Scope of Work Guidelines for Preparing a Construction Execution Plan

Prepared for

International Construction Consulting, LLC

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by

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Scope of Work Guidelines for Preparing the Construction Execution Plan

1.0 Construction Execution Plan Overview

The Construction Execution Plan (CEP) is a critical part of the Project Execution Plan and is a driver for many of the engineering and design aspects of the project. The CEP will address all aspects of the construction execution process in a practical and understandable document to support the overall execution philosophy and schedule. An early start on this work is needed as part of the contractor's engineering work effort. This document provides some guidance on the Owners expectations for the contents of an acceptable first draft of the CEP.

A sample Table of Contents is included to provide an outline of the level of detail expected, see Attachment 1.

2.0 Construction Execution Plan Details

2.1 Executive Summary

The Executive Summary is a high level summary describing the key elements of the CEP. It should be suitable for a management level audience who may not be familiar with the project. It should be essentially stand-alone, such that it could be separated from the CEP and circulated independently. Other than possibly referring to the main report as a source of additional information, the Executive Summary does not refer the reader to specific sections of the CEP.

The Executive Summary should be brief. A reasonable length for the Executive Summary is one to two pages.

2.2 Introduction

The Introduction Portion of the CEP should present a very broad overview of the scope of work. As well, the Introduction should address broad areas such as:

- Construction Execution Philosophy. Describes how the work is broken down, for example weather windows, geotechnical considerations, access restraints, and the rationale used. The number and type of spreads to be used should be spelled out. Overall strategies and construction modes to be used to meet the project schedule should be stated.
- Project Contracting Strategy. Should describe the project construction contracting strategy that formed the underlying basis for the CEP. This should include portions of the work to be sub-contracted, who will perform the work, how will they be supervised,

managed and integrated into the Contractors organization. It should be stated implicitly that the Contractor will be responsible for each subcontractor's compliance with all of the project specifications, codes, etc.

- Project Office. Assumptions should be stated regarding the Project office, it's location, staffing, its start up date and it's demobilization date.
- Project Organization. All assumptions about the project organization, staffing/rotation should be detailed. A copy of the organizational chart should be included as an appendix, showing the organization and reporting for construction management as well as field activities and how they report to the contractors Construction Management Team (CMT) and to the Project Management Team (PMT).
- Project Schedule. Should be a reasonably detailed schedule (level 3) showing the seasons (summer/winter) and generally what activities will be engaged. A brief narrative should be included that explains how the schedule flows and any assumptions that have been made.
- Construction Overview. This should be an overview, with a reasonable amount of detail, where each of the respective spreads will be working throughout the course of the project up to completion. Winter work areas should be detailed. Camp locations and support to complement each of the spreads activities should be included. Any specific logistical constraints should be noted along with mitigations and contingency plans.
- Codes and Standards. This section should reiterate that the contractor will construct the pipeline system according to the codes and standards as set out in the Invitation to Tender (ITT).
- Land Requirements. This should cover the ROW width and how the work will be accomplished within the ROW boundaries; i.e., snow removal, timber stacking, ice road construction, spoil and topsoil management, etc. Further any additional temporary land requirements that will needed for construction such as:
  - At the beginning and end of each construction spread for spread mobilization and demobilization;
  - For stringing truck turnaround areas,

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- Where the pipeline crosses under buried features (i.e., foreign pipelines, utility lines, fault crossings, etc.);
- On both sides of roads, railroads, and water bodies (rivers, creeks, bogs, wetlands, etc);
- Where the push/pull technique will be used to cross wetlands; and
- Other areas where extra space for spoils storage and construction activities are needed

2.3 Temporary Facilities

There are numerous temporary facilities that must be constructed to support pipeline construction. These should be detailed. Some examples of Temporary Facilities include:

- Camps. Camp locations should be indicated, including the hectares needed. Camp utilization should be detailed, for example will several cores be used per spread and the sleepers leap-frogged as crews progress.

  Camp management philosophy should be spelled out, quality of meals and service, and how re-supply of consumables, fire, medical emergencies, security, fuel, etc. are to be managed.

  Further, details of the camp infrastructure should be provided, including:

  - Kitchen/Dining units
  - Recreation units
  - Laundry unit
  - Dormitory units
  - Office units
  - Warehouses
  - Equipment shops
  - Potable water treatment unit
  - Sewage treatment unit
  - Solid waste treatment (incinerators)

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- Propane storage
- Gasoline/Diesel storage
- Medical aid facilities
- Fire fighting equipment
- Power plant
- Parking for equipment and vehicles

- Airports/Airstrips/Helipads. The existing airports and airstrips that are planned to be used should be indicated along with any required upgrades that need to be made. All helipad locations or a philosophy for their use should be spelled out. For example, will each camp location have a helipad? Will any be located at intermediate or special locations, etc? If helicopters will be used, a brief Helicopter Management Plan overview should be included as an Appendix.
- Pipe Storage and Material Storage Yards. The location of each pipe storage yard or material storage site should be noted, including how they will be constructed and eventually restored. As well, the distances between each and the estimated average road speed used for arriving at the number of transport trucks required.
- Co-use of Existing Facilities. In addition to any existing facilities that are planned to be used, this will also include any synergies within the EPC-2 contractors execution teams, i.e shared camps, organization, medical services, etc.
- Access Roads. Details should be provided regarding the use of existing access roads and any planned upgrades; i.e., grading, bridges, etc. Further, any new access roads that will be constructed should be detailed as to location and method of construction, the resources needed to perform the work and where those resources will be acquired from for the construction effort and utilized after (i.e., will they be used for road maintenance or incorporated into contractors work crews?). The planned use of the pipeline ROW for transportation and general movements should be explained. Lastly, details of how these roads and accesses will be maintained should be indicated, including dust control, drainage schemes, snow removal, etc.

It should be expected there will be a certain amount of repair and upgrades to existing roads and bridges. The heavy weight and track type equipment will require some upgrading prior to mobilization and to facilitate movement of equipment from site to site. In addition, after work has been completed, some areas will require repair and replacement to restore areas to their original intended use, or in some cases to be removed completely.

The CEP should identify the upgrades and new construction required as fully and as possible as these works are critical to the successful execution and completion of the work.

2.4 Construction Plan

There should be a short introduction that explains the general sequencing of the work crews. After the introduction, the following points should be addressed:

- Estimated production rates for each distinct section of the work should be provided as well as a rationale for the expected productivity. A full productivity work up could be included as an Appendix. See attached for an example.
- The “down time” assumption that is used in the CEP should be based on benchmark data from the regions crossed by this pipeline. Blanket, undocumented assumptions are unacceptable as a basis for the CEP. The lay rate calculation methodology shown in the attached includes a method for accounting for weather down time.
- A detailed section or paragraph should be included for each work crew (see Table of Contents for examples of crews used). Sufficient detail should be provided for each crew, what their respective responsibilities are, how they will perform their responsibilities, and any special requirements to be performed by each. For example, it should be shown where concrete coated pipe will be used, where and how it will be coated, who will coat it, how it will be transported to the work site. If it is to be performed on site, provisions for environmental controls should be stipulated.
- Special Construction areas should be addressed in detail, such as railroad crossings, river crossings, wetlands, faults, etc. Further it should be noted in general how these are to be performed and what crews and resources will be used. Many of the special

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construction areas will require site-specific construction plans, these areas should be noted and it should be stated that additional plans will be developed and submitted for approval prior to performing the work.

- Water crossings should be addressed in detail. The expected crossing methods as well as special requirements that will be incorporated, i.e., preparation of approaches, fueling, restoration, etc. Again, many of the water crossings will require site-specific construction plans, these crossings should be noted and it should be stated that additional plans will be developed and submitted for approval prior to performing the work.

The following functions should be addressed in detail of how the work function will be performed and how they will interface with the main construction spread:

- Construction Field Support. This should detail the support that will be provided to each spread and should include personnel (mechanics, carpenters, fabricators, etc.), facilities (warehouse, mechanics shops, tires shops, etc.), and supervision.
- Construction Equipment and Rolling Stock. This should be an overview of the Contractors philosophy regarding equipment and rolling stock maintenance, repairs, contingencies, etc.
- Mainline Block Valves (MLV's) and Launchers/Receivers. It should be stated how and where the MLV's and launchers./receivers will be fabricated, tested, transported, protected, and installed. Details as to who will install these appurtenances, when they will be installed and what sequence should be shown.
- Corrosion Protection System (CP). It should be clear how the installation of the CP system will be accomplished, who will do the work and how they will interface with mainline construction.
- Fiber Optic Cable (FOC). It should be clear how the installation of the FOC system will be accomplished, who will do the work and how they will interface with mainline construction.
- Environmental Compliance. This is not meant to be an Environmental Management Plan. This should detail the contractor's environmental monitoring and mitigation methods and the resources that will be provided to accomplish the tasks.

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Included should be training of personnel, how the inspection will be accomplished and what the reporting functions are.

- Quality Control (QC) Inspection. This section is not meant to be a Quality Control Plan or a description of inspection procedures.

  The general activities for QC inspection should be shown; i.e., assuring the work is done according to the procedures, specifications and drawings; and the crews that will have dedicated QC inspectors. The reporting requirements should be clearly indicated. Any additional responsibilities the QC inspectors will be expected to perform should be noted, such as reporting on the physical progress of the construction crews.

- Security. This section is not meant to be a Security Plan. It should provide an overview of the scope of the security to be provided and the organization, with reporting requirements, which will be used to carry out the work.

- Labor Employment and Training. Complete details of the contractors training program will be included in the Socioeconomic Plan, therefore this section is meant to provide an overall understanding of how construction will interface and coordinate with the Training Manager for the timely acquirement of the required quantities of the skill levels needed.

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Attachment 1: Sample Table of Contents

Typical Table of Contents

Appendix E - Pipeline Installation Productivity Analysis

The following analysis follows a detailed analytical process at attempting to develop a realistic productivity analysis as suggested by certain classic pipeline cost estimating literature. It is not intended to be the last word in estimating productivity, just a method that has worked on some estimates.

J. S. Page in his reference book entitled cost Estimating Manual for Pipelines and Marine Structures wrote: "Before one thinks in terms of labor costs, many things must be considered, the most important of which are called Productivity Efficiencies and Production Elements."

After extensive comparison of many projects, J. S. Page found that production percentages could be classified into five categories and that production elements can be grouped into six different listings or classifications:

Production Elements

1. General Economy
2. Project Supervision
3. Labor Relations
4. Job Conditions
5. Equipment
6. Weather

Productivity Efficiency Percentages

Type	Percentage Range
1. Very Low	10 through 40
2. Low	41 through 60
3. Average	61 through 80
4. Very Good	81 through 90
5. Excellent	91 through 100

By evaluating each of the six elements, a site specific Productivity Efficiency Percentage can be derived for any given situation.

Productivity Factor Adjustment Calculation

Objective:

To correct for productivity, efficiency, terrain, soils conditions, and weather.
Production Element Analysis

General Economy:

The general economic conditions in Alaska and Canada will need to be accesses. Due to the size of the project regional economic conditions may need to be considered. Recent contracts / project completion costs benchmarks should be collected and analyzed. The influx of project related activities will likely cause economic conditions to change along some sections of the routes. All these factors and any others considered significant in evaluating the General Economic conditions should be considered in this category. The route is so diverse and the economic conditions may be so varied along the route that a single factor in this category may be insufficient to capture all the impacts for this element. If this is the case then regional factors should be considered and appropriate adjustments made to productivity on a section by section basis.

Project Supervision:

Assumptions on local content and the availability experienced local/regional supervisors may be considered in this element. Some resources will be brought in and a proactive training program could be activated early to enhance performance. Assumptions on how pay scales of workers may impact Project Supervision should be captured in this element. Any assumptions included in the basis for cost estimating and productivity having to do with completion incentive bonus plans should be captured in this element.

Labor Conditions:

The following analysis leads to a rating for this element:

Factor to Consider	Rating
Are existing labor relations good	
Are there skilled craftsmen locally Available	
Experience level of craftsmen in the Region	
Human resource pool size	
Pay levels expected	

Analyze the employment situation in all regions crossed by this project. To reach a rating for this element consider the diverse labor conditions along the route. The labor conditions may be so varied that a single factor in this category may be insufficient to capture all the impacts for this element. If this is the case then regional factors should be considered and appropriate adjustments made to productivity on a section by section basis.

Job Conditions:

This project and cross-country pipeline associated with it will be one of the largest variations in local conditions in recorded history.

Assume that the project schedule will be managed tightly and on a "Just in Time" basis.

Working conditions will be remote. Document assumptions on camp locations and local infrastructure that will be employed to mitigate time loses traveling to and from the job site. Document assumptions on the condition of roads and include a summary of any assumed upgrades envisioned when setting the factor for this element.

Construction will be over varied terrain mostly parallel to existing linear features such as existing pipelines and/or power line corridors. Document the impact assumed access will have on this element. If the conditions are considered to be so variable along the route consider breaking the analysis of this element up into regional effects and make appropriate adjustments on a section-by-section basis.

Capture assumptions and analysis of operations impacts that are envisioned and make appropriate adjustments on a section-by-section basis if felt appropriate. Consider variability of regulatory constraint on a region by region basis if appropriate in determining the rating for this element.

Equipment:

Considerations and analysis:

Consideration	**Rating**
Fit for Purpose, use-ability	
Condition	
Maintenance & Repair (suppliers and parts available)	

Document all considerations used in determining this element rating.

Weather:

The weather in the regions crossed by this project will vary greatly. This fact will probably necessitate developing regional ratings for this element of the analysis. Document all assumptions and basis that are used in setting the rating for this element.

Summary of Six Element Analysis

Analysis Element	Rating
General Economy	
Production Supervision	
Labor Relations	
Job Conditions	
Equipment	
Weather	
Total	

Derived Average Percentage Labor Productivity Factor (LPF)

Total of Elements / 6 = P %; LPF = P/100

Calculation of Expected Lay Rate

The method for determining lay rate suggested by J. S. Page Cost Estimating Manual for Pipelines & Marine Structures starts by using lay rates for various sizes and wall thickness of pipe lay rate under optimum conditions across rock free level terrain. Most likely the ratings included in such standard tables will not be appropriate for this project. The contractor will need to develop and document the method it uses to determine the lay rate.

For a given pipe size the Page method computes an "Actual Terrain Factor", "Rock Adjustment Factor" and utilizes the over all Productivity Factor computed above the estimate the schedule days for construction and illustrated below.

Lay Rate Adjustments for Actual Terrain Factor (ATF):

The Microsoft Excel Worksheet Object can be used to calculate an appropriate terrain factor consistent with the Page Method by entering the section lengths in the appropriate column below (i.e. replacing the "1 s° shown in the "Section Length" column):

Terrain Type	Terrain Factor	Units of Length Section Length	Use Factor Factored Section
Level	1	1	1.0
Slightly Rolling	0.95	1	1.0
Rolling	0.6	1	0.6
Rough	0.5	1	0.5
Very Rough	0.3	1	0.3
Total		5.0	3.4

ATF = Section Length I Factored Section = 0.6700

Rock Factor Adjustment (RFA):

The Microsoft Excel Worksheet Object can be used to calculate an appropriate Rock Factor Adjustment factor consistent with the Page Method by entering the section lengths in the appropriate column below (i.e. replacing the "1 s° shown in the "Section Length" column):

Percent Rock	Rock Factor	Units of Length Section Length	Use Factor
0	1	1	1.00
0 - 25	0.846	1	0.85
26 - 40	0.72	1	0.72
41 - 55	0.627	1	0.63
56 - 70	0.547	1	0.55
Total		5	3.74

RFA =Section Length / Factored Section = 0.748

Adjusted Average Lay Rate Calculation:

Section	Unadjusted Linear Day Rate, Optimum Conditions and Terrain	X	Labor Productivity Factor	X	Actual Terrain Factor (ATF)	X	Rock Factor Adjustment RFA	[9]	Adjusted Lay Rate (units of length/ day)
Description	Units Lengths/day		LPF		ATF		RFA		LR

Computed Scheduled Lay Days:

Section Length I Adjusted Lay Rate = Schedule Days

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Attachment 2: Pipeline Productivity Analysis Sample

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Computed Scheduled Lay Days:

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Appendix 1: Examples of Appendices of Tables to be Included

Examples of appendices that could be included are:

- Organization Charts (Field Management, Construction Management, and how They are Tied to Project Management)
- Level 3 Schedule
- Pipeline Productivity Analysis (See Attachment 2 for a Sample)
- MLV Location Table
- Civil Construction Quantities, including Borrow Pit Locations
- River Crossing Chart (Showing Major Rivers and Expected Crossing Methods)
- Road / Railroad Crossing Chart
- Camp / Warehousing / Laydown Plan with Location Chart by Spread
- Temporary Electric Power Generation & Distribution Plan
- Fuel Storage and Usage Plan
- Material / Equipment Preservation Plan
- Material Management Plan
- Welding Procedures & Training Plan
- Shift Schedule / Workweek / Site Holiday Plan
- Surplus Material Disposal Plan
- Field Procurement Plan
- Hydrostatic Testing & Dewatering Plan
- Communication Plan
- Helicopter Management Plan
- Logistics Plan, including access roads to be used (new, upgraded, existing)
- Drawings
  - Typical ROW Cross Section

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- Typical Temporary Extra Work Space
- Typical Camp Layout

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Appendix 2: Examples of Procedures

Examples of procedures that could be included are:

- Field Joint Coating and Repair
- Field Coating Repair, including locations performed, i.e. upon custody transfer, at laydown yard, prior to lowering-in, etc.
- Welding Procedures, including production, tie-ins, repairs
- Heat Treating
- Chemical Cleaning & Flushing
- Bolt Torquing & Tensioning
- Nitrogen / Air Leak Testing
- Dimensional & Survey Control
- Radiography Inspection
- Ultrasonic Inspection
- Magnetic Particles & Dye Penetrant
- Rock Blasting Procedure