Shipment – shipping release requested by the supplier, and typically approved and assigned a number by the receiving organization (typically the EPC contractor). There will typically be one or more shipments per PO.

Load – A further breakdown of a shipment, often at the same level as a bill of lading. For example, a shipment may be spread over two truck loads.

Container – Further breakdown of a load. For example, a truck may be carrying two containers.

Material – the lowest level, capturing individual components and quantities.

- The shipment-load-container-material hierarchy model is intended to be flexible and able to support a wide variety of scenarios. There will often be cases where not all levels of the hierarchy will be needed. For example, a small shipment of pipe spools may fit on a single truck and not have any containers.

3.10.1. DR150-01: Material Requisition Tracking

Description: List of material requisitions

Source(s): Procurement team

Timing: Beginning of Stage 2 (i.e., long lead)

Frequency: Continuous as revised – at a minimum, weekly through the end of Stage 3

Purpose

To define the master list of material requisitions and their key attributes, including the resulting PO number.

Data Requirement Definition: Material Requisition Tracking

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Requisition Number | Material requisition identifier |
| | Optional | Requisition Description | Description of the requisition |
| | Optional | Requisition – Actual | Actual date to complete material requisition request |
| | Optional | Requisition – Forecast | Forecast date to complete material requisition request |
| | Optional | Requisition – Plan | Planned date to complete material requisition request |
| | Optional | Inquiry – Actual | Actual date to complete vendor inquiries |
| | Optional | Inquiry – Forecast | Forecast date to complete vendor inquiries |
| | Optional | Inquiry – Plan | Planned date to complete vendor inquiries |
| | Optional | CBE – Actual | Actual date to complete commercial bid evaluation |
| | Optional | CBE – Forecast | Forecast date to complete commercial bid evaluation |
| | Optional | CBE – Plan | Planned date to complete commercial bid evaluation |
| | Optional | TBE – Actual | Actual date to complete commercial bid evaluation |
| | Optional | TBE – Forecast | Forecast date to complete commercial bid evaluation |
| | Optional | TBE – Plan | Planned date to complete commercial bid evaluation |
| | Optional | Purchasing Agent | Group or division making purchase |
| | Required | Vendor | Vendor name |

Data Requirement Definition: Material Requisition Tracking (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------|---|
| | Required | Vendor ID | Unique vendor identifier |
| | Required | PO | Purchase order number |
| | Required | PO Description | Purchase order description |
| | Required | PO Status | Status of the PO (e.g., draft, issued) |
| | Required | PO Revision | Current revision of the PO |
| | Required | PO Date | Purchase order date (i.e., when PO is cut) |
| | Optional | Incoterm | Applicable predefined international commercial terms as published by the International Chamber of Commerce (e.g., DDP, FCA) |
| | Optional | Requisition By | Team member |
| | Optional | Unit Price | Unit price |
| | Optional | Unit Price Currency | Unit price currency (e.g., USD, CAD) |

Discussion

- Table data requirements are formed such that a requisition and PO are 1:1. If a requisition has a different relationship to a PO, it is up to the implementing organization to handle it appropriately within its data structures/governance.
- The table is designed to track the procurement steps required to get to a PO, so the team tracks the requisition process and expects the PO number to be populated once the process has progressed enough to generate a PO number.
- Off-the-shelf items can be marked as “N/A.”

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--------------------------------|--------------------|------------------------|
| <i>Project ID</i> | 123544 | BT-HT-00987 |
| <i>Requisition Number</i> | 958564485 | BT-HT-00987-BNHT-09821 |
| <i>Requisition Description</i> | Piping Fabrication | P9807 Upgrade |
| <i>Requisition – Actual</i> | 3/5/2020 | 20200122 |
| <i>Requisition – Forecast</i> | 3/5/2020 | 20200122 |
| <i>Requisition – Plan</i> | 3/2/2020 | 20200120 |
| <i>Inquiry – Actual</i> | 3/24/2020 | 20200217 |
| <i>Inquiry – Forecast</i> | 3/24/2020 | 20200217 |
| <i>Inquiry – Plan</i> | 3/23/2020 | 20200221 |

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------|-------------------------|---------------------------|
| <i>CBE – Actual</i> | 4/3/2020 | 20200310 |
| <i>CBE – Forecast</i> | 4/3/2020 | 20200310 |
| <i>CBE – Plan</i> | 4/6/2020 | 20200320 |
| <i>TBE – Actual</i> | 4/1/2020 | 20200331 |
| <i>TBE – Forecast</i> | 4/1/2020 | 20200331 |
| <i>TBE – Plan</i> | 4/6/2020 | 20200320 |
| <i>Purchasing Agent</i> | EPC Engineers Inc | Oil Owner Company |
| <i>Vendor</i> | Acme Piping Fabrication | Acme Rotating Specialists |
| <i>Vendor ID</i> | 451236 | 12368 |
| <i>PO</i> | PO-001-AC-0898 | 25698BT58894 |
| <i>PO Description</i> | Piping Fabrication | Pump P9807A |
| <i>PO Status</i> | Open | Closed |
| <i>PO Revision</i> | R1 | Rev 0 |
| <i>PO Date</i> | 4/13/2020 | 20200410 |
| <i>Incoterm</i> | DDP | EXW |
| <i>Requisition By</i> | Smith | Jones |
| <i>Unit Price</i> | Confidential | 8,699 |
| <i>Unit Price Currency</i> | – | USD |

3.10.2. DR150-02: Purchase Order Line Items

Description: List of PO line items

Source(s): Procurement team

Timing: Beginning of Stage 2 – line items populated after PO generation

Frequency: Continuous as revised – at a minimum, weekly through delivery

Purpose

To define the master list of PO line items and their key attributes

Data Requirement Definition: PO Line Items

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | PO | Purchase order number |
| PK | Required | Requisition Line Item | Line item on the requisition |
| PK | Required | Line Item Revision | Current revision of the line item |
| | Optional | Approve to Fab – Actual | Actual date for approval to fabricate |
| | Optional | Approve to Fab – Forecast | Forecast date for approval to fabricate |
| | Optional | Approve to Fab – Plan | Planned date for approval to fabricate |
| | Optional | Approve to Ship – Actual | Actual date for approval to ship |
| | Optional | Approve to Ship – Forecast | Forecast date for approval to ship |
| | Optional | Approve to Ship – Plan | Planned date for approval to ship |
| | Required | BOM Description | Bill of materials description |
| | Required | BOM ID | Materials identification code or stock code |
| | Required | CWP | Unique construction work package identifier |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Required | ROS Date | Required on-site date for the needed quantity |
| | Required | Material Category | Material category |
| | Required | Material Type | Material type within the category |
| | Required | Qty PO | Quantity purchased |

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------------|--|
| | Required | Qty UOM | Unit of measurement for quantity purchased (e.g., EA, LF, M, etc.) |
| | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Vendor Drawings – Actual | Actual date of receiving vendor drawings |
| | Required | Vendor Drawings – Forecast | Forecast date of receiving vendor drawings |
| | Required | Vendor Drawings – Plan | Planned date of receiving vendor drawings |
| | Optional | Size | Material sizing information |
| | Optional | Size UOM | Unit of measurement for material sizing (e.g., EA, LF, M, etc.) |

Discussion

- *Size UOM* is intended to be more useful for bulk items, not necessarily a skid or a piece of equipment.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------------|------------------------|----------------------|
| <i>Project ID</i> | 326895 | BT-CP-0388 |
| <i>PO</i> | PO-001-AC-0898 | 25698BT58894 |
| <i>Line Item</i> | 005 | 001 |
| <i>Line Item Revision</i> | R1 | Rev 0 |
| <i>Approve to Fab – Actual</i> | 06/06/2020 | 20200315 |
| <i>Approve to Fab – Forecast</i> | 06/06/2020 | 20200315 |
| <i>Approve to Fab – Plan</i> | 06/15/2020 | 20200330 |
| <i>Approve to Ship – Actual</i> | 08/02/2020 | 20200618 |
| <i>Approve to Ship – Forecast</i> | 08/02/2020 | 20200618 |
| <i>Approve to Ship – Plan</i> | 08/01/2020 | 20200610 |
| <i>BOM Description</i> | 4" A-106 Seamless Pipe | T9809 Bottoms Pump |
| <i>BOM ID</i> | PX05321A | P9807A |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>Discipline</i> | Piping | Equipment |
| <i>ROS Date</i> | 09/01/2020 | 20200715 |
| <i>Material Category</i> | Prefabricated Pipe | Mechanical Equipment |
| <i>Material Type</i> | Carbon Steel | Pump |

Sample Entries (continued)

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------------|-----------------------|-----------------------|
| <i>Qty PO</i> | 5,312 | 1 |
| <i>Qty UOM</i> | Linear Feet | EA |
| <i>Tag</i> | – | P9807A |
| <i>Vendor Drawings – Actual</i> | 05/26/2020 | 20200219 |
| <i>Vendor Drawings – Forecast</i> | 05/26/2020 | 20200219 |
| <i>Vendor Drawings – Plan</i> | 05/20/2020 | 20200228 |
| <i>Size</i> | 4 | – |
| <i>Size UOM</i> | Inch | – |

3.10.3. DR150-03: Supplier Purchase Order Shipments

Description: List of supplier shipments per PO line item

Source(s): Vendor/fabricator

Timing: Beginning of Stage 2 – generated after a supplier creates a shipping plan

Frequency: Continuous as revised – at a minimum, weekly through delivery

Purpose

To define the list of shipments and their associations to their PO Line Items.

Data Requirement Definition: Supplier PO Shipments

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Shipment ID | Shipment identifier |
| PK | Required | PO | Purchase order number |
| PK | Required | PO Line Item | Line item on the purchase order |
| PK | Required | Material ID | Material identifier code |
| | Required | CWP | Unique construction work package identifier |
| | Optional | ETA Refresh Date | Date when ETA information was updated from the supplier |
| | Required | Date Ship – Actual | Actual date to ship in shipment lot |
| | Required | Date Ship – Forecast | Forecast date to ship in shipment lot |
| | Required | Date Ship – Plan | Planned date to ship in shipment lot |
| | Required | Date Delivered – Actual | Actual date delivered |
| | Required | Date Delivered – Forecast | Forecast delivery date |
| | Required | Date Delivered – Plan | Planned delivery date |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Required | Material Category | Material category |
| | Required | Material Type | Material type within the category |
| | Required | Qty Line Item | Quantity purchased |
| | Required | Qty Ship – Actual | Actual quantity to ship in shipment lot |
| | Required | Qty Ship – Forecast | Forecast quantity to ship in shipment lot |
| | Required | Qty Ship – Plan | Planned quantity to ship in shipment lot |
| | Required | Qty Received | Total quantity received |
| | Required | Qty UOM | Unit of measurement for total quantity received (e.g., EA, LF, M, etc.) |

Data Requirement Definition: Supplier PO Shipments (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|------------|---|
| | Required | Size | Material sizing information |
| | Required | Size UOM | Unit of measurement for material sizing (e.g., EA, LF, M, IN, etc.) |
| | Required | Tag | Unique tag number assigned to identify a project item |

Discussion

- Company to decide on relationships between *PO* and *Shipment ID*, as it is not always 1:1.
- *Shipment ID* is known by many names in the industry, including “shipment control number” or “shipment release number.” It is intended to uniquely identify the shipment authorized by the receiving party (EPC or owner).
- *Qty Received* data does not come from a supplier; it comes from a site receiving group described in DR270-02. It is pertinent information to be aligned with the data from the supplier.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------------|--------------------|----------------------|
| <i>Project ID</i> | 326895 | BT-CP-0388 |
| <i>Shipment ID</i> | STK2-0369 | |
| <i>PO</i> | PO-001-AC-0898 | 25698BT58894 |
| <i>PO Line Item</i> | 005 | 001 |
| <i>Materials ID</i> | PX05321A | P9807A |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>ETA Refresh Date</i> | 07/17/2020 | 20200801 |
| <i>Date Ship – Actual</i> | 8/2/2020 | 2020419 |
| <i>Date Ship – Forecast</i> | 8/2/2020 | 2020419 |
| <i>Date Ship – Plan</i> | 8/15/2020 | 20200501 |
| <i>Date Delivered – Actual</i> | 8/10/2020 | 20200424 |
| <i>Date Delivered – Forecast</i> | 8/10/2020 | 20200424 |
| <i>Date Delivered – Plan</i> | 8/20/2020 | 20200510 |
| <i>Discipline</i> | Piping | Mechanical |
| <i>Material Category</i> | Prefabricated Pipe | Mechanical Equipment |
| <i>Material Type</i> | Carbon Steel | Pump |

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------|-----------------------|-----------------------|
| <i>Qty Line Item</i> | 5,312 | 1 |
| <i>Qty Ship – Actual</i> | 5,312 | 1 |
| <i>Qty Ship – Forecast</i> | 5,312 | 1 |
| <i>Qty Ship – Plan</i> | 5,312 | 1 |
| <i>Qty Received</i> | 5,312 | 1 |
| <i>Qty UOM</i> | Linear Feet | EA |
| <i>Size</i> | 4 | – |
| <i>Size UOM</i> | Inch | – |
| <i>Tag</i> | – | P9807A |

3.10.4. DR150-04: Supplier Load Detail

Description: List of supplier load detail

Source(s): Vendor/fabricator

Timing: Beginning of Stage 2 – generated after a supplier creates a shipping plan

Frequency: Continuous as revised – at a minimum, weekly through delivery

Purpose

To define the list of loads and their relationship to shipment and their shipping/delivery schedule dates.

Data Requirement Definition: Supplier Load Detail

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Shipment ID | Shipment identifier |
| PK | Required | Load List ID | Load list identifier |
| PK | Required | Container ID | Identifier of container, box, pallet, etc. |
| | Optional | ETA Refresh Date | Date when ETA information was updated from the supplier |
| | Required | Date Ship – Actual | Actual date to ship in shipment lot |
| | Required | Date Ship – Forecast | Forecast date to ship in shipment lot |
| | Required | Date Ship – Plan | Planned date to ship in shipment lot |
| | Required | Date Delivered – Actual | Actual date delivered |
| | Required | Date Delivered – Forecast | Forecast date delivered |
| | Required | Date Delivered – Plan | Planned date delivered |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Optional | CWP | Unique construction work package identifier |

Discussion

- *CWP* is optional as a single container/pallet may or may not pertain to a single *CWP*. Best practice should be shipping per *CWP* for future site material control.
- The implementation team realizes that not every commodity can be broken down into shipment/load/container/line item. Our intention is to provide a generic framework that can be flexibly applied against a wide range of commodities and shipping configurations.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------------|-----------------------|-----------------------|
| <i>Project ID</i> | 326895 | BT-CP-0388 |
| <i>Shipment ID</i> | STK2-0369 | 4553158 |
| <i>Load List ID</i> | BOL-00892-1A | 56368 |
| <i>Container ID</i> | TCU-845365 | Crate 001 |
| <i>ETA Refresh Date</i> | 07/17/2020 | 20200801 |
| <i>Date Ship – Actual</i> | 8/2/2020 | 2020419 |
| <i>Date Ship – Forecast</i> | 8/2/2020 | 2020419 |
| <i>Date Ship – Plan</i> | 8/15/2020 | 20200501 |
| <i>Date Delivered – Actual</i> | 8/10/2020 | 20200424 |
| <i>Date Delivered – Forecast</i> | 8/10/2020 | 20200424 |
| <i>Date Delivered – Plan</i> | 8/20/2020 | 20200510 |
| <i>Discipline</i> | Piping | Mechanical |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |

3.10.5. DR150-05: Supplier Container Detail

Description: List of supplier container details

Source(s): Vendor/fabricator

Timing: Beginning of Stage 2 – generated after a supplier creates a shipping plan

Frequency: Continuous as revised – at a minimum, weekly through delivery

Purpose

To define the list of shipments and their detailed breakout across containers and packing lists to enable onsite material control.

Data Requirement Definition: Supplier Container Detail

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Shipment ID | Shipment identifier |
| PK | Required | Load List ID | Load list identifier |
| PK | Required | Container ID | Identifier of container, box, pallet, etc. |
| PK | Required | Material ID | Material identifier for the BOM item(s) (bulk) or unique tag identifier if applicable (e.g., tag, spool number, commodity, etc.) |
| | Required | Item Description | Material description |
| | Required | Qty | Quantity of item |
| | Required | Qty UOM | Unit of measurement for quantity (e.g., EA, LF, M, etc.) |
| | Required | CWP | Unique construction work package identifier |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Required | Material Category | Material category |
| | Required | Material Type | Material type within the category |
| | Required | Qty Received | Total quantity received |
| | Optional | Size | Material sizing information |
| | Optional | Size UOM | Unit of measurement for material sizing |
| | Optional | Weight | Weight of item |
| | Optional | Weight UOM | Unit of measurement for weight (e.g., TN, LBS, MT, Kg, etc.) |

Discussion

- *Qty Received* data does not come from a supplier; it comes from a site receiving group, but is pertinent information to be aligned to the data from the supplier.
- *Size* and *Weight* data are required project information but not necessarily needed strictly for AWP. Site material control can use to understand potential offloading and laydown requirements.
 - *Weight* is required for AWP through the Engineering Data for AWP planning (e.g., crane usage).
- Not every commodity can be broken down into shipment/load/container/line item. The intent is to provide a generic framework that can be flexibly applied against a wide range of commodities and shipping configurations.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--------------------------|--------------------|----------------------|
| <i>Project ID</i> | 326895 | BT-CP-0388 |
| <i>Shipment ID</i> | STK2-0369 | 4553158 |
| <i>Load List ID</i> | BOL-00892-1A | 56368 |
| <i>Container ID</i> | TCU-845365 | Crate 001 |
| <i>Material ID</i> | SP-9081-002 | P9807A |
| <i>Item Description</i> | Pipe Spool | Centrifugal Pump |
| <i>Qty</i> | 1 | 1 |
| <i>Qty UOM</i> | EA | EA |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>Discipline</i> | Piping | Mechanical |
| <i>Material Category</i> | Prefabricated Pipe | Mechanical Equipment |
| <i>Material Type</i> | Carbon Steel | Pump |
| <i>Qty Received</i> | 1 | 1 |
| <i>Size</i> | 4 | – |
| <i>Size UOM</i> | NPD | – |
| <i>Weight</i> | 91 | 232 |
| <i>Weight UOM</i> | lbs | Kg |

3.11. DR170 – Structural Detailing

3.11.1. DR170-01: Steel Detailing Deliverables

Description: List of steel detailing deliverables

Source(s): Engineering management team

Timing: Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define planned/forecast/actual milestones for the structural steel detailing process between engineer and detailer.

Data Requirement Definition: Steel Detailing Deliverables

| Key | Tier | Field Name | Definition |
|-----|----------|--|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Structure Tag | Unique tag number assigned to identify a project item |
| | Required | CWP | Unique construction work package identifier |
| | Optional | Designs to Detailer – Actual | Actual date for the engineer to provide designs to detailing |
| | Optional | Designs to Detailer – Forecast | Forecast date for the engineer to provide designs to detailing |
| | Optional | Designs to Detailer – Plan | Planned date for the engineer to provide designs to detailing |
| | Optional | Detail File Name | Structural detail file name |
| | Optional | Erection Dwgs from Detailer – Actual | Actual date for the tracking of delivery of steel erection from detailer |
| | Optional | Erection Dwgs from Detailer – Forecast | Forecast date for the tracking of delivery of steel erection from detailer |
| | Optional | Erection Dwgs from Detailer – Plan | Planned date for the tracking of delivery of steel erection from detailer |
| | Optional | Models from Detailer – Actual | Actual date for steel models and drawings to arrive from a detailer |
| | Optional | Models from Detailer – Forecast | Forecast date for steel models and drawings to arrive from a detailer |
| | Optional | Models from Detailer – Plan | Planned date for steel models and drawings to arrive from a detailer |
| | Optional | Structure Type | Type of structure (e.g., piperack, ladder, etc.) |

Discussion

- Requires collaboration between the engineering management team and the steel detailer to fully populate the data set.
- Large structures may be multiple CWPs. The project may handle this mapping and its detailed implementation, or substitute CWP to CWA if it makes sense to the situation.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---|-----------------------|-----------------------|
| <i>Project ID</i> | DD 031779 | FF 357162 |
| <i>Structure Tag</i> | UR14-4 | STR-2709 |
| <i>CWP</i> | S1601B-2.5-40-02 | S1501C-2.5-60-01 |
| <i>Designs to Detailer – Actual</i> | 02-07-2019 | 02-07-2019 |
| <i>Designs to Detailer – Forecast</i> | 01-24-2019 | 01-31-2019 |
| <i>Designs to Detailer – Plan</i> | 01-31-2019 | 02-15-2019 |
| <i>Detail File Name</i> | UR14-4.IFC | STR-2709.IFC |
| <i>Erection Dwgs from Detailer – Actual</i> | 03-21-2019 | 03-31-2019 |
| <i>Erection Dwgs from Detailer – Forecast</i> | 03-07-2019 | 03-11-2019 |
| <i>Erection Dwgs from Detailer – Plan</i> | 03-15-2019 | 03-15-2019 |
| <i>Models from Detailer – Actual</i> | 03-31-2019 | 03-31-2019 |
| <i>Models from Detailer – Forecast</i> | 03-15-2019 | 03-24-2019 |
| <i>Models from Detailer – Plan</i> | 03-16-2019 | 04-02-2019 |
| <i>Structure Type</i> | Piperack | Ladder |

3.11.2. DR170-02: Steel Detail Drawings

Description: List of steel detail drawings

Source(s): Engineering management team/detailer

Timing: Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define structural steel drawings data sets between engineer and detailer.

Data Requirement Definition: Steel Detail Drawings

| Key | Tier | Field Name | Definition |
|-----|----------|------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Drawing ID | Document number |
| PK | Required | Revision Number | Revision number of the issued document |
| | Required | Structure Tag | Unique tag number assigned to identify a project item |
| | Required | Drawing Type | Drawing class (e.g., GA, erection drawing) |
| | Required | Drawing Filename | Drawing (PDF) filename |
| | Optional | Sequence | Sequence of the steel drawing within the IWP (i.e. represents the path of construction) |
| | Optional | Transmittal Date | Transmittal date |
| | Optional | Transmittal ID | Transmittal ID number |

Discussion

- *Sequence* can be used to further delineate sub-assembly order within a structure.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-------------------------|---------------------|---------------------|
| <i>Project ID</i> | FF 357162 | FF 357162 |
| <i>Drawing ID</i> | E1011 | E1010 |
| <i>Revision Number</i> | 01 | 01 |
| <i>Structure Tag</i> | STR-2709 | STR-2709 |
| <i>Drawing Type</i> | General Arrangement | General Arrangement |
| <i>Drawing Filename</i> | E1011.PDF | E1010.PDF |
| <i>Sequence</i> | 01 | 01 |
| <i>Transmittal Date</i> | 03-31-2019 | 03-31-2019 |
| <i>Transmittal ID</i> | FF_357162_01 | FF_357162_01 |

3.11.3. DR170-03: Steel Piecemarks

Description: List of steel piecemarks

Source(s): Engineering management team

Timing: Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define individual steel piecemarks of this data set.

Data Requirement Definition: Steel Piecemarks

| Key | Tier | Field Name | Definition |
|-----|----------|------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Structure Tag | Unique tag number assigned to identify a project item |
| PK | Required | Piecemark | Piecemark identifier |
| | Required | Count | Piecemark count |
| | Required | Structural Shape | Type of structural steel (e.g., W, angle, etc.) |
| | Required | Length | Length of the item |
| | Required | Length UOM | Unit of measurement for length of the item (e.g., FT, M, etc.) |
| | Required | Weight | Weight of the item |
| | Required | Weight UOM | Unit of measurement for weight of the item (e.g., TN, Lbs, Mt, Kg, etc.) |

Discussion

- N/A

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-------------------------|----------------|----------------|
| <i>Project ID</i> | FF 357162 | FF 357162 |
| <i>Structure Tag</i> | STR-2709 | STR-2709 |
| <i>Piecemark</i> | B1053 | T1004 |
| <i>Count</i> | 1 | 76 |
| <i>Structural Shape</i> | I-BEAM | TOEBOARD |
| <i>Length</i> | 10 | 38 |
| <i>Length UOM</i> | FT | FT |
| <i>Weight</i> | 30.78 | 30.78 |
| <i>Weight UOM</i> | lbs | lbs |

3.11.4. DR170-04: Steel 3D Model Relationship

Description: List of steel 3D model relationships (guide to piecemark/drawing)

Source(s): Engineering management team (detailer input)

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define steel detailing to be populated into the 3D design model and eventually the erection drawings generated for IWPs on site.

Data Requirement Definition: Steel 3D Model Relationship

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Global Unique Identifier | Global unique identifier (GUID) |
| | Required | Piecemark | Assembly mark number |
| | Required | Erection Drawing ID | Unique identifier of the erection drawing |
| | Required | Drawing Name | Title of drawing (e.g., hot oil heater erection drawing) |
| | Required | Count of Connections | Count of connections per piecemark assembly (e.g., a beam has two connections) |

Discussion

- CWP tied to Structure ID in 12-01, Structure ID tied to Drawing in 12-02, Piecemark to Counts per Structure in 12-03, allocating Piecemark to a specific tag on a drawing in 12-04.
- The implementation team acknowledges that piecemark comprises several GUIDs. The intent of the *GUID* field is to capture the main element (e.g., beam, not connection parts).
- Typical process flow would be an engineer who provides a structure design to a detailer, then the detailer completes a detailed design, and these details can be incorporated into a construction model.
- This table creates the relationship between erection drawings as that is needed for installation work packaging on site.

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|---------------------------------|--------------------------------------|--------------------------------------|
| <i>Project ID</i> | FF 357162 | FF 357162 |
| <i>Global Unique Identifier</i> | E4979294-1054-4078-AABD-6135C6DFEC9D | 819FBDCF-A37D-4271-8BD5-A48BB6A852BC |
| <i>Piecemark</i> | B1053 | B1070 |
| <i>Erection Drawing ID</i> | E1011 | E1010 |
| <i>Drawing Name</i> | Elevation Views | Elevation Views |
| <i>Count of Connections</i> | 6 | 2 |

3.11.5. DR170-05: Steel Connection Details

Description: List of steel connection details

Source(s): Engineering management team (detailer input)

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define connection details to individual piecemark.

Data Requirement Definition: Steel Connection Details

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Piecemark | Assembly mark number |
| PK | Required | Assembly Global ID | Assembly global identifier (Connection ID) |
| | Required | Bolt Acceptance Criteria | Method of acceptance for confirming fully installed (e.g., direct tension indicator [DTI], turn-of-nut, torsion, etc.) |
| | Required | Bolt Details | Bolt details, including diameter and length |
| | Required | Bolt Quantity | Quantity of bolts |
| | Required | Bolt Type | Bolt type, such as ASTM A325 (heavy hex structural steel bolts) |
| | Optional | Connect To | Connect to assembly mark number |
| | Optional | Connection Type | Classification of the particular connection type (e.g., weld, bolt) |
| | Optional | Weld Joint Designation Code | Welding joint code per AWS D1.1/D1.1M (e.g., B-P1A, butt weld/partial penetration joint [PPJ]/square groove weld/SMAW) |
| | Optional | Weld Joint Thickness | Thickness of the steel to be welded |
| | Optional | Thickness UOM | Unit of measurement for weld joint thickness (e.g., FT, M, IN, etc.) |
| | Optional | Weld Quantity | Linear inches of weld |
| | Optional | Weld Type | Specific welding machine or method used for this connection (e.g., SMAW, FCAW, GMAW, etc.) |

Discussion

- This table is essentially an IFC export of data in the model. If an IFC file meets the intent of this data set, it is not needed separately.

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|------------------------------------|--------------------------|----------------------------|
| <i>Project ID</i> | FF 357162 | FF 357162 |
| <i>Piecemark</i> | B1522 | B1326 |
| <i>Assembly Global ID</i> | 1QgTd\$5ub8mgcVpXtQN4ba | 3T_rPphcH5f94cUXvQpo3e |
| <i>Bolt Acceptance Criteria</i> | Direct Tension Indicator | – |
| <i>Bolt Details</i> | BOLT 3/4"DIA A325 1"3/4 | – |
| <i>Bolt Quantity</i> | 3 | – |
| <i>Bolt Type</i> | A325N | – |
| <i>Connect To</i> | B1463 | B1056 |
| <i>Connection Type</i> | Bolt | Weld |
| <i>Weld Joint Designation Code</i> | – | Butt Weld |
| <i>Weld Joint Thickness</i> | – | 0.5 |
| <i>Thickness UOM</i> | – | Inch |
| <i>Weld Quantity</i> | – | 5.5 |
| <i>Weld Type</i> | – | Shielded Metal Arc Welding |

3.12. DR180 – Steel Fabrication

3.12.1. DR180-01: Steel Fabrication CWP Tracking

Description: List of steel fabrication CWP tracking

Source(s): Engineering management team (fabricator input)

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the fabrication schedule milestones of a steel CWP.

Data Requirement Definition: Steel Fabrication CWP Tracking

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Fabrication Scope | Unique scope identifier (e.g., PWP, fabrication contract/PO, etc.) |
| PK | Required | CWP | Unique construction work package identifier |
| | Optional | Drawings to Shop Complete – Actual | Actual date for the complete drawings to reach the shop |
| | Optional | Drawings to Shop Complete – Forecast | Forecast date for the drawings to reach the shop complete |
| | Optional | Drawings to Shop Complete – Plan | Planned date for the drawings to reach the shop complete |
| | Optional | Fabrication Complete – Actual | Actual date for fabrication to be complete |
| | Optional | Fabrication Complete – Forecast | Forecast date for fabrication to be complete |
| | Optional | Fabrication Complete – Plan | Planned date for fabrication to be complete |
| | Optional | Fabrication Percent Complete | Fabrication completeness as a percentage |
| | Optional | Shipment Complete – Actual | Actual date for shipment to be complete |
| | Optional | Shipment Complete – Forecast | Forecast date for shipment to be complete |
| | Optional | Shipment Complete – Plan | Planned date for shipment to be complete |
| | Optional | Shipment Percent Complete | Percentage of shipment complete by piecemark count |

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------------------|---|
| | Optional | CWP Steel Delivery – Actual | Actual date to deliver all steel for the CWP |
| | Optional | CWP Steel Delivery – Forecast | Forecast date to deliver all steel for the CWP |
| | Optional | CWP Steel Delivery – Plan | Planned date to deliver all steel for the CWP |
| | Optional | CWP Steel Delivery – ROS | Required on-site date specified for the CWP |
| | Optional | Detailer | Name of the detailer (company name) |
| | Optional | Specialty Coating Complete – Actual | Actual date for specialty coating to be complete |
| | Optional | Specialty Coating Complete – Forecast | Forecast date for specialty coating to be complete |
| | Optional | Specialty Coating Complete – Plan | Planned date for specialty coating to be complete |
| | Optional | CWP Weight | Actual weight of the CWP |
| | Optional | Weight UOM | Unit of measurement for weight of the CWP (e.g., TN, lbs, Mt, Kg, etc.) |

Discussion

- *Fabrication Scope* is used to differentiate fabricators by contract or PO if needed.
- Specialty coatings are optional, but if needed can be expanded to include necessary fields (e.g., specialty coating type, thickness, etc.)
- *Weight* is only intended to be an order of magnitude value for understanding if needed.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--|-------------------------|---------------------|
| <i>Project ID</i> | FF 357162 | FF 357162 |
| <i>Fabrication Scope</i> | 237-18 | 107-19 |
| <i>CWP</i> | S1601A-2.5-60-01 | S1501B-2.5-80-03 |
| <i>Drawings to Shop Complete – Actual</i> | 05-07-2019 | 05-28-2019 |
| <i>Drawings to Shop Complete – Forecast</i> | 04-24-2019 | 05-15-2019 |
| <i>Drawings to Shop Complete – Plan</i> | 04-30-2019 | 05-30-2019 |
| <i>Fabrication Complete – Forecast</i> | 05-21-2019 | 06-21-2019 |
| <i>Fabrication Complete – Plan</i> | 05-21-2019 | 06-21-2019 |
| <i>Fabrication Complete – Actual</i> | 05-31-2019 | 06-30-2019 |
| <i>Fabrication Percent Complete</i> | 100 | 100 |
| <i>Shipment Complete – Actual</i> | 06-22-2019 | 07-22-2019 |
| <i>Shipment Complete – Forecast</i> | 06-06-2019 | 07-07-2019 |
| <i>Shipment Complete – Plan</i> | 06-15-2019 | 07-15-2019 |
| <i>Shipping Percent Complete</i> | 90 | 80 |
| <i>CWP Delivery – Actual</i> | 07-07-2019 | 08-15-2019 |
| <i>CWP Delivery – Forecast</i> | 06-15-2019 | 07-15-2019 |
| <i>CWP Delivery – Planned</i> | 06-24-2019 | 07-24-2019 |
| <i>CWP Delivery – ROS</i> | 06-30-2019 | 08-11-2019 |
| <i>Detailer</i> | Fergusson Atlantic Inc. | Reliable Structures |
| <i>Specialty Coating Complete – Actual</i> | 06-15-2019 | 07-15-2019 |
| <i>Specialty Coating Complete – Forecast</i> | 06-01-2019 | 07-01-2019 |
| <i>Specialty Coating Complete – Plan</i> | 06-01-2019 | 07-01-2019 |
| <i>CWP Weight</i> | 103.5 | 52.4 |
| <i>Weight UOM</i> | Tons | Tons |

3.12.2. DR180-02: Steel Fabrication Details Tracking

Description: List of steel fabrication details tracking

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the status of detailed piecemark fabrication.

Data Requirement Definition: Steel Fabrication Details Tracking

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | CWP | Unique construction work package identifier |
| PK | Required | Piecemark | Assembly mark number |
| | Required | Structure Tag | Unique tag number assigned to identify a project item |
| | Required | Member Type | Piecemark member type (e.g., beam, column, brace, etc.) |
| | Required | Count Fabricated | Piecemark count fabricated |
| | Required | Count Required | Piecemark count required |
| | Required | Count Shipped | Piecemark count shipped |
| | Required | Length | Length of the item |
| | Required | Length UOM | Unit of measurement for length of the item (e.g., FT, M, etc.) |
| | Required | Weight | Weight of the item |
| | Required | Weight UOM | Unit of measurement for weight of the item (e.g., TN, Lbs, Mt, Kg, etc.) |
| | Optional | 3D GUID | Comma-separated list of 3D model piecemark GUIDs within the CWP |
| | Optional | Galvanizing Required | Indicates whether structure requires galvanizing |
| | Optional | Fireproofing Required | Indicates whether structure requires fireproofing |

Discussion

- N/A

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------------|---|---|
| <i>Project ID</i> | FF 357162 | FF 357162 |
| <i>CWP</i> | S1601A-2.5-60-01 | S1501B-2.5-80-03 |
| <i>Piecemark</i> | VB1035 | A67 |
| <i>Structure Tag</i> | S1601A-2.5-60-01-PR-001 | S1501B-2.5-80-03-SP-020 |
| <i>Member Type</i> | VERTICAL_BRACE_6X15 | ANGLE_8x4x1 |
| <i>Count Fabricated</i> | 2 | 2 |
| <i>Count Required</i> | 2 | 4 |
| <i>Count Shipped</i> | 2 | 2 |
| <i>Length</i> | 17.067 | 16 |
| <i>Length UOM</i> | FT | FT |
| <i>Weight</i> | 512 | 99.76 |
| <i>Weight UOM</i> | lbs | lbs |
| <i>3D GUID</i> | 1eNj8eJPf1T8u9z9fi_KDb, 3vRk_ljHT8vg0H7VLTktVK | 2aOjkrMs55qB6DCAo\$D660, 2HnIBtHkD28PYLSJBXLypF, 3KH9v6pPP5leF3ThHUGyIE, 1Qwq20c1bDw9eB7mYylez |
| <i>Galvanizing Required</i> | Yes | No |
| <i>Fireproofing Required</i> | No | Yes |

3.13. DR190 – Pipe Detailing

3.13.1. DR190-01: Pipe Isometric Detailing

Description: List of pipe isometric detailing

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To track the commitments and progress against the detailing of piping isometrics.

Data Requirement Definition: Pipe Isometric Detailing

| Key | Tier | Field Name | Definition |
|-----|----------|--|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Isometric Drawing | Piping isometric drawing number |
| | Required | CWP | Unique construction work package identifier |
| | Optional | Engineering Isos to Detailer – Actual | Actual date for engineer to transmit pipe isometrics |
| | Optional | Engineering Isos to Detailer – Forecast | Forecast date for engineer to transmit pipe isometrics |
| | Optional | Engineering Isos to Detailer – Plan | Planned date for engineer to transmit pipe isometrics |
| | Optional | Fabricator Detailing Delivery – Actual | Actual date for delivery of pipe drawings from a detailer |
| | Optional | Fabricator Detailing Delivery – Forecast | Forecast date for delivery of pipe drawings from a detailer |
| | Optional | Fabricator Detailing Delivery – Plan | Planned date for delivery of pipe drawings from a detailer |
| | Optional | Piping Line Number | Parent line number of associated isometric |

Discussion

- The assumption is that an isometric should not split CWP boundaries, as this would mean that engineering was not following construction's direction or construction was not involved in the engineering process (different entities).

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|---|-----------------------|-----------------------|
| <i>Project ID</i> | PR001 | AN.9892 |
| <i>Isometric Drawing</i> | HOR-CX-1492-04 | AA-IX-732-01 |
| <i>CWP</i> | CWP-1001 | 280X810A-01 |
| <i>Engineering Isos to Detailer – Actual</i> | 01/03/2020 | 06/04/2020 |
| <i>Engineering Isos to Detailer – Forecast</i> | 01/03/2020 | 06/01/2020 |
| <i>Engineering Isos to Detailer – Plan</i> | 01/03/2020 | 04/08/2020 |
| <i>Fabricator Detailing Delivery – Actual</i> | 01/17/2020 | 07/01/2020 |
| <i>Fabricator Detailing Delivery – Forecast</i> | 01/16/2020 | 07/03/2020 |
| <i>Fabricator Detailing Delivery – Plan</i> | 01/16/2020 | 05/01/2020 |
| <i>Piping Line Number</i> | HOR-CX-1492 | AA-IX-732 |

3.13.2. DR190-02: Pipe Isometric Transmittals

Description: List of pipe isometric transmittals

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the unique list of transmittals and their relation to the isometric files.

Data Requirement Definition: Pipe Isometric Transmittals

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Isometric Drawing | Piping isometric drawing number |
| PK | Required | Isometric File Type | File type of isometric (e.g., PDF, PCF, etc.) |
| PK | Required | Transmittal ID | Transmittal ID the document was issued under |
| | Required | Isometric Revision | Pipe isometric's revision released version |
| | Required | Doc Status | Current state of release of the pipe isometric (e.g., IFA, IFC) |
| | Required | CWP | Unique construction work package identifier |
| | Required | On Hold | Indicates whether the isometric is currently on hold |
| | Required | Deleted | Indicates whether the ISO has been deleted |
| | Required | Isometric File Name | Name of isometric (includes extension) |
| | Optional | Isometric File Title | Title of isometric |

Discussion

- The implementation team recognizes that isometric transmittals are key data sets needed to link transmittal to isometrics that require additional attributes not captured in the DR120 Document Control data sets.
- The implementation team included *Isometric File Type* as part of Primary Key, but it is up to the project team to determine how document control is structured (e.g., isometrics with multiple file type attachments or separate isometric per file type).

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------|----------------------------|----------------------------|
| <i>Project ID</i> | PR001 | AN.9892 |
| <i>Isometric Drawing</i> | HOR-CX-1492-04 | AA-IX-732-01 |
| <i>Isometric File Type</i> | DGN | PDF |
| <i>Transmittal ID</i> | PR001-004-023 | XMTL-007 |
| <i>Isometric Revision</i> | 01 | -01A |
| <i>Doc Status</i> | ISSUED FOR CONSTRUCTION | ISSUED FOR CONSTRUCTION |
| <i>CWP</i> | CWP-1001 | 280X810A-01-01 |
| <i>On Hold</i> | ON HOLD | NOT ON HOLD |
| <i>Deleted</i> | NOT DELETED | NOT DELETED |
| <i>Isometric File Name</i> | HOR-CX-1492-04.DGN | AA-IX-732-01.PDF |
| <i>Isometric File Title</i> | KNOCKOUT DRUM VENT LINE | 80# INSTRUMENT AIR |

3.13.3. DR190-03: Pipe Spools

Description: List of pipe spools by CWP

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define a unique spool list with an association to an isometric drawing.

Data Requirement Definition: Pipe Spools

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Spool Tag | Pipe spool unique identifier |
| | Required | Isometric Drawing | Piping isometric drawing number |
| | Required | CWP | Unique construction work package identifier |
| | Required | Length | Length of the item |
| | Required | Length UOM | Unit of measurement for length of the item (e.g., FT, M, etc.) |
| | Required | Material | Spool material of construction |
| | Required | Weight | Weight of the item |
| | Required | Weight UOM | Unit of measurement for weight of the item (e.g., TN, LBS, Mt, Kg, etc.) |
| | Required | Schedule/ Thickness | Spool schedule or wall thickness |

Discussion

- Assumption: *Spool Tag* contains the isometric number plus spool sequence number, but a separate *Isometric* field is included for the isometric drawing number, as this is useful for database manipulation.

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|--------------------------------|-----------------------|-----------------------|
| <i>Project ID</i> | PR001 | AN.9892 |
| <i>Spool Tag</i> | HOR-CX-1492-0401 | AA-IX-732-0101 |
| <i>Isometric Drawing</i> | HOR-CX-1492-04 | AA-IX-732-01 |
| <i>CWP</i> | CWP-1001 | 280X810A-01-01 |
| <i>Length</i> | 40 | 18 |
| <i>Length UOM</i> | M | Linear Feet |
| <i>Material</i> | STAINLESS STEEL | C156 |
| <i>Weight</i> | 320 | 180 |
| <i>Weight UOM</i> | Kg | lbs |
| <i>Schedule/ Thickness</i> | SCH-STD | 12MM |

3.14. DR200 – Pipe Fabrication

3.14.1. DR200-01: Pipe CWP Fabrication Delivery Requirements

Description: List of pipe spool delivery requirements

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the delivery schedule of each CWP by fabrication scope/contract.

Data Requirement Definition: Pipe CWP Fabrication Delivery Requirements

| Key | Tier | Field Name | Definition |
|-----|----------|--|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Fabrication Scope | Unique scope identifier (e.g., PWP, fabrication contract/PO, etc.) |
| PK | Required | CWP | Unique construction work package identifier |
| | Required | CWP Pipe Spools Delivery – ROS | Required on site date specified for the CWP |
| | Required | CWP Pipe Spools Delivery – Planned | Planned date to deliver all pipe spools for CWP |
| | Required | CWP Pipe Spools Delivery – Forecast | Forecast date to deliver all pipe spools for CWP |
| | Optional | CWP Pipe Spools Delivery – Actual | Actual date to deliver all pipe spools for CWP |

Discussion

- The implementation team recognizes that the actual delivery date will most likely come from on-site material controls and not from the fabricator.
- The team also expects that the ROS date can be a moving target based on the refined path of construction as it is updated. As such, the planned delivery date was the locked baseline for comparison purposes.

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|--|-----------------------|-----------------------|
| <i>Project ID</i> | PR001 | AN.9892 |
| <i>Fabrication Scope</i> | PWP-001 | PO-1240095 |
| <i>CWP</i> | CWP-1001 | 280X810A-01-01 |
| <i>CWP Pipe Spools Delivery – ROS</i> | 08/15/2020 | 06/19/2020 |
| <i>CWP Pipe Spools Delivery – Planned</i> | 08/10/2020 | 06/15/2020 |
| <i>CWP Pipe Spools Delivery – Forecast</i> | 08/11/2020 | 12/15/2020 |
| <i>CWP Pipe Spools Delivery – Actual</i> | 08/11/2020 | TBD |

3.14.2. DR200-02: Pipe Spool Fabrication Tracking

Description: List of pipe spool fabrication tracking

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the list of piping spools and track their status through the fabrication cycle.

Data Requirement Definition: Pipe Spool Fabrication Tracking

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Spool Tag | Unique tag number assigned to identify a project item |
| | Required | CWP | unique construction work package identifier |
| | Required | CWA | construction work area identifier |
| | Required | EWP | engineering work package identifier |
| | Required | Isometric Drawing | Piping isometric drawing number |
| | Required | In Production | Date pipe spool fabrication began |
| | Required | Fabrication Complete | Date pipe spool fabrication was completed |
| | Optional | Painting Complete | Date pipe spool painting was completed |
| | Optional | PWHT Complete | Date the pipe spool had post weld heat treatment, if required |
| | Required | Length | Length of the item |
| | Required | Length UOM | Unit of measurement for length of the item (e.g., FT, M, etc.) |
| | Required | Weight | Weight of the item |
| | Required | Weight UOM | Unit of measurement for weight of the item (e.g., TN, lbs, Kg, etc.) |
| | Optional | Material Allocated | Date spool material was allocated |
| | Required | On Hold Date | Date engineering placed a hold on fabrication of the pipe spool |
| | Required | Release Hold | Date engineering released a hold on the spool |
| | Required | ROS | Required onsite date for this pipe spool |
| | Optional | QA/QC Complete | Date QA/QC completed inspection |

Data Requirement Definition: Pipe Spool Fabrication Tracking (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------|--|
| | Optional | Header Size | Maximum size of the header |
| | Optional | Priority | Project priority |
| | Optional | Transmittal No. | Transmittal number |
| | Optional | Material Type | Material type |
| | Optional | Material Type Description | Material type description |
| | Optional | Line Spec | Specification of the line |
| | Optional | Heat Treat | Heat treatment requirement |
| | Optional | Shop Test | Hydrotest or pneumatic requirement |
| | Optional | Surface Area | Surface area of the spool |
| | Optional | FDI | Field diameter inch |
| | Optional | Last Status | Last status numerical identifier |
| | Optional | Last Status Desc | Last status text identifier |
| | Optional | Next Status | Next status numerical identifier |
| | Optional | Next Status Desc | Next status text identifier |
| | Optional | Paint System | Paint code |
| | Optional | Released to Shop Date | Status date timestamp – released to shop |
| | Optional | Cut Complete Date | Status date timestamp – cut complete |
| | Optional | Weld Complete Date | Status date timestamp – weld complete |
| | Optional | QC Complete Date | Status date timestamp – quality control complete |
| | Optional | Ship Complete Date | Status date timestamp – shipping complete |
| | Optional | Delivery No. | Delivery number |
| | Optional | Ship To Name | Shipping name received |
| | Optional | Hold Code | Hold code |
| | Optional | Hold Date | Hold date timestamp |
| | Optional | Data Date | Current record data date |
| | Optional | Remarks | Any remarks or notes |

Discussion

- ROS dates of spool should match CWP ROS dates. However, ROS dates specific to a spool can allow for prioritization within a CWP.
- The *Spool Piecemark* tag is tied to *Shipment ID*, *Load List ID*, *Container ID*, and line item (*Material ID*) on DR150-04 and DR150-05.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------------|---------------------------------|----------------|
| <i>Project ID</i> | PR001 | AN.9892 |
| <i>Spool Tag</i> | HOR-CX-1492-0401 | AA-IX-732-0101 |
| <i>CWP</i> | CWP-1001 | 280X810A-01-01 |
| <i>CWA</i> | 10 | 280X810A |
| <i>EWP</i> | 1001 | 280X810A-01-01 |
| <i>Isometric Drawing</i> | HOR-CX-1492-04 | AA-IX-732-01 |
| <i>In Production</i> | 04/02/2020 | 03/21/2019 |
| <i>Fabrication Complete</i> | 04/04/2020 | – |
| <i>Painting Complete</i> | 05/01/2020 | – |
| <i>PWHT Complete</i> | – | – |
| <i>Length</i> | 40 | 18 |
| <i>Length UOM</i> | M | Linear Feet |
| <i>Weight</i> | 320 | 180 |
| <i>Weight UOM</i> | Kg | lbs |
| <i>Material Allocated</i> | 03/27/2020 | 02/10/2019 |
| <i>On Hold Date</i> | – | 03/26/2019 |
| <i>Release Hold</i> | – | 08/22/2020 |
| <i>ROS</i> | 05/06/2020 | 09/24/2020 |
| <i>QA/QC Complete</i> | 05/02/2020 | – |
| <i>Header Size</i> | 040 | 060 |
| <i>Priority</i> | 0 | High |
| <i>Transmittal No.</i> | 001 | 252 |
| <i>Material Type</i> | 60 | CS |
| <i>Material Type Description</i> | A333 GR1, 6 LTCS @ <=50F | A33 |
| <i>Line Spec</i> | G3B-1TM-B-60 | 1CS1 |
| <i>Heat Treat</i> | N | Y |
| <i>Shop Test</i> | Hydro | Pneumatic |
| <i>Surface Area</i> | 64.56 | 50.25 |
| <i>FDI</i> | 107.54 | 109 |
| <i>Last Status</i> | 880 | 50 |
| <i>Last Status Desc</i> | 880 – Final Update | 50-Checking |
| <i>Next Status</i> | 999 | 52 |
| <i>Next Status Desc</i> | 999 – Complete – Ready to Purge | 52-Approved |

Sample Entries (continued)

| Field Name | Sample Entry 1 | Sample Entry 2 |
|------------------------------|----------------|---|
| <i>Paint System</i> | 9B | 10 |
| <i>Released to Shop Date</i> | 4/29/2020 | 29-05-2021 |
| <i>Cut Complete Date</i> | 05/12/2020 | 30-06-2021 |
| <i>Weld Complete Date</i> | 6/1/2020 | 31-07-2021 |
| <i>QC Complete Date</i> | 6/8/2020 | 01-08-2021 |
| <i>Ship Complete Date</i> | 6/17/2020 | 10-08-2021 |
| <i>Delivery No.</i> | 2 | 1 |
| <i>Ship To Name</i> | RSJA | FOX |
| <i>Hold Code</i> | 1 | – |
| <i>Hold Date</i> | 7/17/2020 | – |
| <i>Data Date</i> | 6/17/2020 | 10/08/2021 |
| <i>Remarks</i> | – | SPOOL FABRICATION DELAYED DUE TO ENGINEERING HOLD AND GLOBAL PANDEMIC |

3.15. DR230 – Contractor Scope Items

3.15.1. DR230-01: Contractor Scope

Description: List of contractor scope

Source(s): Engineering management team

Timing: Beginning of Stage 2

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 2

Purpose

To define the breakdown of scope items per contractor.

Data Requirement Definition: Contractor Scope

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Contractor ID | Labor contractor on the project that performed the material take-off (MTO) for the CWP |
| | Required | Scope Item | Item that may be from the construction contractor's take-off or progress database, line items from an estimate, IFC drawings, schedule activities, installation work packages, or any other basis of defining scope |
| | Optional | CWP | Unique construction work package identifier |
| | Optional | IWP | Unique installation work package identifier |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Optional | Est Hrs | Estimated hours for installation activities associated with the reported quantities |
| | Optional | Tag | Unique tag number assigned to identify a project item |
| | Optional | Test Package Designation | Test package identifier |
| | Required | Scope Total QTY | Total quantity of the material type within the CWP for the primary and secondary classifications |
| | Required | Scope QTY UOM | Unit of measurement for the total quantity field (e.g., EA, LF, Dia. In, M) |
| | Optional | Sub-System ID | Unique turnover sub-system identifier |
| | Optional | Phase | Field phase of execution (e.g., construction, testing, etc.) |
| | Optional | Material Take-off Document Number | Document number of the MTO |

Data Requirement Definition: Contractor Scope (continued)

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------|---|
| | Optional | Material Description | Short description of the material in consideration for the MTO analysis |
| | Optional | Material Type | Specific type of material within scope of the CWP |

Discussion

- This table is intended to provide a very flexible model to define construction contractor scope to be executed and to liken that scope to the delineations of the AWP packages (e.g., CWP, IWP, etc.).
- Testing and turnover attributes may not be available until later in the project.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--|-----------------------------|-----------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Contractor ID</i> | Acme Mechanical Works, Inc. | 56484987 |
| <i>Scope Item</i> | Install Spool SP-9882-002 | Set Pump P9101A |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>IWP</i> | IWP-0012-00A1-Pipe-003 | IWP-DA02-Equip-01-001 |
| <i>Discipline</i> | Piping | Mechanical |
| <i>Est Hrs</i> | 14 | 80 |
| <i>Tag</i> | SP-9882-002 | P-9101A |
| <i>Test Package Designation</i> | TP.12.A1.9882.01 | – |
| <i>Scope Total QTY</i> | 9 | 1 |
| <i>Scope QTY UOM</i> | Linear Feet | Ea |
| <i>Sub-System ID</i> | 20-EF-001-001 | DEM-25-002-023 |
| <i>Phase</i> | Construction | Construction |
| <i>Material Take-off Document Number</i> | P22L08-SN-784153-1 | EQP-P8392-9101-28B |
| <i>Material Description</i> | Piping Spool | Centrifugal Pump |
| <i>Material Type</i> | Carbon Steel | Mechanical Equipment |

3.16. DR260 – Constraints

3.16.1. DR260-01: Constraints

Description: List of constraints

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To capture a list of execution constraints against all package types.

Data Requirement Definition: Constraints

| Key | Tier | Field Name | Definition |
|-----|----------|------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Package ID | Unique package identifier (e.g., the IWP or CWP number) |
| PK | Required | Package Type | Type of package (e.g., IWP, CWP, STR, etc.) |
| PK | Required | Constraint ID | Unique constraint identifier within the package |
| | Required | Assigned To | Party responsible for clearing the constraint |
| | Required | Constraint Description | Specific description of the constraint |
| | Required | Constraint Type | Type of constraint (e.g., materials, scaffold, manpower, etc.) |
| | Required | Date Identified | Date the constraint was identified |
| | Required | Date Required | Date the constraint is due to be cleared |
| | Required | Date Resolved | Date the constraint is resolved |
| | Required | Constraint Status | Current status (e.g., working, on hold, cleared, etc.) |
| | Optional | Notes | Miscellaneous notes |

Discussion

- This is intended to be a flexible model, to capture any constraint type per package that the project chooses to track.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-------------------------------|---|--|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Package ID</i> | IWP-0012-00A1-Pipe-003 | IWP-DA02-Equip-01-001 |
| <i>Package Type</i> | IWP | IWP |
| <i>Constraint ID</i> | IWP-0012-00A1-Pipe-003-Const-02 | 45612 |
| <i>Assigned To</i> | Smith | Jones |
| <i>Constraint Description</i> | Two of five spools have not yet been received on-site | Pending resolution of foundation RFI |
| <i>Constraint Type</i> | Material Availability | RFI |
| <i>Date Identified</i> | 09/02/2020 | 20200718 |
| <i>Date Required</i> | 09/15/2020 | 20200730 |
| <i>Date Resolved</i> | – | 20200721 |
| <i>Constraint Status</i> | Open | Resolved |
| <i>Notes</i> | Expediating w/ fabricator | RFI cleared, installation greenlighted |

3.17. DR270 – Site Materials

3.17.1. DR270-01: Materials Location

Description: List of material storage locations

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To define all possible locations where material can be stored on site.

Data Requirement Definition: Materials Location

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Facility ID | Short identifier to uniquely mark the materials location (e.g., warehouse, container number, yard number, etc.) |
| PK | Required | Location ID | Bin identifier for correct location of the item (e.g., warehouse location, shelf and bay or box) |
| | Optional | Facility Description | Description of the materials location |
| | Optional | Facility Site | Site where the materials location resides |
| | Optional | Facility Type | Type of location (e.g., warehouse, laydown, etc.) |

Discussion

- N/A

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------|-------------------|-------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Facility ID</i> | Laydown 1 | Warehouse 1 |
| <i>Location ID</i> | A1 | R02.A.02 |
| <i>Facility Description</i> | Outdoor Laydown | Indoor Warehouse |
| <i>Facility Site</i> | Construction Site | Offsite Warehouse |
| <i>Facility Type</i> | Laydown Yard | Offsite Storage |

3.17.2. DR270-02: Material Receiving Report

Description: List of material receiving reports

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To capture material receiving information

Data Requirement Definition: Material Receiving Reports

| Key | Tier | Field Name | Definition |
|-----|----------|---------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Material Receiving Report | Unique identifier of the delivery |
| PK | Required | Shipment ID | Shipment identifier |
| PK | Required | Load List ID | Load list identifier |
| PK | Required | Container ID | Identifier of container, box, pallet, etc. |
| PK | Required | Material ID | Material identifier for the BOM item(s) (bulk) or unique tag ID if applicable (e.g., tag, spool number, commodity, etc.) |
| | Required | PO | Purchase order number |
| | Optional | Requisition Line | Line item on the requisition |
| | Required | Item Description | Material description |
| | Optional | Date Received | Date material received – site takes custody |
| | Required | Expected Qty | Quantity of item identifier |
| | Required | Expected Qty UOM | Unit of measurement for quantity of item (e.g., EA, LF, Dia. In, M, etc.) |
| | Required | Qty Received | Total quantity received |
| | Optional | Qty Overage | Quantity overage of the received item(s) |
| | Optional | Qty Shortage | Quantity shortage of the received item(s) |
| | Optional | Qty Damage | Quantity damaged of the received item(s) |
| | Required | CWP | Unique construction work package identifier |
| | Required | Tag | Unique tag number assigned to identify a project item |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Optional | Material Category | Material category |
| | Optional | Material Type | Material type within the category |

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------|--|
| | Optional | Facility ID | Short identifier to uniquely mark the location of the materials (e.g., warehouse, container number, yard number, etc.) |
| | Optional | Location ID | Bin identifier for correct location of the item (e.g., warehouse location, shelf and bay or box) |
| | Optional | Material Size | Material sizing information |
| | Optional | Material Size UOM | Unit of measurement for material sizing (e.g., EA, LF, M, In, etc.) |
| | Optional | Weight | Weight of Item ID |
| | Optional | Weight UOM | Unit of measurement for weight of the item (e.g., TN, lbs, Kg, etc.) |

Discussion

- This utilizes the same shipping material model as Procurement data sets. See DR150 for more detail.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|----------------------------------|--------------------|-------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Material Receiving Report</i> | MRR-454562 | 12355689 |
| <i>Shipment ID</i> | STK2-0369 | 4553158 |
| <i>Load List ID</i> | BOL-00892-1A | 56368 |
| <i>Container ID</i> | TCU-845365 | Crate 001 |
| <i>Material ID</i> | SP-9081-002 | P9807A |
| <i>PO</i> | PO-001-AC-0898 | 25698BT58894 |
| <i>Requisition Line Item</i> | 005 | 001 |
| <i>Item Description</i> | Pipe Spool | Centrifugal Pump |
| <i>Date Received</i> | 07/15/2020 | 20200418 |
| <i>Expected Qty</i> | 1 | 1 |
| <i>Expected Qty UOM</i> | EA | EA |
| <i>Qty Received</i> | 2 | 1 |
| <i>Qty Overage</i> | 1 | 0 |
| <i>Qty Shortage</i> | 0 | 0 |
| <i>Qty Damage</i> | 0 | 0 |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>Tag</i> | SP-9081-002 | P9807A |

Sample Entries (continued)

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--------------------------|--------------------|----------------------|
| <i>Discipline</i> | Piping | Equipment |
| <i>Material Category</i> | Prefabricated Pipe | Mechanical Equipment |
| <i>Material Type</i> | Carbon Steel | Pump |
| <i>Facility ID</i> | Laydown 1 | Warehouse 1 |
| <i>Location ID</i> | A1 | R02.A.02 |
| <i>Material Size</i> | 4 | – |
| <i>Material Size UOM</i> | NPD | – |
| <i>Weight</i> | 91 | 223 |
| <i>Weight UOM</i> | lbs | Kg |

3.17.3. DR270-03: Materials Inventory

Description: List of materials inventory

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To define the list of materials in inventory and key attributes, including package relationships.

Data Requirement Definition: Materials Inventory

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Material ID | Material identifier for the BOM item(s) (bulk) or unique tag identifier, if applicable (e.g., tag, spool number, commodity, etc.) |
| | Required | Item Description | Material description |
| | Optional | CWP | Unique construction work package identifier |
| | Optional | IWP | Unique installation work package identifier |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Required | Facility ID | Location identifier for the material item(s) |
| | Required | Location ID | Bin identifier for correct location of the item (e.g., warehouse location, shelf and bay or box) |
| | Required | Material Category | Material category |
| | Required | Material Description | Material description |
| | Required | Material Type | Material type within the category |
| | Required | Qty Inventory | Current quantity in inventory at location |
| | Required | Qty Issued | Quantity issued |
| | Required | Qty Purchased | Total quantity purchased for the project to date |
| | Required | Qty Received | Total quantity received for the project to date |
| | Required | Qty UOM | Unit of measurement for quantity of the item (e.g., Dia. In, M, etc.) |
| | Required | Tag | Unique tag number assigned to identify a project item |
| | Optional | Material Size | Material sizing information |
| | Optional | Material Size UOM | Unit of measurement for material size (e.g., EA, LF, Dia. In, M, etc.) |

Discussion

- This table is meant to be flexible by associating components to a broader parent tag.
- For many materials, the *Material ID* and the *Tag* will be 1:1 (e.g., spool), but for many other materials, multiple *Material IDs* will link to a parent *Tag* (e.g., ship loose components to a pump).

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------|------------------------|-----------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Material ID</i> | SP-9081-002 | P9807A |
| <i>Item Description</i> | Pipe Spool | Centrifugal Pump |
| <i>CWP</i> | CWP-0012-00A1-Pipe | CWP-DA02-Equip-01 |
| <i>IWP</i> | IWP-0012-00A1-Pipe-003 | IWP-DA02-Equip-01-001 |
| <i>Discipline</i> | Piping | Mechanical |
| <i>Facility ID</i> | Laydown 1 | Warehouse 1 |
| <i>Location ID</i> | A1 | R02.A.02 |
| <i>Material Category</i> | Prefabricated Pipe | Mechanical Equipment |
| <i>Material Description</i> | Pipe Spool | Centrifugal Pump |
| <i>Material Type</i> | Carbon Steel | Pump |
| <i>Qty Inventory</i> | 1 | 1 |
| <i>Qty Issued</i> | 1 | 0 |
| <i>Qty Purchased</i> | 1 | 1 |
| <i>Qty Received</i> | 1 | 1 |
| <i>Qty UOM</i> | EA | EA |
| <i>Tag</i> | SP-9081-002 | P9807A |
| <i>Material Size</i> | 4 | – |
| <i>Material Size UOM</i> | NPD | – |

3.17.4. DR270-04: Materials Issue**Description:** List of materials issue**Source(s):** Engineering management team**Timing:** Beginning of Stage 3**Frequency:** Continuous as revised – at a minimum, monthly through the end of Stage 3*Purpose*

To capture materials issued from inventory to the field for installation.

Data Requirement Definition: Materials Issue

| Key | Tier | Field Name | Definition |
|-----|----------|----------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Materials Issue Request ID | Material requisition identifier for the materials issue request |
| PK | Required | Material ID | Material identifier for the BOM item(s) |
| | Required | Material Description | Material description |
| | Required | Delivered To | Responsible stakeholder that the materials issue was provided to |
| | Required | Issued Date | Date of materials issue |
| | Required | IWP | Unique installation work package identifier |
| | Required | Qty Issued | Total quantity issued |
| | Required | Qty Requested | Total quantity requested for issue |
| | Required | Qty Shortage | Total quantity shortage |
| | Required | Qty UOM | Unit of measurement for quantity (e.g., EA, LF, Dia. In, M, etc.) |
| | Required | Requested By | Responsible stakeholder who requested the issuance of materials |
| | Required | Requested Date | Date of materials issue request |
| | Required | Tag | Unique tag number assigned to identify a project item |

Discussion

- N/A

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-----------------------------------|------------------------|-----------------------|
| <i>Project ID</i> | 98938277 | CPLX-0987 |
| <i>Materials Issue Request ID</i> | MIR-12569 | 1549875 |
| <i>Material ID</i> | SP-9081-002 | P9807A |
| <i>Material Description</i> | Pipe Spool | Centrifugal Pump |
| <i>Delivered To</i> | Smith | Jones |
| <i>Issued Date</i> | 08/19/2020 | 05/02/2020 |
| <i>IWP</i> | IWP-0012-00A1-Pipe-003 | IWP-DA02-Equip-01-001 |
| <i>Qty Issued</i> | 1 | 1 |
| <i>Qty Requested</i> | 1 | 1 |
| <i>Qty Shortage</i> | 0 | 0 |
| <i>Qty UOM</i> | EA | EA |
| <i>Requested By</i> | Martinez | Williams |
| <i>Requested Date</i> | 08/11/2020 | 04/29/2020 |
| <i>Tag</i> | SP-9081-002 | P9807A |

3.18. DR290 – Site Progress

3.18.1. DR290-01: Rules of Credit

Description: List of rules of credit

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To define rules of credit for claiming progress per component type groupings.

Data Requirement Definition: Rules of Credit

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | IWP Type | Type of installation work package (e.g., install, hydrotest, etc.) |
| PK | Required | Work Type | Type of work (e.g., spool, cable, foundation, etc.) |
| PK | Required | Work Sub Type | Subset of typical steps for a specific type grouping |
| PK | Required | Typical Step Number | Sequencing order for typical steps |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Required | Typical Step Description | Short description for the typical step (e.g., stage, erect, connect, support, punch) |
| | Required | Typical Step Spread | Percentage spread factor that the typical step “earns” of Total Qty upon completion of the step |

Discussion

- The implementation team understands that data should be grouped by type (e.g., spools), but different rules of credit may apply, depending on the sub type (e.g., carbon steel above ground spool).

Sample Entries

| Field Name | <i>Sample Entry 1</i> | <i>Sample Entry 2</i> |
|---------------------------------|-----------------------|----------------------------|
| <i>Project ID</i> | 24198 | 350-10046 |
| <i>IWP Type</i> | Install | Hydrotest |
| <i>Work Type</i> | Pipe Spool | Pipe Fitting |
| <i>Work Sub Type</i> | Underground | Flange |
| <i>Typical Step Number</i> | 4 | 2 |
| <i>Discipline</i> | Piping | Piping |
| <i>Typical Step Description</i> | Fusion Complete | Restoration/Punch Complete |
| <i>Typical Step Spread</i> | 25% | 15 |

3.18.2. DR290-02: IWP Work Steps

Description: List of IWP work steps

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To define progress through rules of credit for each IWP work step.

Data Requirement Definition: IWP Work Steps

| Key | Tier | Field Name | Definition |
|-----|----------|-----------------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | IWP | Unique installation work package identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| PK | Required | Work Step Number | Sequencing number of the work step in the IWP for the specified material component |
| | Required | Component or Assembly Name | Name for the component or assembly |
| | Required | Work Type | Type of work (e.g., spool, cable, foundation, etc.) |
| | Required | Work Sub Type | Subset of typical steps for a specific type grouping |
| | Required | Discipline | Discipline responsible for the engineering design |
| | Required | IWP Type | Type of installation work package (e.g., install, hydrotest, etc.) |
| | Required | Percent Complete | Percentage complete of the specified work step |
| | Required | Total QTY | Total quantity of the specified material component in the specified IWP |
| | Required | QTY UOM | Unit of measurement for the quantity reported (e.g., EA, LF, Dia. In, M, CY, etc.) |
| | Required | Work Step Description | Short description of the work step |
| | Optional | Work Step Earnable QTY | Quantity “to earn” with 100% progress of the specified work step |
| | Optional | Component or Assembly Description | Short description for the component or assembly |
| | Optional | Total Budget HRS | Total budget hours of the specified material component in the specified IWP |

Discussion

- This table captures the component-level progressing information for each IWP for each rule of credit step.
 - *Percent Complete* should capture how far along the component is in each typical step (e.g., 20% complete of installing pipe component).
 - *Work Step Earnable Qty* should calculate value earned for a particular step of a single component once complete. Although this is a calculated field, this simplifies claiming steps in the field.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--|----------------------------|------------------------|
| <i>Project ID</i> | 24198 | 350-10046 |
| <i>IWP</i> | 0AB1-STG-MS-BYPASS | IWP-A2-Civil-01-001 |
| <i>Tag</i> | 01AB23PS001 | 017111-DB-00234 |
| <i>Work Step Number</i> | 1 | 2 |
| <i>Component or Assembly Name</i> | Spool | Pier-02 |
| <i>Work Type</i> | Pipe Spool | Foundation |
| <i>Work Sub Type</i> | Aboveground | Pier |
| <i>Discipline</i> | Piping | Civil |
| <i>IWP Type</i> | Install | Install |
| <i>Percent Complete</i> | .05 | 80% |
| <i>Total QTY</i> | 10 | 488 |
| <i>QTY UOM</i> | LF | CY |
| <i>Work Step Description</i> | Stage | Pour |
| <i>Work Step Earnable QTY</i> | 1 | 390.4 |
| <i>Component or Assembly Description</i> | Shop Fabricated Pipe Spool | Cast-in-place Concrete |
| <i>Total Budget HRS</i> | .56 | 256 |

3.18.3. DR290-03: IWP Execution**Description:** IWP execution progress**Source(s):** Engineering management team**Timing:** Beginning of Stage 3**Frequency:** Continuous as revised – at a minimum, monthly through the end of Stage 3*Purpose*

To capture the actual progress of each IWP on the project.

Data Requirement Definition: IWP Execution

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | IWP | Unique installation work package identifier |
| | Required | IWP – HRS Actual | Actual man-hours expended on IWP based upon actual installation work |
| | Required | IWP – HRS Earned | Total man-hours “earned” in the IWP based upon installed quantity and rules of progress |
| | Required | IWP – HRS To Go | Total man-hours to be able “to be earned” in the IWP based upon quantity of IWP scope |
| | Required | IWP Percentage Complete | Total percentage complete of work steps in the IWP |
| | Required | IWP Start – Actual | Actual start date of the IWP in the short-range lookahead schedule |
| | Required | IWP Start – Forecast | Forecast start date of the IWP in the short-range lookahead schedule |
| | Required | IWP Start – Plan | Planned start date of the IWP in the baseline lookahead schedule |
| | Required | IWP Finish – Actual | Actual finish date of the IWP in the short-range lookahead schedule |
| | Required | IWP Finish – Forecast | Forecast finish date of the IWP in the short-range lookahead schedule |
| | Required | IWP Finish – Plan | Planned finish date of the IWP in the baseline lookahead schedule |

Discussion

- This table may be an export of progress, as captured in scheduling or WorkFace Planning tools.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--------------------------------|-----------------------|-----------------------|
| <i>Project ID</i> | 24198 | 350-10046 |
| <i>IWP</i> | 0AB1-STG-MS-BYPASS | IWP-A2-Civil-01-001 |
| <i>IWP – HRS Actual</i> | 800 | 1500 |
| <i>IWP – HRS Earned</i> | 600 | 1500 |
| <i>IWP – HRS To Go</i> | 200 | 0 |
| <i>IWP Percentage Complete</i> | 75% | 1.00 |
| <i>IWP Start – Actual</i> | 7/20/2020 | 6/4/2020 |
| <i>IWP Start – Forecast</i> | 7/18/2020 | 6/4/2020 |
| <i>IWP Start – Plan</i> | 7/3/2020 | 6/9/2020 |
| <i>IWP Finish – Actual</i> | – | 6/16/2020 |
| <i>IWP Finish – Forecast</i> | 7/29/2020 | 6/16/2020 |
| <i>IWP Finish – Plan</i> | 7/14/2020 | 6/21/2020 |

3.18.4. DR290-04: IWP Delays

Description: List of IWP delays

Source(s): Construction management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To capture the IWP execution delay and constraint data.

Data Requirement Definition: IWP Delays

| Key | Tier | Field Name | Definition |
|-----|----------|-------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | IWP | Unique installation work package identifier |
| PK | Required | Tag | Unique tag number assigned to identify a project item |
| PK | Required | Work Step Number | Sequencing number of the work step in the IWP for the specified material component |
| PK | Required | Delay Code | Standard code used for trending reasons for the delay |
| PK | Required | Delay Date | Date when delay was captured |
| | Required | IWP – HRS Delayed | Delayed man-hours wasted on IWP due to unforeseen field constraints stopping IWP close |
| | Optional | Comments | Short description of the reason for delay and inability to close out the IWP |

Discussion

- *Delay Date* is part of the primary key to capture unique delays for the same reason (e.g., lightning/weather delay on Monday and Wednesday of the same IWP).

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|--------------------------|---------------------|-----------------------------|
| <i>Project ID</i> | 24198 | 24198 |
| <i>IWP</i> | IWP-B2-Elect-01-001 | IWP-B2-Elect-01-001 |
| <i>Tag</i> | 01EKF36XF001 | 01EKF36XF001 |
| <i>Work Step Number</i> | 2 | 2 |
| <i>Delay Code</i> | 4X | 4X |
| <i>Delay Date</i> | 7/14/2020 | 7/15/2020 |
| <i>IWP – HRS Delayed</i> | 4 | 15 |
| <i>Comments</i> | Rain out | Second weather day in a row |

3.19. DR310 – Completions

3.19.1. DR310-01: Sub-Systems Index

Description: List of sub-systems index

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

Defines the list of sub-systems and key attributes, including turnover forecasting and relationship to parent system.

Data Requirement Definition: Sub-Systems Index

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Sub-System ID | Unique turnover sub-system identifier |
| | Required | Sub-System Description | Description of the sub-system |
| | Required | Plan TCCC Date | Baseline plan date for transfer of care, custody, and control (TCCC) |
| | Required | Forecast TCCC Date | Current forecast date for TCCC |
| | Required | Actual TCCC Date | Actual date for TCCC |
| | Required | Current Custody Status | Current status of the turnover system (e.g., construction, pre-com, CSU, client, etc.) |
| | Optional | System Type | Type of system (e.g., process, fire detection, safety, telecom, etc.) |
| | Required | Related Tag | Related tag for the sub-system |
| | Required | Related IWP | Related installation work package for the sub-system |
| | Required | Related SWP | Related system work package for the sub-system |
| | Required | Commissioning Zone ID | Unique commissioning zone identifier |
| | Required | Commissioning Zone Description | Description of commissioning zone |
| | Required | System ID | Unique turnover system identifier |
| | Required | System Description | Description of system |

Discussion

- Commissioning zones can consist of multiple operating systems, each of which can consist of multiple sub-systems.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------------------|-----------------------|------------------------|
| <i>Project ID</i> | 24198 | 350-10046 |
| <i>Sub-System ID</i> | 01AB01 | 01-35 |
| <i>Sub-System Description</i> | Unit 1 Main Steam AB | Fuel Gas Pump |
| <i>Plan TCCC date</i> | 8/24/2020 | 9/15/2020 |
| <i>Forecast TCCC Date</i> | 8/31/2020 | 9/15/2020 |
| <i>Actual TCCC Date</i> | 8/31/2020 | – |
| <i>Current Custody Status</i> | Const | Pre-commissioning |
| <i>System Type</i> | Process | Process |
| <i>Related Tag</i> | 52-PU-2501 | 44-SU-582.1 |
| <i>Related IWP</i> | 52-CWP-001 | 44250-45-0001 |
| <i>Related SWP</i> | 01AB-02 | 01-A |
| <i>Commissioning Zone ID</i> | 01 | 01 |
| <i>Commissioning Zone Description</i> | Unit 1 | Fuel Gas North |
| <i>System ID</i> | 01AB | 01 |
| <i>System Description</i> | Unit 1 Main Steam A | Fuel Gas North General |

3.19.2. DR310-02: Test Packages

Description: List of test packages

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To capture a list of project test packages with the status of each.

Data Requirement Definition: Test Packages

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Test Package ID | Unique test package identifier (e.g., hydrotest package) |
| | Required | Sub-System ID | Unique turnover sub-system identifier |
| | Required | Plan Test Date | Baseline plan date for test |
| | Required | Actual Test Date | Actual date for test |
| | Required | Forecast Test Date | Current forecast date for test |
| | Required | Test Status | Current status of the system test (e.g., construction, ready for test, complete, etc.) |
| | Required | Test Type | Type of test to be performed (e.g., hydro, loop check, megger, etc.) |
| | Optional | Test Discipline | Discipline responsible for the test (e.g., piping, electrical, etc.) |
| | Required | Related Tag | Related tag for the test package |
| | Required | Related IWP | Related installation work package for the test package |
| | Required | Related SWP | Related system work package for the test package |

Discussion

- A typical use for this table would be to understand all testing required per sub-system or system and its status.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---------------------------|-----------------------|-----------------------|
| <i>Project ID</i> | 24198 | 350-10046 |
| <i>Test Package ID</i> | 001-PZQ-AB-00101 | 145674009 |
| <i>Sub-System ID</i> | 01AB01 | 01-35-001 |
| <i>Plan Test Date</i> | 7/20/2020 | 8/09/2020 |
| <i>Actual Test Date</i> | 7/21/2020 | 8/09/2020 |
| <i>Forecast Test Date</i> | 7/21/2020 | 8/09/2020 |
| <i>Test Status</i> | Ready for Test | Construction |
| <i>Test Type</i> | Hydrostatic | Holiday inspection |
| <i>Test Discipline</i> | Pipe | Coatings |
| <i>Related Tag</i> | 52-PU-2501 | 44-SU-582.1 |
| <i>Related IWP</i> | 52-CWP-001 | 44250-45-0001 |
| <i>Related SWP</i> | 01AB01-A | 01-35-001-003 |

3.19.3. DR310-03: Punch List Items

Description: List of punch list items

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To capture a punch list of items, status, and other key attributes.

Data Requirement Definition: Punch List Items

| Key | Tier | Field Name | Definition |
|-----|----------|------------------------|---|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Punch List | Identifies specific walkdown that the punch list was captured in (e.g., mechanical completion walkdown, commissioning walkdown, client turnover walkdown, etc.) |
| PK | Required | Punch Item ID | Unique identifier used to track the punch list item |
| | Required | Punch Item Description | Description of the punch list item |
| | Required | Related Sub-System | Related sub-system package for the punch list item |
| | Required | Priority | Priorities as defined by project (e.g., A, B, C) |
| | Required | Assigned Date | Date that the punch list item was assigned |
| | Required | Assigned To | Individual that the punch list item was assigned to |
| | Required | Originator By | Individual or team that identified the punch list item |
| | Required | Originator Date | Date that the punch list item was created |
| | Required | Resolution Date | Date that the punch list item was resolved |
| | Required | Punch Item Status | Status of the punch list item (i.e., open or closed) |
| | Optional | Originating IWP | IWP scope from which the punch item originated (e.g., IWP tag where valve tag was missing) |
| | Optional | Related Tag | Related equipment tag for the punch list item |
| | Optional | Related Drawing | Related drawing for the punch list item |
| | Optional | Exception Flag | Identifies whether punch list item will be received without completing |
| | Optional | Remarks | Any remarks or notes |

Discussion

- A *Punch List ID* can be used to specify the walkdown where the punch list items were captured (e.g., phases of the project where custody transfers between construction, commissioning, and client).
- The *Exception Flag* is typically a checkbox with the signature of the receiving party that is taking custody of the sub-system.
 - Project guidelines should define priority codes and which item requires an exception flag signature.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|-------------------------------|------------------------------------|--|
| <i>Project ID</i> | 24198 | 350-10046 |
| <i>Punch List</i> | Mech. Comp. | Client Turnover |
| <i>Punch Item ID</i> | 10489 | 126734 |
| <i>Punch Item Description</i> | Remove spring can hydrotest blocks | Complete tagging of Fuel Gas inlet valve station |
| <i>Related Sub-System</i> | 01-AB-001 | 01-35-001 |
| <i>Priority</i> | A | 2 |
| <i>Assigned Date</i> | 6/13/2020 | 7/15/2020 |
| <i>Assigned To</i> | CSMCINTY | Jones, Brett J. |
| <i>Originator By</i> | ASANUSI | Brummert, Brian K. |
| <i>Originator Date</i> | 6/1/2020 | 7/4/2020 |
| <i>Resolution Date</i> | 6/14/2020 | 7/31/2020 |
| <i>Punch Item Status</i> | Complete | Verified |
| <i>Originating IWP</i> | 01AB01-STG-MS-TIEINS | IWP-A4-PIPE-04-003 |
| <i>Related Tag</i> | 01AB24PHE001 | 01-35-01-004-3A |
| <i>Related Drawing</i> | 001-PHE-AB-0024 | 01-35-XFA-04-003 |
| <i>Exception Flag</i> | – | – |
| <i>Remarks</i> | – | – |

3.19.4. DR310-04: Check & Test Sheets

Description: List of check and test sheets

Source(s): Engineering management team

Timing: Beginning of Stage 3

Frequency: Continuous as revised – at a minimum, monthly through the end of Stage 3

Purpose

To capture check and test sheets, status, and other key attributes.

Data Requirement Definition: Check & Test Sheets Items

| Key | Tier | Field Name | Definition |
|-----|----------|--------------------------------|--|
| PK | Required | Project ID | Unique project identifier |
| PK | Required | Check & Test Sheet Number | Unique identifier of the check and test sheet |
| | Required | Check & Test Sheet Description | Description of the check and test sheet |
| | Required | Check & Test Sheet Revision | Current revision of the check and test sheet |
| | Required | Check & Test Sheet Discipline | Discipline of the check and test sheet |
| | Required | Check & Test Sheet Type | Type of the check and test sheet |
| | Required | Originator | Name of the originator |
| | Required | Document Type | Type of document |
| | Required | Related Sub-System | Related sub-system package for the check and test sheet |
| | Required | Priority | Priorities as defined by project (e.g., A, B, C) |
| | Required | Check & Test Sheet Status | Status of the check and test sheet (i.e., open or closed) |
| | Required | Related IWP | Related installation work package for the check and test sheet |
| | Required | Related SWP | Related system work package for the check and test sheet |
| | Required | Related Tag | Related equipment tag for the check and test sheet |
| | Optional | Related Drawing | Related drawing for the check and test sheet |
| | Optional | Remarks | Any remarks or notes |

Discussion

- Each sub-system can consist of check and test sheets that document the completion of commissioning activities.
- An SWP can be small in scope and magnitude and be a collection of check and test sheets or it can be scoped at a system or multi-sub-system level.
- Related IWPs correspond to pre-energization scope (i.e., all items documented on construction and pre-commissioning check sheets).
- Related SWPs correspond to post-energization scope.
- Some companies establish the association of IWPs to sub-systems and SWPs for every IWP. Additional effort or sophisticated software may be required to handle these relationships. Other companies wait for construction to make progress (typically over 60% or 70%) before they make that association, then focus on highlighting the remaining work required to complete a system, transitioning from bulk construction to execution driven by system completion.

Sample Entries

| Field Name | Sample Entry 1 | Sample Entry 2 |
|---|------------------------------|--------------------------------------|
| <i>Project ID</i> | 24198 | 52423 |
| <i>Check & Test Sheet Number</i> | ECS-002-A (A2) | G-001 (A2) |
| <i>Check & Test Sheet Description</i> | LV/Control Cable Test Record | Act of Inspection of Concealed Works |
| <i>Check & Test Sheet Revision</i> | U07 | U06 |
| <i>Check & Test Sheet Discipline</i> | Electrical | General |
| <i>Check & Test Sheet Type</i> | Construction | Construction |
| <i>Originator</i> | QC/RA | RA |
| <i>Document Type</i> | Checksheet | RVD |
| <i>Related Sub-System</i> | 40-1200-0111 | 52-1522-0001 |
| <i>Priority</i> | High | 1A |
| <i>Check & Test Sheet Status</i> | Open | Closed |
| <i>Related IWP</i> | 45-4000E-0052 | – |
| <i>Related SWP</i> | 40-1200-0111-D | 52-1522-0001-07 |
| <i>Related Tag</i> | 45-CAB-052 | 51-AC-201-015-001 |
| <i>Related Drawing</i> | 45-SCA-000-000-001 | – |
| <i>Remarks</i> | – | – |

Chapter 4: Conclusions and Recommendations

4.1. Conclusions

The primary conclusion of the project outcomes was the promotion of more productive information sharing for capital project stakeholders through AWP. The project team developed, wrote, reviewed, refined, and published the data requirements to augment the CII Best Practice of AWP. The project team collected data from the SMEs in CII Working Group 19-01 and utilized them to create this Implementation Guideline, which is this project's main deliverable.

This *AWP Data Requirements Implementation Guideline* satisfies an identified need from CII's membership. This need was largely derived from experience implementing AWP as defined by CII RT-272. Results from RT-272 provided foundational project framework elements for the *AWP Data Requirements Implementation Guideline*. The results of this project also support and facilitate the CII Best Practice of AWP.

4.2. Recommendations

The essential recommendation is for stakeholders on capital projects to implement these AWP Data Requirements to facilitate the standardization of information flow for work processes. More specifically, the AWP Data Requirements should be adopted as a reference for contractual requirements for data sharing among stakeholders on capital projects. Industrial and academic research showed a strong relationship between AWP implementation and higher project performance, compared to traditional planning and execution processes: up to 25% increase in field productivity and up to 10% decrease in total installed cost (CII/COAA 2015).

The project team envisions the following benefits for implementation of the *AWP Data Requirements Implementation Guideline*:

- Improving alignment among stakeholders
- Identifying and potentially mitigating risk
- Increasing the transparency surrounding AWP data sharing through standardization
- Enabling better proactive planning for stakeholders

The project team encourages personnel responsible for implementing this guide to select data requirement categories that are applicable to the work being performed. A project may require the use of all or only some of the data requirements, depending on the scope of work. The Working Group encourages project stakeholders to modify the recommended AWP Data Requirements to match their specific project needs to promote the implementation of the key project findings so their companies will experience the anticipated benefits.

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Revision Log

Versioning Convention

This guideline utilizes a two-field convention for version numbers, XX.YY:

XX: Major changes (e.g., added or removed major tables)

YY: Minor changes (e.g., added minor table; added, edited, or removed attributes); updates and clarification in documentation; no change to the data requirements (e.g., added to discussion sections but made no changes to the data requirements themselves)

Revision Log

| Version | Date | Revision Description |
|---------|-------------|---|
| 1.0 | Sep-18-2020 | Initial issue |
| 1.1 | Dec-01-2021 | First revision based on industry feedback |
| 1.2 | Jun-15-2022 | Figures 2 and 3 updated based on RT-364 – no changes to the data requirements |
| 1.3 | Sep-07-2022 | Added Figure 4. Added appendix to present Top-level Data Requirements. |
| 1.4 | Apr-24-2023 | Added Companion Document |

Acronym Glossary

| | |
|------|--|
| AG | Above Ground |
| AWG | American Wire Gauge |
| AWP | Advanced Work Packaging |
| AWS | American Welding Society |
| BOM | Bill of Materials |
| CBA | Community for Business Advancement |
| CBE | Commercial Bid Evaluation |
| CII | Construction Industry Institute |
| CSU | Cost Schedule Update |
| CSV | Comma-separated Value |
| CWA | Construction Work Area |
| CWP | Construction Work Package |
| DR | Data Requirement |
| DTI | Direct Tension Indicator |
| EHT | Electrical Heat Tracing |
| EMT | Electrical Metallic Tube |
| EPC | Engineering, Procurement, and Construction |
| ERP | Enterprise Resource Planning |
| ETA | Estimated Time of Arrival |
| EWP | Engineering Work Package |
| GUID | Global Unique Identifier |
| IFA | Issue for Approval |
| IFC | Issued for Construction |
| IFI | Issued for Information |
| IFR | Issued for Review |
| IS | Inside Shield |
| IWP | Installation Work Package |

| | |
|------|--|
| KPI | Key Performance Indicator |
| MDL | Minimum Detectable Level |
| MDI | Manual Data Input |
| MTO | Material Take-off |
| NPD | Nominal Pipe Diameter |
| OID | Object Identifier |
| OS | Outside Shield |
| PCF | Portable Compiled Format |
| PO | Purchase Order |
| PPJ | Partial Penetration Joint |
| PWP | Procurement Work Package |
| RFI | Request for Information |
| ROS | Required on Site |
| SBS | System Breakdown Structure |
| SMAW | Shielded Metal Arc Welding |
| STR | Structural |
| SWP | System Work Package |
| TBE | Technical Bid Evaluation |
| TCCC | Transfer of Care, Custody, and Control |
| TP | Test Package |
| UCI | Unique Component Identification |
| UG | Underground |
| UOM | Unit of Measure |
| WBS | Work Breakdown Structure |
| WFP | WorkFace Planning |

Appendix: Top-level Data Requirements

3.1. DR010 – AWP Master Index (6)

- 3.1.1. DR010-01: Project Information
- 3.1.2. DR010-02: CWAs
- 3.1.3. DR010-03: CWP's
- 3.1.4. DR010-04: EWP's
- 3.1.5. DR010-05: IWP's
- 3.1.6. DR010-06: SWP's

3.2. DR020 – Project Schedule (1)

- 3.2.1. DR020-01: Schedule Activities

3.3. DR050 – Equipment Design (1)

- 3.3.1. DR050-01: Equipment List

3.4. DR070 – Piping Design (4)

- 3.4.1. DR070-01: Line List
- 3.4.2. DR070-02: Isometric List
- 3.4.3. DR070-03: Tie-in List
- 3.4.4. DR070-04: Pipe Support List

3.5. DR080 – 3D Modeling (2)

- 3.5.1. DR080-01: Pipe Components
- 3.5.2. DR080-02: Generic Components

3.6. DR090 – Civil-Structural Design (4)

- 3.6.1. DR090-01: Structures List
- 3.6.2. DR090-02: Rebar
- 3.6.3. DR090-03: Anchor Bolts
- 3.6.4. DR090-04: Foundations

3.7. DR100 – Electrical & Instrumentation Design (7)

- 3.7.1. DR100-01: Cable Schedule
- 3.7.2. DR100-02: Electrical Equipment
- 3.7.3. DR100-03: Instrument Index
- 3.7.4. DR100-04: Conduit
- 3.7.5. DR100-05: Cable Tray
- 3.7.6. DR100-06: Lighting & Devices
- 3.7.7. DR100-07: Electrical Heat Tracing

3.8. DR120 – Document Control (2)

- 3.8.1. DR120-01: Document Register
- 3.8.2. DR120-02: Document to Entity

3.9. DR140 – Estimating and Cost (2)

- 3.9.1. DR140-01: EWP Estimate
- 3.9.2. DR140-02: CWP Estimate

3.10. DR150 – Procurement (5)

- 3.10.1. DR150-01: Material Requisition Tracking
- 3.10.2. DR150-02: Purchase Order Line Items
- 3.10.3. DR150-03: Supplier Purchase Order Shipments
- 3.10.4. DR150-04: Supplier Load Detail
- 3.10.5. DR150-05: Supplier Container Detail

3.11. DR170 – Structural Detailing (5)

- 3.11.1. DR170-01: Steel Detailing Deliverables
- 3.11.2. DR170-02: Steel Detail Drawings
- 3.11.3. DR170-03: Steel Piecemarks
- 3.11.4. DR170-04: Steel 3D Model Relationship
- 3.11.5. DR170-05: Steel Connection Details

3.12. DR180 – Steel Fabrication (2)

- 3.12.1. DR180-01: Steel Fabrication CWP Tracking
- 3.12.2. DR180-02: Steel Fabrication Details Tracking

3.13. DR190 – Pipe Detailing (3)

- 3.13.1. DR190-01: Pipe Isometric Detailing
- 3.13.2. DR190-02: Pipe Isometric Transmittals
- 3.13.3. DR190-03: Pipe Spools

3.14. DR200 – Pipe Fabrication (2)

- 3.14.1. DR200-01: Pipe CWP Fabrication Delivery Requirements
- 3.14.2. DR200-02: Pipe Spool Fabrication Tracking

3.15. DR230 – Contractor Scope Items (1)

- 3.15.1. DR230-01: Contractor Scope

3.16. DR260 – Constraints (1)

- 3.16. DR260-01 – Constraints (1)

3.17. DR270 – Site Materials (4)

- 3.17.1. DR270-01: Materials Location
- 3.17.2. DR270-02: Material Receiving Report
- 3.17.3. DR270-03: Materials Inventory
- 3.17.4. DR270-04: Materials Issue

3.18. DR290 – Site Progress (4)

- 3.18.1. DR290-01: Rules of Credit
- 3.18.2. DR290-02: IWP Work Steps
- 3.18.3. DR290-03: IWP Execution
- 3.18.4. DR290-04: IWP Delays

3.19. DR310 – Completions (4)

- 3.19.1. DR310-01: Sub-Systems Index
- 3.19.2. DR310-02: Test Packages
- 3.19.3. DR310-03: Punch List Items
- 3.19.4. DR310-04: Check & Test Sheets

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