PRCI Final Report and Software Specification

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Last Revised by

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1. Final Reports[1]

The primary purpose of final reports is to convey knowledge efficiently and effectively from the researcher(s) who performed the work to the audience. Typically, the audience of final reports are the PRCI operating and associate members, but readers can also include the general public and regulatory agencies. It is a best practice, ***and is highly recommended***, that the research contractor meets with the project team after significant research results have been produced but before there is significant development of the draft final report. ***It is the responsibility of the research contractor to identify the appropriate time in the project schedule for this meeting.*** At this meeting, the principal investigator, PRCI project team leader, and a representative subset of the project team should:

- Review the research results to date and the associated conclusions,
- Determine the intended audience of the report including:
    - PRCI membership only,
    - Public for sale in addition to PRCI members, and/or
    - Courtesy copies to be provided to related industry organizations, standards bodies, and/or regulatory agencies, and
- Develop an outline for the draft final report.
    - List any key points, conclusions, or recommendations that should be included in the report.

What information is to be included and how it is presented in the report will depend on the state of the technology readiness level (TRL) of the research being performed. In general, the content of the report should gravitate more toward how the audience should use and apply the results as the research approaches the higher TRLs. For high TRL reports, the related highly technical content should be excluded from the main body of the report but should be included in an appendix or a companion report; the main body of the report should be used to communicate specific recommendations and/or best practices that an operator should adopt based on the research conclusions.

The report should be technically precise and professional; specifically:

- Superlatives should be eschewed,
- Technical content based on other original work by others should be properly cited,
- Manufacturer's name and model names or numbers shall not be used in titles or abstract, and
- The use of the trademark symbol (™) is not allowed. The first time a trademarked name appears in the body text, it may be footnoted. The footnote will state that it is registered and the name of the owner of the trademark. This is to avoid the implication of endorsement of any commercial product.

[1] The conformance checklist that can be used to help assure that a final report are in compliance with this specification. A report skeleton is also available and should be used as a template for the final report.

Use of AI Technologies

PRCI deliverables may utilize some artificial intelligence (AI) tools in their development. AI tools include but are not necessarily limited to:

- Large language models (LLM) are trained on large text datasets to understand and generate language, visuals, audio, etc.
- Neural networks are models that use interconnected nodes to learn from data.
- Bayesian methods are models based on probability theory.
- Deep learning (DL) models are multilayer neural networks used for image recognition, speech synthesis, natural language understanding, and other applications.
- Machine learning (ML) models learn from data and improve their performance over time without being explicitly programmed.
- Expert systems simulate the decision-making ability of a human to a specific domain.
- Generative regressions/predictive modeling/statistical learning tools are used for fitting data to equations.

PRCI allows the use of AI tools in developing deliverables subject to the following constraints:

- All produced content must meet the requirements of this specification including formatting and that the generated content is original work and therefore can be copyrighted.
- The author(s) must have the rights/license to use the content/tools produced by the AI tools.
- Sensitive data and/or data protected by non-disclosure is protected from potential leaks that can occur via AI tools. Example of protection methods include[2]:
    - Highly sensitive data is excluded from AI tools altogether,
    - Data is suitably blinded/scrubbed of sensitive information prior to submitting to AI tools.
    - The AI tools are hosted within a closed modeling environment such that there is no bridge/path to a publicly accessible area.
- The output of the AI tools is ultimately transferrable or adoptable for usage. As a specific example, demonstrating that a neural network can be used with a set of data is not sufficient. The deliverable must provide a method that the user could actually use the associated neural network tool with their own data. Exceptions are limited to projects where the goal is specifically limited to a feasibility assessment of specific AI technologies.
- The author(s) are responsible for the technical correctness and accurateness of the AI produced content. Specifically (but not limited to)
    - The content is free of hallucinations.
    - Models are not overfit[3] and reliably represent the underlying physics.
        - Use diverse and representative datasets to train AI models and regularly assess for biases.
        - Add ‘virtual points’ (e.g., passing through zero) when the corresponding physical certainty is known but there is no corresponding test data).

[2] The details on how data is used and protected should be detailed in the corresponding data management plan.
[3] Overfitting is where a model learns the training data too well, including invalid outliers and noise rather than the underlying patterns. Overfitting can result in models that perform well on the training data but poorly on new, unseen data.

  - Models include bounds/ranges for the input parameters where the model is are reliably modeled.
  - Citations to source reference material are included and those references are verified.

a. Report format

The first step of creating a new research final report is to download the most current version of the Template - PRCI Final Report Example-Skeleton.docx and use it as the report template/baseline.

Format must be in US paper format. A margin of at least 25mm (1 in) should be left on all sides of each page. Acceptable font for the normal text is Times New Roman, size 12 single spaced; headers should be larger variations of this style (bolded, italicized, underlined, etc.). Arial, Veranda, Tahoma, and Currier fonts styles may be used for other text such as the content of tables and captions. The document should be formatted for a standard paper format of US Letter (8.5" X 11") with alternate US standard sizes (Legal – 8.5" X 14" and Tabloid – 11" X 17") allowed for large tables or graphs in landscape and found in the Appendices. Text will be in English and use U.S. customary spelling.

Body text should be in a single column and the text justified with hyphenation turned on. Table text should be left justified for text and right justified for numeric values. Paragraphs should begin without indentations. Generally, only proper nouns should be capitalized.

Sections must be numbered. Subsections should use numbers with an additional level of numbering for each sublevel down (e.g., 1.2.1 would be used for Heading 3) or letters for appendices (e.g., Appendix A.), should be left justified, and use title case (e.g., 'Data Gathering and Analysis').

Except for the cover page, each page should be numbered. Pages prior to the Executive Summary section should use lower case Roman numerals and later pages should use numeric values. The easiest way to accomplish this is to use a section break in Word as shown in the PRCI Final Report Example-Skeleton.

The report should NOT include any contractor proprietary header or footer information, including logos.

Working or draft versions of the report must be supplied in Microsoft Word format compatible with the Word 2007 format (docx) and must not contain macros. Final copies of the report should be provided in Microsoft Word format and unsecured (editable) Adobe Acrobat file format (PDF). Files must be named beginning with the catalog number followed by the report title. For example:

PR000-22605-R01 Design Guideline for Retrofittable Inline Flow Measurement.pdf

The report should have a header section that has a PRCI identifier and the Catalog number. The footer section should have the document title and a page number. SeeAppendix D – Catalog Numbers for details on determining catalog number.

To ensure compatibility with SharePoint and other similar document repository applications, special characters are not allowed in the Title and length restrictions apply. See Appendix F – Title and File Name Guidance for more details.

The document properties (accessible through MS Word File menu > Info > Properties) should be updated to reflect the contents of the report. Guidance on information for applicable fields is in the report template and below; mandatory fields are Title, Subject, Author, Company, and Comments, while other fields, such as Tags, are preferred but optional.

Field Name:	*Content:*
Title:	Title of the Report
Comments:	Catalog number
Subject:	PRCI Technical Committee name (e.g. Compressor & Pump Station, Corrosion, Design, Materials & Construction, Integrity & Inspection, Measurement, Surveillance, Operations & Monitoring, Underground Storage, Subsea, Emerging Fuels Institute, etc.)
Author:	Author(s) of the report
Company:	Contract organization
Tags:	Add any keywords to help with Search

Section or page breaks should not be used except in the following circumstances:

- A section break is required just above the Executive Summary. This is because the page numbering format changes and restarts at page 1 beginning at the Executive Summary.
- Page breaks should be used just above the start of each appendix section.
- Section breaks are required when a change to/from portrait/landscape page layout.

The document should not contain blank or empty pages.

Data tables, when utilized or included in reports or the project should also be provided in csv format with verbose column and row labels, along with meta data describing what is each row or column and the data types represented.

b. Graphics

Graphics should be as clear as possible. Original photos, or precisely scanned files should be used to preserve the highest level of quality. File compression should be used for large files. If the graphics are to be used for the Web, use the highest resolution and color density possible within existing online graphics formats (jpg and png). The use of gif files should be avoided because of special licensing requirement for files that use that format.

Excel graphs should be pasted into the final report as an enhanced metafile (Paste Special, Picture (Enhanced Metafile). Graphs can be in color, but consideration should be given to the possibly the report will be printed in black and white. As such, it is recommended that colored graphs use symbols and/or line styles that would uniquely show the information when printed in black and white.

Graphics from sources that are predominately text (for example, a table of data from an Excel spreadsheet) should be copied as RTF or HTML rather than in a picture format. This significantly reduces the file size of the document.

All graphics should have a caption added and referenced in a list of figures. Figures should generally be located near the first reference to that figure in the text. Captions for tables should go above the table, captions for figures should go below the figure.

c. Report Version Control

Version updates will be noted on the cover page of the report (see the cover page example in Appendix A). A separate revision log spreadsheet will be included with each revision of the document. The spreadsheet will list:

- The applicable document revision number where the change was first implemented
- The section of the document
- The page numbers in the earlier version of the document (if applicable) and the page number in the revised document.
- The original content (if applicable)
- The latest content
- Why the revision was made
- The date the revision was made
- Who made the revision

An example of the revision spreadsheet is found in Appendix E. A single spreadsheet will be used for all revisions of the document with new revision tracking appended to the bottom of the spreadsheet.

A PRCI project manager may allow alternatives to the revision tracking spreadsheet outlined above such as utilizing the revision tracking capabilities of word processing applications. Requests for alternate tracking methods must be formally approved by the PRCI project manager in advance of their use.

d. Cover Page

The cover page requires the following information:

- PRCI logo
- Catalog number (as outlined in Appendix D; NOTE: **the –R## in the catalog number refers to report number, not a revision number**)
- Final Report Title (see section Appendix F – Title and File Name Guidance for more details)
- PRCI Research Contract Number
- Author's Name
- Contractor Name
- Release Date (the date the author(s) made their final revision)

All the information should fit on a single page. The cover page may also have some contractor specific information necessary to track the work or other contract specific relevant information. Examples include the contractor's project number, document review/approval number, JIP project number, DOT project number, etc. It should not include contractor logos but in some cases may include the logo of project cofunders.

Note that some contracts require additional content on the cover page, for example, projects funded in part by PHMSA require an additional disclaimer. Please coordinate with the PRCI program manager.

A sample cover page is included in Appendix A.

e. PRCI Disclaimer

Each report must have a disclaimer section that is located directly behind the cover page. A sample disclaimer is provided in Appendix B. The disclaimer should only be edited to reflect the appropriate research contractor, contract number, copyright year, and catalog number.

f. Abstract

The report abstract should be located on the first page after the disclaimer. The abstract is used to describe the purpose of the research effort including the specific gaps and objectives of the research addressed as well as the potential value for adopting the recommendations produced from the research. The abstract should not divulge specific results or conclusions of the research, nor include any citations. It should supply enough detail such that one reading the abstract can decide if the research is applicable to them and if they should read the full report. The abstract shall start with a problem statement, followed by a sum of the document contents followed by who the target audience is and how they could use the information in their daily function (see the report skeleton for an example). References to the project, the contractor, and like content should not be included in the abstract as being superfluous.[4] Generally, the abstract should be no more than 250 words.

g. Acknowledgments

A separate page for acknowledgements should follow the abstract and lists the PRCI project team members and their company affiliation. By default, all project team members will be listed in the final report; however, inclusion in this list is strictly voluntary. The research contractor must confirm if any of the project team members would like to be excluded from the project team list. The list should include an identification of the project team leader and any special acknowledgments to equipment suppliers and suppliers of in-kind support. The list for the project team should not include any contact information such as phone numbers or email addresses. An example is shown in Appendix C.

[4] As an example, 'This work, which was funded by PRCI via Project MX-2-01, developed…' is better written as 'This work developed…' This applies throughout the entire document. The cover page clearly identified that it is a PRCI project and references the corresponding project code.

Reports should avoid naming specific host sites by company name or facility name (e.g., Meta-pipeline, Station 407). Instead, a generic description of the facility should be used (e.g., a large compressor located in northwestern Pennsylvania).

Note that not all reports are suitable to include project team membership. For example, reports that are intended to be used for technical background to support the development or revision of regulations as one example. The Principal Investigator should work closely with the PRCI Program Manager to assess if the project team should or should not be included in the document.

h. Table of Contents

The Table of Contents must have major section headings, and subsection headings, listed with page numbers. In addition, all references and appendices must be listed in the Table of Contents. A List of Tables and a List of Figures must follow the Table of Contents if they are used in the document. Note that the Abstract, List of Acronyms, List of Tables and Figures and other headings that are not part of the main body of the report should be excluded from the Table of Contents.

i. Nomenclature and Abbreviation

The Table of Contents section should be followed by a nomenclature list if formulas are used in the document. A list of abbreviations/acronyms should follow if the document uses them. If acronyms or abbreviations are used, they should be spelled out on their first use followed by the abbreviation in parentheses. Thereafter in the document, the abbreviation can be used provided it is listed in the table of abbreviations/acronyms. For example:

> *The trapped equivalence ratio (TER) was much higher than stoichiometric. The TER was increased until the lean limit of combustion was reached.*

The content of the nomenclature table should be limited to symbols used in equations. The unbordered table should include a column for the associated engineering units. For example:

q_v	Volumetric heat flux	BTU/ft^3

Abbreviations that are <u>commonly</u> found in mainstream English dictionaries can be excluded from these requirements. Company names that are more commonly known by their acronym can also be excluded. Examples include:

- Also known as (AKA)
- As soon as possible (ASAP)
- North American Free Trade Agreement (NAFTA)
- National Aeronautics and Space Administration (NASA)
- Radio detection and ranging (RADAR)
- Etcetera (etc.)

‘Slang’ abbreviations (e.g., LOL, IMHO, IDK, LMAO) shall not be used.

For more information, see Appendix G – Style Guidelines.

j. Executive Summary

The first full section of the document is the executive summary located directly after the Table of Contents, list of figures, etc. It is a key part of a report. The executive summary is a highly condensed version of the essential information contained in the full document. Many readers may only look at the executive summary when deciding whether to read the entire document. Therefore, the executive summary must be a well-written and concise summary that gives readers a substantial understanding of the research conducted and its results and benefits.

The executive summary is the report miniature (1 – 2 pages) and expands on the information presented in the abstract. It includes enough information for readers to become acquainted with the key objectives, results, and benefits of the research conducted without having to read the full document. The executive summary has a statement of the project goal, necessary background material and information, a description of research conducted, and the major conclusions. An effective executive summary should communicate the main points and benefits of the work without becoming bogged down in details.

The executive summary should include a paragraph describing the target audience of the document.

It is likely that someone who reads only the executive summary will not have the technical background of the author or other technical experts involved in producing the Final Report. Therefore, detailed technical information, references, and vocabulary should be kept to a minimum in this section.

k. Introduction

The executive summary is followed by the introduction. The introduction is used to give the history of the research project and an overview of the report. This part of the report conveys the need for this research (details of the gaps, issues, and/or objective of the research), an overview of the results of the research, and the benefits of adopting the research.

l. Other Sections

The author can add other sections between the 'introduction' and 'conclusion' sections as needed to layout and communicate the approach and results of the research. Examples include but are not limited to:

- Literature Review
- Test Protocol
- Data Gathering
- Data Reduction
- Analysis

m. Recommendations

Specific recommendations on how the results of the research should be utilized should be placed in this section.

If the recommendations include changes to or the development of new standards or recommended practices, the report will include draft language to be included in those documents. If the draft language is relatively brief, it can be included in this section. Otherwise, the draft language should either be in an appendix to the report or in a related standalone document.

This section will not contain recommendations for follow-on research; suggestions for follow-on research should be directly entered into PRIME as research ideas. The exception is for research efforts that are specifically designated as a 'gap analysis' and is intentionally designed to identify the needs for future research.

n. Conclusions

This section is a summary of the key observations and conclusions that were developed in the report.

o. Referenced Publications

List all publications upon which contents of the report are based or which are essential to an understanding of the contents. Referenced publications should be formatted in the style of ISO 690. Utilize the built-in Citations & Bibliography functions in Word under the References tab to manage the sources. When referencing a specific publication in the document, a citation should be referenced to the document number in the bibliography with a specific reference to a page number if pertinent. The reference should be between parentheses or square brackets. For example:

> *The yield strength was calculated per section 3 of ASTM C774 – 88. (16, p. 37)*

p. Applied Software Technology Requirements

(1) In the design of the software application, the Contractor shall use and apply software industry accepted standards and technologies for software application architecture. The proposed architecture must be drafted and approved by PRCI prior to contracting with changes requiring prior approval by PRCI. The intent is to prevent changes to the proposed software architecture without agreement from PRCI. For example, switching from a standalone executable application to a cloud-based application. The preferred implementation is a web-based application, leveraging standard components and techniques as described in this section, e.g. cloud hosted software on a PRCI account, with application code maintained in the PRCI GitHub repository. If the application is a computational tool, a standard user interface with standard user management workflow (e.g. login with password reset and user management) is required to be delivered with the tool. **A headless computational tool that runs and provides an API for a GUI can also be delivered, but this must be agreed to by PRCI .**

(2) In the development process the Contractor shall use contemporary software programming technology, languages, and development tools which will produce a standalone application. The programming technology, language, development tools, and third-party components will be identified prior to contracting. A change in the software technology will require prior approval by PRCI. The intent is to ensure that the application has long term support. For example, if the use of third-party components may create licensing issues; switching development tools or esoteric languages may limit the ability to provide post - production support or enhancements.

(3) Software application source code shall be documented, and additional source code supporting documentation shall be provided by the Contractor. Source code supporting documentation should provide additional information such as list of files, third party components information, underlying technology, description of the math models and/or algorithms. Application code shall be provided to a PRCI GitHub code repository.
(4) The preferred software development application is Microsoft Visual Studio using the languages of C# and/or Visual Basic Other acceptable languages include C++ (for numerically intensive calculations), Ruby on Rails, and, for large data/machine-learning applications, F#, R, and Python. Dynamic/interactive webpages may use JavaScript.

The preferred development structure is to develop using the ASP.NET Core framework using Razor components so the application is widely portable. It should be developed in a model view controller (MVC) architecture or Blazor with separate folders within the integrated development environment for each category. For example:

- **Models – folder for object classes**
- **Pages – folder for user display screens**
- **Data – folder for code related to interfaces between the model and the data storage (database)**
- **Services – folder for code relating to calls to/from calculation engines, operating systems, or other services**

Prior to a proposal to develop any software, the corresponding development system and architecture must be reviewed and approved by the PRCI Executive Director of Research IT and the PRCI Program Manager.

Development Specification: Modular Headless Computational Tool System

- Enables external contributors (e.g. contractors, researchers) to easily develop and deliver standalone computation tools.
- Automatically exposes these tools as API endpoints using FastAPI, without requiring contractors to write any web or database code.
- Interfaces with a standardized front-end UI that dynamically interacts with each tool via its metadata and input/output definitions.
- Utilizes a managed backend service (e.g. Supabase) for authentication, persistent storage, and audit logging.

Each tool is delivered as a self-contained module using a standardized format and interface. The main system dynamically loads and serves these tools as API endpoints.

Development Workflow For Contractors:

- Receive a project folder template.
- Implement the compute.py file with a run(inputs: dict) -> dict function.
- Define the inputs/outputs in metadata.json.
- Submit the tool folder via Git, zip, or upload interface.

(5) It is strongly recommended that Entity Framework Core is used to map the data to objects. The preference being to develop the database structure first such that it follows the proper naming convention and have the comments and other required elements in the database. Once the model is built, use Entity Framework Migrations to allow for evolving the database as the model changes. Alternately, the Contractor may plug into the PRCI database service and leverage that to build the tool.

(6) The Contractor shall implement version control in the software application for both the (a) source code and (b) executables.

(7) In the design, development and implementation of the software application's Graphical User Interface (GUI), the Contractor shall ensure that the GUI fully complies with the Microsoft guidelines for GUI design as described in the latest version (applicable to Microsoft Windows 7) of Microsoft Windows User Experience Interaction Guidelines for Windows-based applications. The design of applications for other platforms will be reviewed and approved by the project team and should follow conventional formats and conventions for the operating platform selected. Alternatively, the Contractor may choose to implement a headless calculational tool.

(8) For standard user management features, authorization and authentication, the Contractor may plug into the PRCI auth system.

(9) The Contractor shall implement type checking, input error prevention, and error handling controls.

(10) Software application programming interfaces (API), if used, will use representational state transfer (REST) architecture utilizing JSON as a data format for information exchange unless otherwise approved by PRCI.

(11) The Contractor shall deliver a software application with an integrated Help system developed and based on Microsoft HTML Help Technology or other appropriate systems. The Help system should contain all the necessary elements and information for the user to properly run the software application. If approved by the PRCI project manager, a comprehensive users' manual may be used instead of an integrated help system.

(12) The Contractor shall provide a Software Application User Manual.

(13) The Contactor shall prepare the software application setup in accordance with Microsoft Installer (MSI) Technology or other current industry-accepted installation procedure for easy deployment and maintenance.

(14) The Contractor shall perform complete testing of the software application prior to submitting the application to PRCI for acceptance. The Contractor must test the software to ensure installation and operation under Windows 10 and Windows 11.

(15) The Contractor shall design and develop a set of benchmark cases that cover all the features and full range of conditions permitted by the software. For each benchmark case, the values of input parameters and expected output from the software should be clearly stated. The benchmark cases shall be fully documented in the supporting documentation. See Software subsection g for more information on additional tests required.

(16) Prior to the full development of the user interface, storyboards of the interface must be reviewed and approved by PRCI. The interface will be branded as a PRCI product and will be free of any branding related to the developer's company.

q. Data

While all data necessary to an understanding of a discussion should be included with the text at that point in the report, all data relevant to the report should be placed in an Appendix, and supplied in machine readable form, such as markdown or as CSV and should include metadata. If the dataset is too large to include in the report, it should be provided to PRCI in a suitable electronic format (e.g., Excel, Access, etc.). Data in the report and any electronic formats must clearly identify any relevant engineering units; they may be either US Customary or SI based. In reports, the preference is to use US Customary units followed by SI units in parentheses (e.g., 1000 lbm (453.6 kg). The unit preference should be established with the PRCI project team well in advance of the drafting of the report.

r. Hard Copies

Three printed copies of the report as approved in final form shall be sent to the PRCI main offices in care of the project manager.

s. Other Project Related Documents

Information provided in spreadsheet format should be compatible with Excel 2016. No earlier versions will be supported, and documents generated using later versions should be saved to the Excel 2007 format (xlsx). If macros are used, the file should be saved as an xlsm or an xlsb file.

All Excel spreadsheets should include a tab that contains PRCI's end user license agreement (See **Error! Reference source not found.** within this document). The end user license agreement should also be included as a standalone document accompanying spreadsheet (typically zipped together with the report). No catalog number assignment is required for the end user license agreement. Please contact your PRCI program manager for the latest version of the agreement.

t. Equations

If equations are used, they should be numbered. The best way to achieve this is to create a two-column table without borders. Place the equation in the left cell and the equation number in the right cell. It is recommended that the 'caption' function within Word is used for equation numbering. Equation numbers and their corresponding references will be correctly maintained using this feature. An explanation of the variables (that have not already been explained) should directly follow the equation. Examples:

> Unit Utilization (*UU*) is the percentage that a compressor unit is operating. It is expressed as a percentage of the time the compressor unit is operating online vs. the total time in the measurement period. It is calculated from the equation:

$$UU = \frac{OperatingTime}{PeriodTime} * 100 \tag{1}$$

> Where:

Operating-Time	The total unit operating time during the *PeriodTime* in seconds

PeriodTime The total time in a given period in seconds

Unit availability – gross (UAG) indicates the amount of time a unit was available to run in a given time period. It is expressed as a percentage of the time the compressor unit is operating online (including warm-up and cool-down) or available to run vs. the total time in the measurement period. It is calculated from the equation:

$$UAG = \frac{PeriodTime - UnvailableTime}{PeriodTime} * 100 \tag{2}$$

Where

UnavailableTime The total time a unit is unavailable to operate during the *PeriodTime* in seconds

For reports that contain equations developed as part of the research, a corresponding Excel spreadsheet is required that includes working examples of the related final equations that would be used by the user to apply the research (intermediate equations used in a derivation of the equations do not require examples). If specific engineering units are expected, that should be made obviously clear in the spreadsheet. The equations spreadsheet should be counted as deliverable and reviewed by the project team. Typically, the spreadsheet is zipped with the report, EULA, and with the related report in the final published document. The equations spreadsheet also serves as an independent verification/check to make sure the equations are correct; and provides a template for the user for immediate use without having to interpret the report and create a spreadsheet on their own. It is ok to use VBA for the equations provided the equations VBA code is not locked (recommend using the .xlsb format for these documents).

u. Video Files

Reports may embed video files to aid the transfer of knowledge with the following restrictions:

- The video must be in one of the following formats:
  - Moving Picture Expert Group-4 (.mp4, .mpg, or .mpeg)
- Videos should be directly added to the final pdf document using the instructions: Adding multimedia to PDFs. For a draft final report review, a placeholder should be added to the Word version of the document with a separate file(s) of the video posted to PRIME with the file type 'Project – Task Report'.
- The total file size of the document in .pdf format should be less than 2 Gb.

v. Compressed files

It is sometimes beneficial to bundle more than one file into a single file for distribution. This should be done using Windows compression, see **Figure 1**. This will create a file with a .zip extension. Other compression methods are not acceptable.

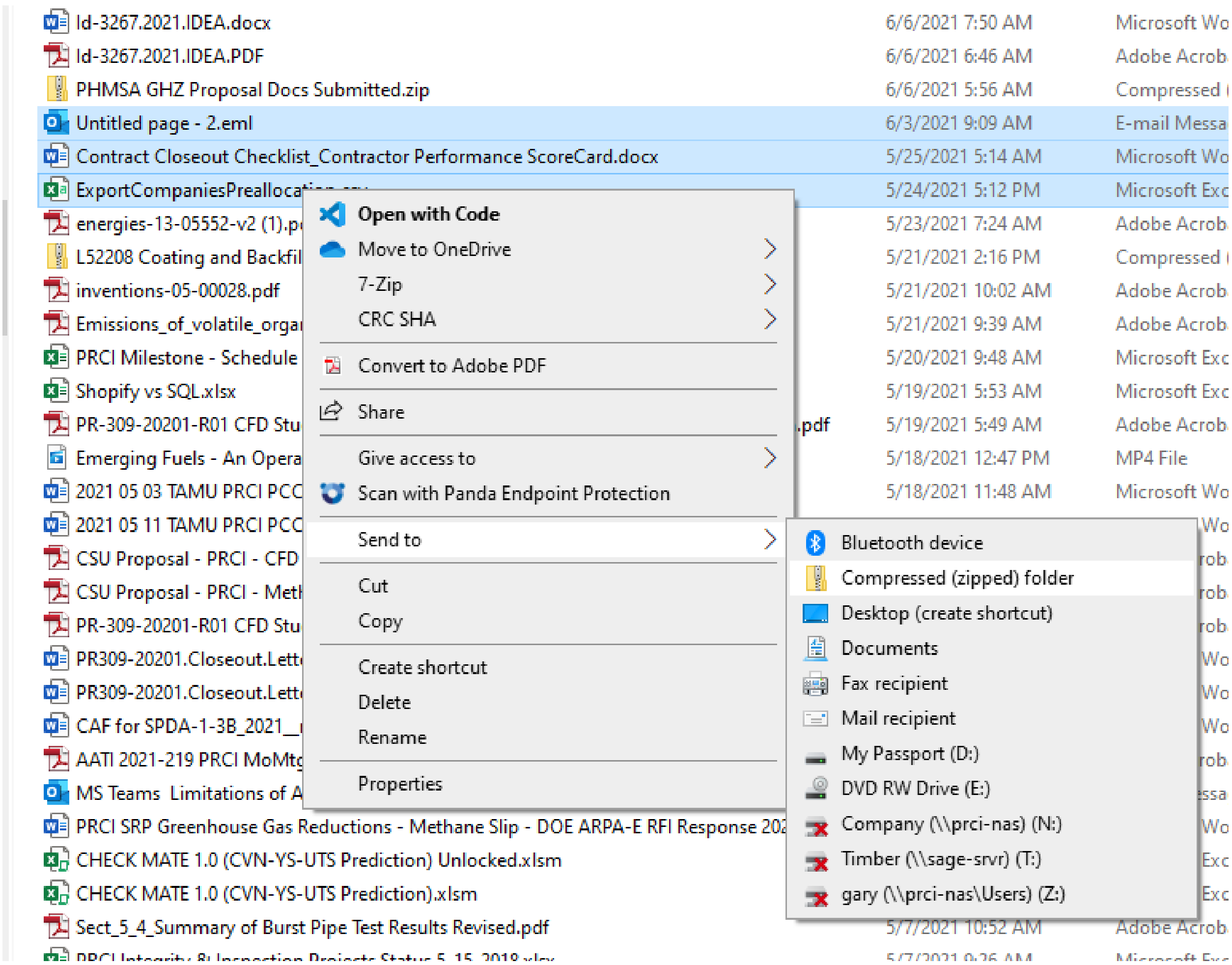

Figure 1 – Compressing multiple files into a single file

2. Software

a. *Software Applications*

The contractor must provide for each software application, a set of elements produced by the software development process including design documentation, source code, source code supporting documentation, compiled code in the form of executables and/or dynamic link library, help system, user manual, installation/setup and testing protocols. Source code for all custom developed dynamic link libraries must be provided upon the completion of the project and will be provided to the PRCI GitHub repository.

b. *Software Application Deliverables & Acceptance*

(1) The Contractor shall deliver to PRCI the software application setup and corresponding user manual of final version with the software testing report form (test plan with test cases and verification that the test cases performed as expected, see sub section g of this section for more details) by posting to the PRCI PRIME site along with the Final Report.

(2) The Contractor shall deliver to PRCI the benchmark cases and demonstrate that the application software passes all the benchmark cases for acceptance.

(3) The Contractor shall deliver to PRCI the software application source code, configuration project files (.proj, .res, .dll, etc.), and source code supporting documentation such that the application could be recompiled by an independent party.
(4) Should PRCI find any errors or malfunctioning in the software application during the acceptance process, the Contractor shall take immediate corrective action and resubmit the software once the software has been corrected and all the benchmark cases have been tested.
(5) The Contractor shall bear all risks relating to the software application until its final acceptance

c. Ownership of the Software Application

Ownership and use rights will be as contained in the base contract between PRCI and Contractor.

d. Warranty Obligations

(1) The Contractor confirms the undertaking of all warranty obligations at no additional costs. Under the warranty software application will be kept functional during the warranty period at the level of functionality when initially developed and accepted by PRCI.
(2) The Contractor shall warrant that the software application at time of delivery is of the most recent version and incorporate current versions of software design and tools. The Contractor shall further warrant that the software application or its elements have no defect arising from design, development, tools or workmanship.
(3) The Contractor will be responsible for correcting/making well any defect in or damage to any part of software application which may appear or occur during the warranty period and which results from faulty workmanship or development of the software application, or any act of omission of developer.
(4) The Contractor will be committed to, at its own cost, correct/make well the defect or damage. If the Contractor is unable or unwilling to make the correction, PRCI will have the right to carry out the work at the expense of the contractor.
(5) The source code delivered by the Contractor will be signed with digital signature as a proof of origin and must be properly documented and packed in the form which will be convenient for PRCI or recipient organization to use for maintenance and further development or upgrade of the software application. If modifications are made to the source code by any other than the Contractor the warranty obligations for the Contractor will expire accordingly.
(6) The warranty shall remain valid for a period of 1 (one) year after final acceptance of the software application by PRCI.

e. Software Application Upgrades

The Contractor shall be prepared to upgrade the software application upon request of PRCI, and the Contractor shall be separately remunerated for such additional work under separate agreement with PRCI. If no agreement can be reached between PRCI and the Contractor, PRCI retains the right to use any other software developer for any upgrades or other modifications.

f. End User License Agreements

All PRCI software must have an end user license (EULA) agreement for each individual using the software. For desktop software, the user must agree to the EULA on the original installation and anytime there is an upgraded version of the software. For spreadsheets, the spreadsheet EULA needs to be included on a tab of the spreadsheet as well as included as a separate document zipped with the spreadsheet.

Pipeline Research Council (PRCI) Software End User License Agreement

Last Revised: 6/5/2025

This agreement describes your rights and the conditions upon which you may use this software product distributed by PRCI. You should review the entire agreement.

By using this software, you agree to all of these terms of this agreement. If you do not accept and comply with these terms, you may not use the software or its features and are entitled to a refund of your purchase price.

1. Overview.

a. **Applicability.** This agreement applies to the software included in this distribution package. This may be compiled software that requires an installation package, cloud-based software, or software based on commercially available platforms or tools such as Excel.

b. **Additional terms.** In the case of software that requires the use of commercially available platforms or tools, the user must obtain their own licenses for those products.

2. Installation and Use Rights.

a. **License.** The software is licensed to individual users, not sold. Under this agreement, PRCI grants you the right to install (if you acquired the software from a retailer) and run one instance of the software on your device (the licensed device), for use by one person at a time, but only if you comply with all the terms of this agreement.

b. **Device.** In this agreement, “device” means a single hardware system. That system may be either a physical or virtual device capable of running the software; this includes a hardware partition or server blade.

c. **Restrictions.** PRCI reserves all rights not expressly granted in this agreement. For example, this license does not grant the end user the right to:

(i) publish, copy, rent, lease, or lend the software;
(ii) use or virtualize features of the software separately;
(iii) use the software as server software, for commercial hosting, make the software available for simultaneous use by multiple users over a network, install the software on a server and allow users to access it remotely, or install the software on a device for use only by remote users;
(iv) transfer the software (except as permitted by this agreement);

(v) reverse engineer, work around technical restrictions or limitations, decompile, or disassemble the software, or attempt to do so, except if the laws where you live (or, if a business, where your principal place of business is located) permit this even when this agreement does not. In that case, you may do only what your law allows; or

(vi) install or host the software is such a way that multiple users may use the product at the same time.

d. Backup copy. You may store a backup copy of the software on a separate device.

3. Transfer of software. You may not transfer this software to a third party. You may transfer the product from one device to another device provided the software is uninstalled from the original device.

4. Networks, data and Internet usage. Some features of the software and services accessed through the software may require your device to access the Internet. Your access and usage (including charges) may be subject to the terms of your cellular or internet provider agreement. Certain features of the software may help you access the Internet more efficiently, but the software's usage calculations may be different from your service provider's measurements. You are always responsible for (i) understanding and complying with the terms of your own plans and agreements, and (ii) any issues arising from using or accessing networks, including public/open networks. You may use the software to connect to networks, and to share access information about those networks, only if you have permission to do so.

5. Consumer Rights; Regional Variations. This agreement describes certain legal rights. You may have other rights, including consumer rights, under the laws of your state or country. You may also have rights with respect to the party from which you acquired the software. This agreement does not change those other rights if the laws of your state or country do not permit it to do so.

6. Reservation of Rights and Feedback. Except as expressly provided under this agreement, PRCI does not grant you a license or any other rights of any type under any patents, know-how, copyrights, trade secrets, trademarks or other intellectual property owned or controlled by PRCI or any related entity, including but not limited to any name, trade dress, logo or equivalents. If you give to PRCI any idea, proposal, suggestion or feedback, including without limitation ideas for new products, technologies, promotions, product names, product feedback and product improvements ("Feedback"), you give to PRCI, without charge, royalties or other obligation to you, the right to make, have made, create derivative works, use, share and commercialize your Feedback in any way and for any purpose. You will not give Feedback that is subject to a license that requires PRCI to license its software, technologies or documentation to any third party because PRCI includes your Feedback in them.

7. Entire Agreement. This agreement (together with the printed paper license terms or other terms accompanying any software supplements, upgrades, updates, and services that are provided by PRCI) are the entire agreement for the software and any such supplements, updates, and upgrades. You agree that you will read the terms before using the software or services, including any linked terms. You understand that by using the software and services, you ratify this agreement and the linked terms.

Pipeline Research Council (PRCI) Spreadsheet End-user License Agreement

Last Revised: 6/5/2025

This agreement describes the user's rights and the conditions upon which the user may use this spreadsheet distributed by PRCI. The user should review the entire agreement.

By using this spreadsheet product, the user agrees to all of these terms of this agreement. If the user does not accept and comply with these terms, the product or its features may not be used and the user may be entitled to a refund of the purchase price.

1. Overview.

a. Applicability. This agreement applies to the spreadsheet and the corresponding documentation (if any).

b. Additional terms. The user must obtain their own licenses for Excel or other spreadsheet applications that are compatible with Excel.

2. Installation and Use Rights.

a. License. The spreadsheet is licensed to individual users, not sold. Under this agreement, PRCI grants the user the right use the spreadsheet or copies thereof on only one hardware device at a time, for use by one person at a time, but only if the user complies with all the terms of this agreement. Read only versions or reports produced from the spreadsheet may be shared with others without restrictions.

b. Device. In this agreement, "device" means a single hardware system. That system may be either a physical or virtual device capable of running the product; this includes a hardware partition or server blade.

c. Restrictions. PRCI reserves all rights not expressly granted in this agreement. For example, this license does not grant the end-user the right to:

(i) publish, rent, lease, resell, or lend the product;

(ii) use or virtualize features of the spreadsheet separately;

(iii) use the spreadsheet on a shared server (e.g., hosting on a single hardware device for remote access by multiple users), make the spreadsheet available for simultaneous use by multiple users over a network, install the spreadsheet on a server and allow users to access it remotely, or install the spreadsheet on a device for use only by remote users;

(iv) transfer the spreadsheet to another party (except as permitted by this agreement);

(v) reverse engineer, work around technical restrictions or limitations, decompile, or disassemble the spreadsheet, or attempt to do so, except where exceptions are granted by local laws; and in that case, only to the extent that the law allows; or

(vi) install or host the spreadsheet is such a way that multiple users may use the product at the same time.

d. Backup copy. A backup copy of the spreadsheet may be stored on a separate device but may not be used directly from that backup.

3. Transfer of the spreadsheet. The user may not transfer this spreadsheet product to a third-party. The user may transfer the product from one device to another device provided the product and all derivative copies are removed from the original device. The product license is purchased by a company, the product may also be transferred in its entirety from one individual to another individual that works for the same company. This transfer cannot be done is such a manner that the transfers are tantamount to sharing the product (i.e., the transfers must not move back and forth frequently between the same set of users).

4. Networks, data and Internet usage. Some features of the spreadsheet and services accessed through the spreadsheet may require the user's device to access the Internet. Access and usage (including charges) may be subject to the terms of the user's cellular or internet provider agreement. Certain features of the product may help the user access the Internet more efficiently, but the product's usage calculations may be different from the user's service provider's measurements. The user is always responsible for (i) understanding and complying with the terms of the user's own plans and agreements, and (ii) any issues arising from using or accessing networks, including public/open networks. The user may use the product to connect to networks, and to share access information about those networks, only if the user has permission to do so.

5. Consumer Rights; Regional Variations. This agreement describes certain legal rights. The user may have other rights, including consumer rights, under the laws of the user's state or country. The user may also have rights with respect to the party from which the product was acquired. This agreement does not change those other rights if the laws of the local laws do not permit it to do so.

6. Reservation of Rights and Feedback. Except as expressly provided under this agreement, PRCI does not grant the user a license or any other rights of any type under any patents, know-how, copyrights, trade secrets, trademarks or other intellectual property owned or controlled by PRCI or any related entity, including but not limited to any name, trade dress, logo or equivalents. If the user provides to PRCI any idea, proposal, suggestion, or feedback, including without limitation ideas for new products, features, technologies, promotions, product names, product feedback, and product improvements ("Feedback"), the user gives to PRCI, without charge, royalties or other obligation, PRCI has the right to make, have made, create derivative works, use, share and commercialize the user's Feedback in any way and for any purpose. The user will not give Feedback that is subject to a license that requires PRCI to license its products, technologies, or documentation to any third-party because PRCI includes the user's Feedback in them.

7. US Government End-users. Documentation and Software are 'commercial items' as defined in Federal Acquisition Regulation 48 CFR 2.101 (FAR). Regardless of any provisions set out in FAR or other contractual clauses to the contrary of this agreement for which this agreement is incorporated, Government end-users will acquire the Software and Documentation with only the rights set forth in this agreement. Any provisions in this agreement that are not in compliance with federal procurement regulations are not enforceable against the U.S. Government.

8. Entire Agreement. This agreement (together with the printed paper license terms or other terms accompanying any product supplements, upgrades, updates, and services that are provided by PRCI) are the entire agreement for the products and any such supplements, updates, and upgrades. The user agrees that the user will read the terms before using the products or services, including any linked terms. The user understands that by using the products and services, the user ratifies this agreement and the linked terms.

9. Governing Law, Jurisdiction and Venue. The terms of this agreement are governed by the laws of the Commonwealth of Virginia. All claims and disputes related to this agreement will be via binding arbitration in the Commonwealth of Virginia or another location as mutually agreed. This agreement will govern over any version that is translated into another language.

10. Integration. If any portion of this agreement is found to be void or unenforceable, the remaining provisions shall remain in full force and effect. This agreement supersedes any previous versions of this agreement.

g. Software Testing and Acceptance

User testing and a formal acceptance is required to ensure robust quality assurance, proper security protocols, and functional verification across all software deliverables.

Prior to completion of an Alpha version of the software, the Contractor shall develop a software testing plan. The plan shall include test cases and the independently verified expected answers/outcomes and testing datasets with documentation of edge cases. It is recommended that the software development utilizes unit test cases for numerical calculations and includes a test case for each active branch in the software with the tests verified prior to each official version release.

Software will be tested in an isolated test environment. For desktop applications, the software will be installed on a virtual machine. Virtual machines must implement secure remote desktop protocol access with proper authentication for remote user acceptance testing and shall replicate production specifications (operating system version, dependencies, resource allocation). For cloud-based applications, the test environment will be in a sandboxed server consistent with the intended production operating system and database (if any) but fully segregated from production data; test users must be provisioned with temporary credentials scoped to the minimum required permissions.

Version control and issue tracking will be performed with:

- Unique issue identifiers for each identified issue (preferably auto incremented)
- Short title
- Issue type: bug, enhancement, question, missing or incorrect data, etc.
- Detailed description of issue
- Severity/priority matrix classification
- Target milestone/version for resolution
- Resolution notes/comments
- Assigned resources
- Implementation version number

Any suitable issue tracking application is allowed including PRCI's Software Issue tracker spreadsheet.

A release candidate qualifies for acceptance when:

- Priority defects (critical or high) are resolved with the corresponding regression testing complete

- Testing coverage thresholds met across all modules
  - Test cases must have a minimum coverage of 95% of core business logic and 90% branch coverage except for exception handling paths and security related functionality which must have 100% coverage.
  - Code that cannot be tested through automated methods must have documented manual test procedures and verification that the software passed the test.
- Performance metrics within service level agreement parameters
- Security scans completed with no critical/high vulnerabilities
- Pipeline Research Council International stakeholders have reviewed and approved test artifacts

The test documentation package must include:

- Test execution logs with pass/fail status
- Code coverage analysis with branch/path metrics
- Performance benchmarks compared to requirements
- Risk assessment for any known issues with mitigation strategy

Formal approval documentation from the Pipeline Research Council International project team is required to confirm acceptance of the software.

3. Software User Manuals

Software user manuals will conform to the PRCI report format requirements as applicable. The document will include screen shots and step-by-step instructions to perform key functions. To the extent possible, the software user manual will follow the format of the PRCI Final Report Specifications. The user manual will have a catalog number ending in -M## (whereas a final report ends in -R##), see Appendix D – Catalog Numbers for details on determining the proper catalog number.

The user manual should have a disclaimer section. A sample software disclaimer is provided in Appendix B. The disclaimer must only be edited to reflect the appropriate research contractor, contract number, copyright year, and catalog number.

4. Database Specification Guidelines

a. Architecture/Database Normalization

The process to determine the schema of a database requires a review to determine what information resides in what tables; this is the process of normalizing the data. Reasons to normalize data include minimizing duplicate data, minimizing or avoiding data modification issues, maintaining data integrity, and simplifying queries. PRCI's preference it to utilize the third normal form as a compromise between complexity, data integrity, and performance. Exceptions to this form should be reviewed and approved by PRCI in advance of the database development.

Descriptions

Modern databases allow for description comments to be added to the database itself, tables, views, stored procedures, columns, stored procedures, and functions. The description text should be populated for all of these items in the database with relevant information about what the data for that item is, its associated engineering units (if relevant), etc. It is unacceptable to simply have the description match the corresponding item name (e.g., for the column FirstName[5], the description should be 'The person's full legal first name' and not 'First name'. Fields for numerical values that have an associated engineering unit shall have the expected engineering unit identified in this field. For example, a field named PipeLength would have a description of 'The length of a pipe segment in meters.'

Naming Conventions

Database Wide:

- All names are to be in PascalCase with the exceptions (e.g., for functions and keys) as noted below.
  - When acronyms are used as part of a name, only the first letter of the acronym is capitalized, e.g., a column for a user's role within PRCI would be named PrciRole.
- The use of hyphens, spaces, quotes, underscores, etc. in table/column names are prohibited.
- Use complete words (not abbreviations) so long as the name is less than 50 characters.
- Names should never exceed 128 characters in length.
- Avoid superfluous information in the name. For example, the use of Number in PhoneNumber doesn't add useful information in most databases. A phone number can simply be referenced as Phone unless multiple phone numbers are used in which case phone should be appended with the type of number. Said another way PhoneWork is preferred to PhoneNumberWork.
- Database reserved words (e.g., User, Date, etc.) should never be used for table or column names.

Tables

- Table names use the singular, not plural. For example, User and Organization rather than Users and Organizations. It is obvious that a table is intended to contain multiple records.
- Table names in a relational database should never be prepended with 'tbl' as it is intuitively obvious from the query syntax the distinction between table data and column data.
- The order that columns appear together in a table is important:
  - The primary key should always be the first column in the table.
  - Subsequent columns should be grouped logically (like information adjacent to each other) with the most commonly used columns listed first.

Views

Views shall follow the naming rules for tables. When a view connects to an external data source that does not conform to the data naming convention of this standard, aliases shall be used to change names to conform to this standard. System documentation will have a table noting the cross-reference of table/column names for views of external data.

---

[5] As discussed below, the preference for a first name column is actually NameFirst.

Stored Procedures

All stored procedures should start with SP_ and end in a verb related to the action performed by the procedure. It is this verb that distinguishes the action performed by the procedure. The name should be in noun-verb format. For example, a procedure to update customer address information would be named SP_CustomerAddressUpdate and not SP_UpdateCustomerAddress. Common verbs include:

- Add
- Append
- Delete
- Get
- List
- Modify
- Remove
- Replace
- Search
- Update

Functions

Functions should be prepended with 'fn_' and begin with a verb. An example is fn_StripHtml-Characters.

Columns

- The primary key for each table is the table name appended with ID. For example, PersonID.
- Other columns that are populated with globally unique information for a given table (e.g., there will only be one record in that table with a given value in that column) should be appended with SK (secondary key) in that table.
    - For tables that use that same column in other tables, FK is appended rather than SK to show it is a foreign key.
- When compound names are required, like items should be group named. For example, a person may have more than one phone number (a work, mobile, and a home number). Data can be grouped in multiple ways, for example, either location based (work, mobile, home) or by item (phone, street address, zip code). The preference is to group by item first. In the example above PhoneWork is preferable to WorkPhone but either approach is valid so long as it is done consistently through the database. Some items only logically group in a single way (e.g., NameFirst, NameMiddle, NameLast or PressureMaximumOperating, PressureBurst). The intent is that, if the columns are sorted alphabetically, the information that is interrelated would all be grouped together.
- Simple/single name columns that are commonly used in multiple tables in different contexts (the column uses different/non-relational data in each respective table) should be prepended with the table name. This helps to avoid the need to create alias names when tables are joined. An example is the use of a column named Code in tables named Project and Invoice. The column names should be ProjectCode and Invoice-Code[6] in the respective tables. Single name columns to avoid include:

    - Category
    - Code
    - Cost
    - Date
    - Day
    - Description
    - End

[6] It is highly likely in this example that these will be secondary keys in their respective tables so the complete names would be ProjectCodeSK and IndexCodeSK.

- Index
- Item
- Link
- Month
- Name
- Number
- Title
- Zone
- Type
- Start
- Subject
- Status
- Year

- Names that store Boolean information (true/false data) should be prefixed with 'Is' or 'Has' where the modifier clearly identifies the information as being a Boolean column, which state the 'true' condition applies, and groups all the Boolean columns by name.
- Examples:

Incorrect	**Correct**
wkPhNo	PhoneWork
PhNoMb	PhoneMobile
First_Name	NameFirst
ObsltFilFmt	IsObsoleteFileFormat
Lst Nm	NameLast
Code	ProjectCode

b. Column Datatypes[7]

Primary Keys

Primary keys should be either globally unique identifiers or 4/8-bite integers (depending on the maximum expected number of records to be in the table). Integer based keys should be sequential based on the order a new record is added to the table.

Character Strings/Text

The preferred datatype for character string data is *varchar*. As a general rule, data that will only be numeric should never be stored as character strings.

[7] Datatypes used in this section are based on the use of Microsoft SQL Server. Other databases may use different names for these datatypes. All date datatypes used should be in compliance with ISO 8601.

Exact Numerics

Exact number datatypes <u>shall</u> be used for all parameters where fractions of a number are not allowed (e.g., number of people, number of non-bulk items in inventory, test run number, etc.). Exact numbers also apply to true/false items (Boolean parameters) and monetary values.

- 4-byte signed integers (*int*) should be used in most cases.
- 8-byte signed integers (*bigint*) should be used if the range of values is expected to exceed ±1E9.
- Any currency should be assigned as 8-byte *money* datatypes.
- Boolean parameters should be assigned as *bits*.
- As a general rule, fixed precision floating point (AKA *decimal* and *numeric* datatypes) should not be used. The exceptions are when a numeric value exactly matches the data the data format. For example, a part number such as 20123.0012 or the output from a linear counter that measures length in discrete increments of 0.001 units.

Approximate Numerics

Approximate numeric shall be used for any value where a fraction of a unit is possible. Common parameters that would be stored using approximate numeric include distance, mass, pressure, volume, and flow measurements. In most cases, an 8-byte (double precision) value should be used unless the parameter can be verified that it will always be within the range of a 4-byte real (typically ±1.8E ±E38).

Geographical Data

- Round earth geographic data (e.g., GPS data) should be stored in a *geography* datatype.
- Flat plane (Euclidean) data should be stored using a *geometry* datatype.

Dates and Time

- For dates where the time of day is not important (whole dates), use the datatype *date*.
- Where the date and the time of day (as in the case of a time stamp on a measurement), use the datatype *datetime2*.[8]
    - If time zone adjustments are needed, use the *datetimeoffset* datatype.

c. Data and Metadata

Metadata (purpose of the database, default engineering units, authoring company/individuals, and other like data) shall be maintained in the *Extended Properties* section of the database.

<u>The Use of Default Values and Nulls</u>

Null values should be used when the value for a field is unknown. The corresponding downstream logic should be writing to accommodate handling null values.

Default values should only be used when the used when the value is imputed or strongly implied, for example, generating an invoice should default the invoice number to the next unused value in the sequence and the associated date to the current date.

[8] Note that for data sampled at very high frequencies (faster than 100ns), the datetime2 column will not work as a timestamp. In those cases, alternate timestamp methods are needed such as the date/time that the test started, the sample frequency, and the sequential number of the sample.

Engineering units

All data employing engineering units shall be stored in SI customary units with a hidden layer between the user interface and the database to allow the user to work in their units of choice. All related data types that are approximate numerics and their associated conversions shall be at least double precision. All currency units will be in $US. By default, all measured parameters shall use the applicable standard SI units (meters, seconds, kilogram, ampere, kelvin, etc. and their derived units, e.g., Watts) with the following exceptions by parameter type listed in the Table 1 below.

Table 1 – Engineering Unit Standards

Quantity	Application	Unit
Length	Pipe diameter	millimeters
Length	Pipe wall thickness	millimeters
Power	Driver, compressor	kilowatts
Pressure	Pipeline operating pressure	megapascals

Normalized parameters should be expressed in fractional values and not percentage.

5. Use Restrictions

(a) Contractor must make reasonable efforts to ensure that non-members do not have access to the Reports, Software, or any other PRCI intellectual property and other materials that are intended solely for PRCI members. Contractor shall use PRCI's copyright notice on materials when appropriate.

(b) Contractor may not upload any PRCI copyrighted content to generative artificial intelligence engines without PRCI's express prior written consent. Likewise, generative artificial intelligence must not be used to generate report content without prior written consent from PRCI.

(c) Reports may not be duplicated or posted to a location where there is unlimited electronic access without PRCI express prior written consent.

Appendix A – Sample Report Cover Pages

There are two formats used for the cover page. The first format is the most applied format for PRCI projects. The second format is for consortium of joint industry projects.

Note, this document includes a footer, but the actual cover page of a report would have neither a header nor footer.

Catalog No. [PR000-22605-R01]

Design Guideline for Retrofittable Inline Flow Measurement

[PRCI Project Number]

Contract [ContractNumber]

Prepared for the

[PRCI Technical Committee] Technical Committee

Of

Pipeline Research Council International, Inc.

Prepared by:

[ContractorName]

Authors:

[Author(s)]

Release Date:

[Release Date]

Version	Date of Last Revision	Comments
1	[May 3, 2023]	Initial draft
2	[June 29, 2023]	Final report
3		
4		
5		

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Catalog No. [PR000-22605-R01]

Design Guideline for Retrofittable Inline Flow Measurement

[PRCI Project Number]

Contract [ContractNumber]

Prepared for the

[PRCI Technical Committee] Technical Committee

Of

Pipeline Research Council International, Inc.

Prepared by:

[ContractorName]

Authors:

[Author(s)]

Release Date:

[Release Date]

Version	Date of Last Revision	Comments
1	[May 3, 2023]	Initial draft
2	[June 29, 2023]	Final report
3		
4		
5		

CONSORTIUM PROJECT, DISTRIBUTION IS RESTRICTED

Appendix B – Disclaimer

Please note there are two versions of the Disclaimer. The first is for report. The second is for software.

a. Report Disclaimer

The disclaimer below shall be copied into the report exactly as shown below with the information between and including the square brackets ([]) replaced with the appropriate information.

This report is furnished to Pipeline Research Council International, Inc. (PRCI) under the terms of PRCI contract [ContractNumber], between PRCI and [ContractorName]. The contents of this report are published as received from [ContractorName]. The opinions, findings, and conclusions expressed in the report are those of the authors and not necessarily those of PRCI, its member companies, or their representatives. Publication and dissemination of this report by PRCI should not be considered an endorsement by PRCI of [ContractorName], or the accuracy or validity of any opinions, findings, or conclusions expressed herein. This report conforms to PRCI's report specification regarding the use of artificial intelligence technologies; all content gleaned from other sources was gathered in conformance with established copyright laws.

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Pipeline Research Council International Catalog No. [CatalogNumber]

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b. Software Disclaimer

The disclaimer below shall be copied into the software exactly as shown below with the information between and including the square brackets ([]) replaced with the appropriate information.

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Pipeline Research Council International Catalog No. [CatalogNumber]

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Appendix C – Acknowledgements

Below is an example of the acknowledgements section, which goes after the Abstract and before the Table of Contents in the report. Acknowledgements list the PRCI project team members and their company affiliation. ***By default, all project team members will be listed in the final report; however, inclusion in this list is strictly voluntary.*** *The research contractor must confirm if any of the project team members would like to be excluded from the project team list. The project team members that worked on the project is usually the same as the project team listed in PRIME. The team should be listed in a two-column table that is left justified. Special acknowledgements may also be included.*

Acknowledgements

The PRCI project team supporting this project were:

Name	**Organization**
Curtis Andersen*	ExTransCanada Pipelines, Ltd.
Bob Jackson	Urada Pipeline
Doug Benton	TransGas, Ltd.
Jeff Becket	Southern Florida Gas Company
Bill Gibson	Intermountain Natural Gas

*Team leader

Special thanks to Ron Witchburn and Benton Mosfet for their assistance in developing the design assessment list and project related documents. Thanks also goes to Achelve Corp for their loan of specialized test equipment to the project.

Appendix D – Catalog Numbers

The catalog numbers are based on the contract number appended with an R (report), S (software), M (user or software manual), W (webinar), E (other, such as a spreadsheet), or Z (zipped files), and a two-digit number. This number increments sequentially by each deliverable package associated to the contract. Related works of different document types would have the same two-digit number.

For example, for the second phase of work (and the project had a report that was published under the first phase) for contract PR212-11200 that includes a report, software, and a software user's manual would have the following catalog numbers respectively: PR212-11200-R02, PR212-11200-S02, and PR212-11200-M02. If those files are combined into a master zipped file, it would have the catalog number PR212-11200-Z02.

<u>NOTE</u>: The catalog number stays constant for all revisions of the same document. Specifically, in the above example, the catalog number does not change from PR212-11200-R02 to PR212-11200-R03 for the second revision of the final report published under the second phase.

Appendix E – Report Version Control[9]

Below is an example of a version control tracking spreadsheet. The purpose of the tracker is to allow a simplified method to track where revisions to a specific version of a document occurred. This allows reviewers to verify sections of the report were modified satisfactorily without having to review the entire document. The format used here may be revised if approved by the PRCI project manager to suit the specific needs of a project.

Report:	**Differential Pressure Transmitter Calibration Optimization**
Project:	**MEAS-2-22**
Contractor	**Probaren Institute of Technology**
Contract Number	**PR027-14201**

	Reviewer comments					**Contractor response**			
Item	**By**	**Document Version**	**Original Page, Paragraph**	**Type of Comment**	**Comment**	**By**	**Revision Version**	**New Page, Paragraph**	**Revision Comment**
1	Choquette	Draft 1	1	Conformance	Cover page does not conform to PRCI requirements	Smith	Draft 2	1	Cover page updated
2	Choquette	Draft 1	Multiple	Conformance	Catalog number should be PR-027-14201-R01	Smith	Draft 2	Multiple	Updated catalog number
3	Choquette	Draft 1	3	Conformance	Missing a 'value to member section'	Smith	Draft 2	3	Added a value to member section
4	Becket	Draft 1	6, 2	Technical	The audit trail should include the original data and edits. If this is implied, it is not clear.	Jones	Draft 2	6, 3	Added a statement "Original data must be retained and part of the audit package."
5	Benton	Draft 1	Multiple	Editorial	Coriolis is a proper name it should be capitalized throughout the document	Smith	Draft 2	Multiple	Capitalized Coriolis throughout the document

[9] An Excel version of the Template - Revisions Tracker for PRCI Final Reports is available.

6	Gibson	Draft 1	6,5	Technical	The new approach to define the averaging method for DP, Ps, and Tf as flow dependent linear average in various parts of 1.4 is in direct opposition to Equation 6 which allows flow dependent formulaic averaging under certain conditions.	Jones	Draft 2	7,4 & Appendix C	Deleted "linear" from all locations that are not specific to determining DPdynamic to include differential pressure, static pressure, and flowing temperature. The reader is also directed to a new Appendix C for a discussion on the acceptable averaging methods.
7	Holbrook	Draft 1	34, 3	Editorial	Hard to understand the last sentence	Jones	Draft 2	35, 2	Added a simple example to provide more explanation.
8	Benton	Draft 1	9 & 10	General	For Figure 8 and Figure 9, ISA symbols are being used. Include a reference in section 4.3	Jones	Draft 3	13, 1	A new section has been added in 4.3 that includes a cross reference to ISA symbols.
9	Benton	Draft 2	3, 4	Editorial	Coriolis is not capitalized	Jones	Draft 3	4,1	Capitalized Coriolis
10	Jackson	Draft 2	8, 2	Editorial	What are "other approved linear metering standards"? Too vague, needs to be tighten up or deleted.	Jones	Draft 3	8, 2	Deleted phrase "or other approved linear metering standards."

Appendix F – Title and File Name Guidance

Title and File Name Restrictions

The title of the report should be in title case. The total length of the title, including the catalog number and file extension, may not exceed 110 characters in length. In addition, the following characters cannot be used anywhere in a file name:

- Tilde (~)
- Comma (,)
- Number sign (#)
- Percent (%)
- Ampersand (&)
- Asterisk (*)
- Braces ({ })
- Backslash (\)
- Colon (:)
- Angle brackets (< >)
- Question mark (?)
- Slash (/)
- Pipe (|)
- Quotation mark (“)
- The period character consecutively in the middle of a title name (i.e, ..)
- The title cannot begin with an underscore character (_)
- Leading and training spaces are not permitted

In addition, file names may not end with any of the following strings:

- .files
- _files
- -Dateien
- _fichiers
- _bestanden
- _file
- _archivos
- -filer
- _tiedostot
- _pliki
- _soubory
- _elemei
- _ficheiros
- _arquivos
- _dosyalar
- _datoteke
- _fitxers
- _failid

- _fails
- _bylos
- _fajlovi
- _fitxategiak

Abbreviations of words should not be used in the title but acronyms common to the industry (e.g., ILI, NDE, etc.) may be used.

Document Name: -- For draft and final reports, this should be the exact same as the title on the report preceded by the catalog number.

File Name -- For draft and final reports, this should be exactly the same as the document name appended by the file extension. The total length should be **no more than 110** characters including spaces. Spaces should not be replaced with user score characters (_).

Document Title for Publication: -- Title of Published Document. For draft and final reports, this should exactly match the title on the cover page of the document.

Important! The title in the document needs to match the one used in the document name, and the file name, and the title on the report cover page. All need to match.

So, given all of this, what is the maximum number of characters that I can use in my title?

Start with the File Name: If you get this one right, the rest falls into place.

Must be no more than 110 characters (including spaces).

File name is comprised of the catalog number, the title, and file extension.

- Pre-2017: The catalog number typically uses 17 characters plus a space = 18 characters
- Post 2017: The catalog number typically uses 16 characters plus a space = 17 characters
- The file extension (in this example) commonly uses 4 characters (i.e. **.**pdf)
- That leaves 99 characters (maximum) for the title (post 2017).

Examples:

Assume a report with the proposed title: "Initial Development to Establish the Potential Severity of Various Cathodic Protection Shielding Parameters" that has a catalog number of PR874-214606-R01. From the table directly below, this title is not acceptable as it is too long. Changing the title to "Establishing the Potential Severity of Various Cathodic Protection Shielding Parameters" creates a title that is acceptable. It is common for reports to default their title to match the title of the corresponding project; that is acceptable but that is not a requirement. The report title should be a succinct descriptor of the contents of the document.

Catalog Number	+	Title	+	File Ext	≤	110
PR874-214606-R01		Initial Development to Establish the Potential Severity of Various Cathodic Protection Shielding Parameters		.pdf		
17	**+**	107	**+**	**4**	**=**	**128**
PR874-214606-R01		Establishing the Potential Severity of Various Cathodic Protection Shielding Parameters		.pdf		
17	**+**	**87**	**+**	**4**	**=**	**108**

Document Name: PR874-214606-R01 Establishing the Potential Severity of Various Cathodic Protection Shielding Parameters

File Name: PR874-214606-R01 Establishing the Potential Severity of Various Cathodic Protection Shielding Parameters.pdf

Report Title and Footers: Establishing the Potential Severity of Various Cathodic Protection Shielding Parameters

Appendix G – Style Guidelines

a. General

Some helpful references are:

- [Technical Writing Guidelines, TechProse]
- [Purdue Online Writing Lab]
- Science & Technical Writing, A Manual of Style, By Philip Rubens

b. Abbreviations

- Typically, abbreviate social titles (Ms., Mr.) and professional titles (Dr., Rev.).
- Follow most abbreviations with a period, except those representing units of measure ("Mar." for March; "mm" for millimeter).
- Typically, do not abbreviate geographic names and countries in text (i.e., write "Saint Cloud" rather than "St. Cloud"; write "United States" rather than "U.S."). However, these names are usually abbreviated when presented in "tight text" where space can be at a premium, as in tables and figures.
- Use the ampersand symbol (&) in company names if the companies themselves do so in their literature, but avoid using the symbol as a narrative substitute for the word "and" in the text.
- In text, spell out addresses (Third Avenue; the Chrysler Building) but abbreviate city addresses that are part of street names (Central Street SW).
- Try to avoid opening a sentence with an abbreviation; instead, write the word out.
- When presenting a references page, follow the conventions of abbreviation employed by a journal in your field. To preserve space, many journals commonly use abbreviations, without periods, in their references pages (e.g., "J" for Journal; "Am" for "American").

c. Acronyms

- For uncommon acronyms infrequently used in the document (e.g., less than three times), consider only writing out the reference and not using the acronym.
- Unless they appear at the end of a sentence, do not follow acronyms with a period.
- Generally, acronyms can be pluralized with the addition of a lowercase "s" ("three URLs"); acronyms can be made possessive with an apostrophe followed by a lowercase "s" ("the DOD's mandate").
- As subjects, acronyms should be treated as singulars, even when they stand for plurals; therefore, they require a singular verb ("NIOSH is committed to . . .").

- Be sure to learn and correctly use acronyms associated with professional organizations or certifications within your field (e.g., ASME for American Society of Mechanical Engineers; PE for professional engineer).

- With few exceptions, present acronyms in full capital letters (FORTRAN; NIOSH). Some acronyms, such as "scuba" and "radar," are so commonly used that they are not capitalized.

- When an acronym must be preceded by "a" or "an" in a sentence, discern which word to use based on sound rather than the acronym's meaning. If a soft vowel sound opens the acronym, use "an," even if the acronym stands for words that open with a hard sound (i.e., "a special boat unit," but "an SBU"). If the acronym opens with a hard sound, use "a" ("a KC-135 tanker").

- As a general rule, when writing out the words to be used in an acronym, the words should not be capitalized unless they are proper nouns or trademarked names. For example, 'American Association of Pipeline Engineers (AAPE)' is correct but 'Automated Detonation Detection (ADD)' is preferred as 'automated detonation detection (ADD)'.

d. *PRCI Final Report and Software Specification*

Creating a new report

Download the skeleton document

The first step of creating a new research report is to download the most current version of the Template - PRCI Final Report Example-Skeleton.docx.

Save the document with the filename in the format [CatalogNumber] [Title]

See Appendix D on how to determine the catalog number. See Appendix F for guidance on title. Note that there are length restrictions on the title length.

Edit Metadata

Open the document for editing and edit the file's information:

- File menu

- Info (see **Figure 2**)

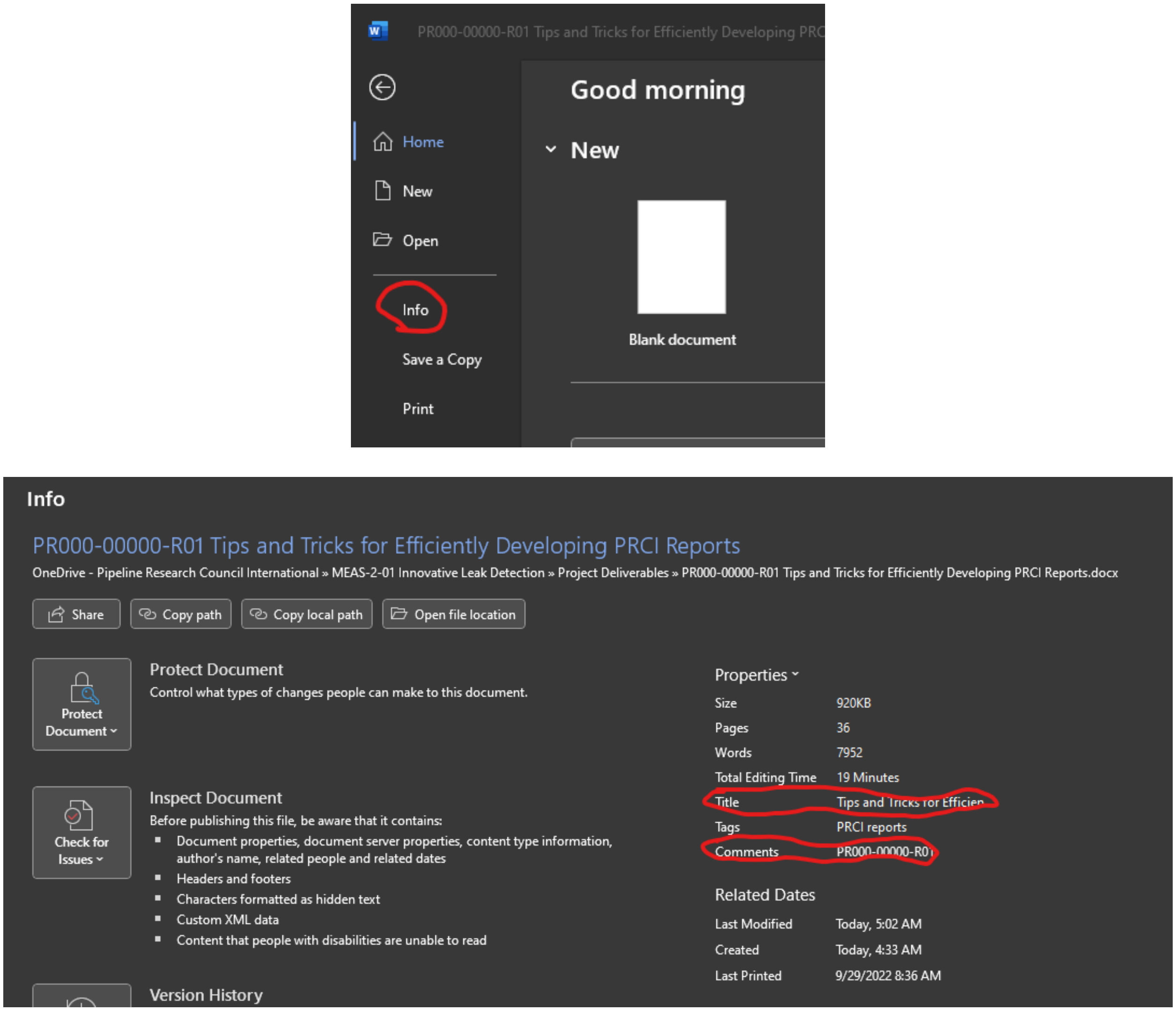

Figure 2 – File info for metadata editing

- Edit the title and place the catalog number in the Title and Comments fields respectively.
    - Note that the file name of the document should be the catalog number followed by the title.
    - See Appendix D on how to determine the catalog number.
    - See Appendix F for guidance on title. Note that there are length restrictions on the title length.
- In the Subject field, enter the corresponding PRCI Technical Committee (e.g. Compressor & Pump Station, Corrosion, Design, Materials & Construction, Integrity & Inspection, Measurement, Surveillance, Operation & Monitoring, Underground Storage, Subsea, Emerging Fuels Institute, etc.)

- In the Author and Company fields, enter the report author(s) and contract organization, respectively.

- Add key words as appropriate in the Tags section.

This would be a good time to update all fields (see section below ***Updating all fields*** for more details).

Replacing placeholder content

Search and replace (F5) the following[10]:

Placeholder	Example
[PRCI Project Number]	MEAS-2-01
[ContractNumber]	PR329-222011
[Committee]	Corrosion
[ContractorName]	Optimized Technical Solutions, LLC

Page formatting

Switching to/from landscape to portrait is beneficial at times, especially when displaying large tables. To do so requires inserting a section break and then changing the page layout.

Project Team

Update the PRCI project team with the project team roster as found on PRIME.

Styles

Shortcut keys to set heading styles for the main body of the report.

- Highlight the text of interest.

- Shift+Ctrl+1 for Heading 1, Shift+Ctrl+2 for Heading 2, etc.

Table of Contents and List of Figures/Tables

If headings and styles (including captions) are applied correctly, the creation and maintenance of the Table of Contents and List of Figures/Tables can greatly be simplified.

Inserting a caption

[10] The square brackets '[]' are intended to indicate placeholder content. The replaced content should eliminate the brackets. For example [Committee] would be replaced with the correct corresponding technical committee such as Corrosion.

To insert captions on a figure or table, right click on the item and select insert caption (**Figure 3**). Select the position for the text (above for tables, below for figures, **Figure 4**), then click the Ok button. Edit the caption as desired.

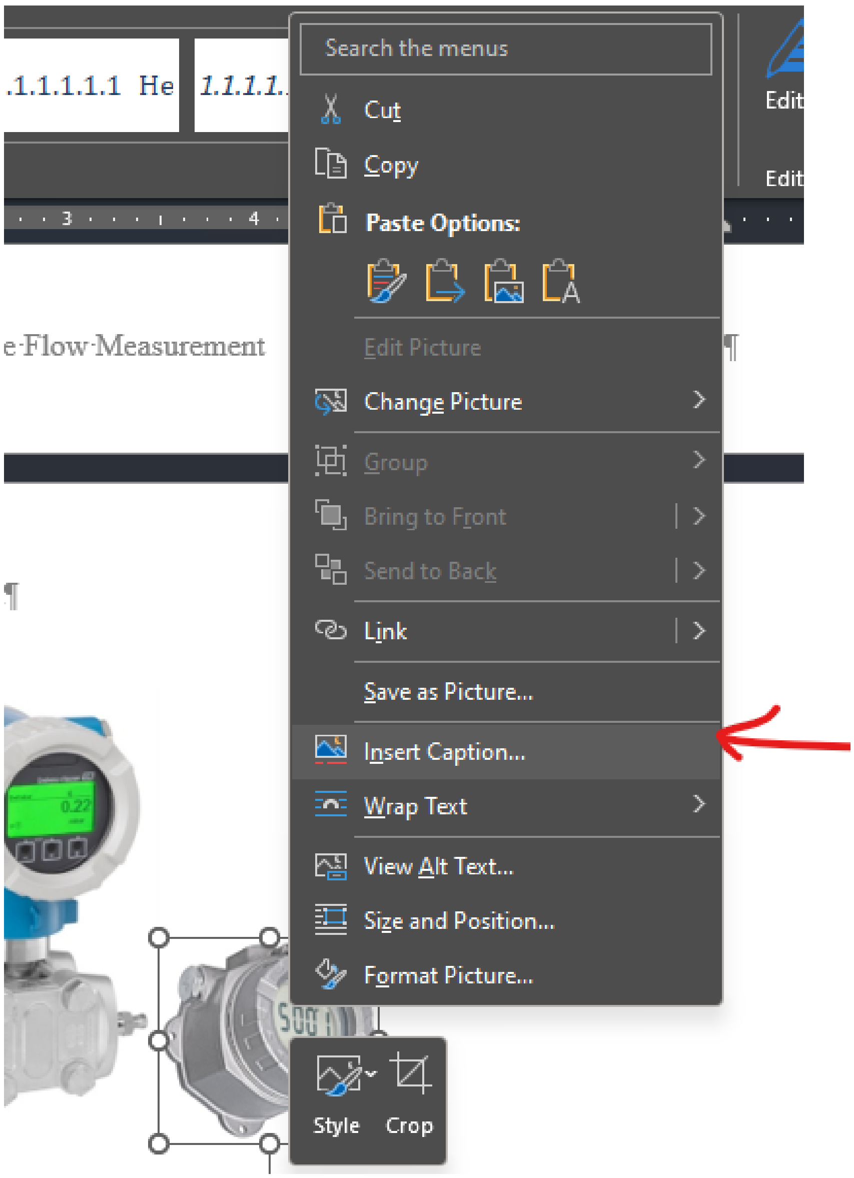

Figure 3 – Inserting a caption to a figure or table

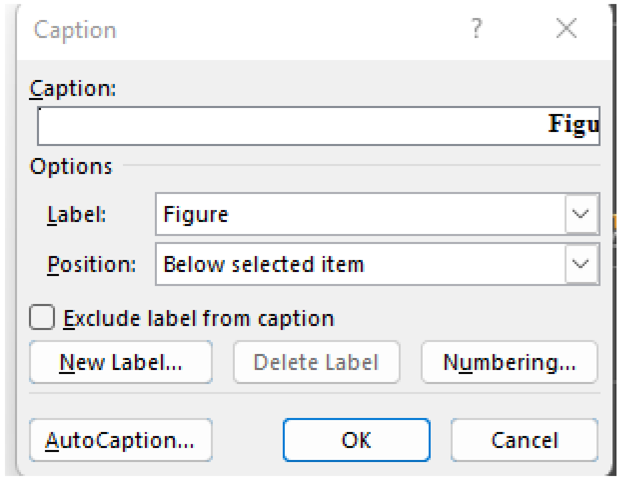

Figure 4 – Selecting where caption is located._ Note, this is also an example of a long caption where only part of the caption is found in the list of figures.

Long captions

In some cases, a long caption is desired on a table or figure but only a subset of that caption is desired in the table of figures. This can be achieved by inserting a style separator[11] between the section to be included in the table of figures. To do so, the following procedure is recommended:

- Type the caption as desired. It is commonplace to place a period after the section to be included in the list of figures.

- Type a line of normal 'dummy' text after the caption (**Figure 5**).

- Click the caption and insert the style separator. Note that the style separator is usually created at the end of the caption and the dummy text now appears on the same line as the caption (**Figure 6**).

- Move the style separator to its desired location, delete the dummy text (**Figure 7**).

Figure 5 – Caption followed by dummy text

[11] The shortcut key for the style separator is Ctrl+Alt+Enter. It can also be added to the Quick Access Toolbar from the 'All Commands' set. See How can I include only part of an image caption in a table of figures in Microsoft Word? - Super User for more details.

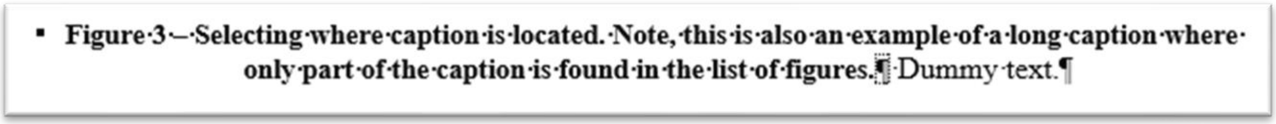
▪ Figure·3·–·Selecting·where·caption·is·located.·Note,·this·is·also·an·example·of·a·long·caption·where· only·part·of·the·caption·is·found·in·the·list·of·figures.¶·Dummy·text.¶

Figure 6 – Caption with style separator inserted

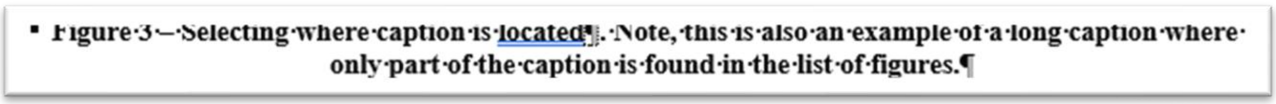
▪ Figure·3·–·Selecting·where·caption·is·located¶.·Note,·this·is·also·an·example·of·a·long·caption·where· only·part·of·the·caption·is·found·in·the·list·of·figures.¶

Figure 7 – Caption with style separator moved, dummy text deleted

Page and section breaks

Page breaks

Page breaks should be used between the main body of the report (after the Reference section) and the first appendix. Page breaks should also be used between each appendix. Examples of this can be found in this document.

Section breaks

The use of section breaks should be limited. They are used anytime significant formatting differences are required within a section of the document. For example, new page numbering (either in format or value) is required or when the page layout (portrait or landscape) changes. In this document, section breaks are used:

- On the title page because different header/footer formatting is required,
- Directly before the first use of Heading 1 (1. Final Reports) because the page numbering format changes.

Word productivity tricks

Moving between pages/sections

When styles are properly used, it is easy to navigate to different sections within the document using the navigation pane. To open the navigation pane, click the very far left bottom section of the document (where it says Page X of Y). Select either Headings or Pages. Jumping to a page or to a section as noted by its heading is easily accomplished from the navigation pane.

Headings

The headings view allows the user to jump to the beginning of a section as identified by its heading. The headings view also provides an outline of the document (**Figure 8**).

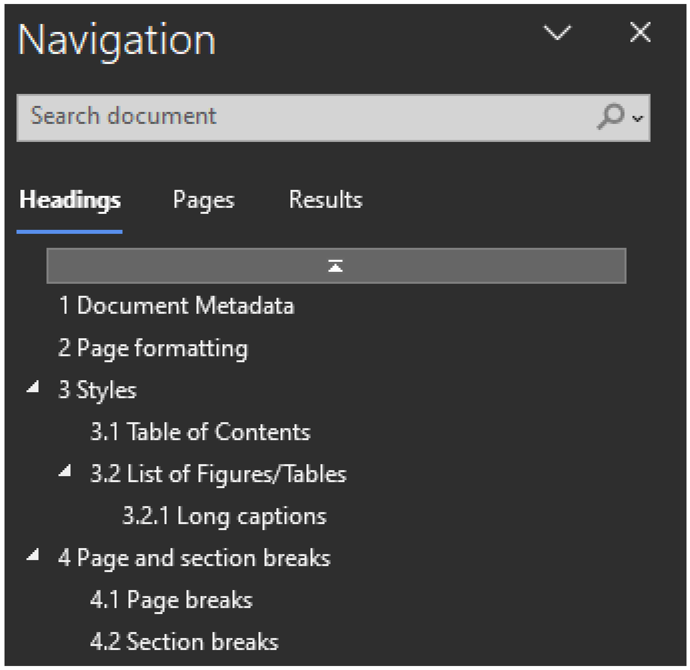

Figure 8 – Navigation by headings

Pages

Navigation by pages allows the user to move to a specific page using large icons that display the miniaturized content of each page as well as the page number (**Figure 9**).

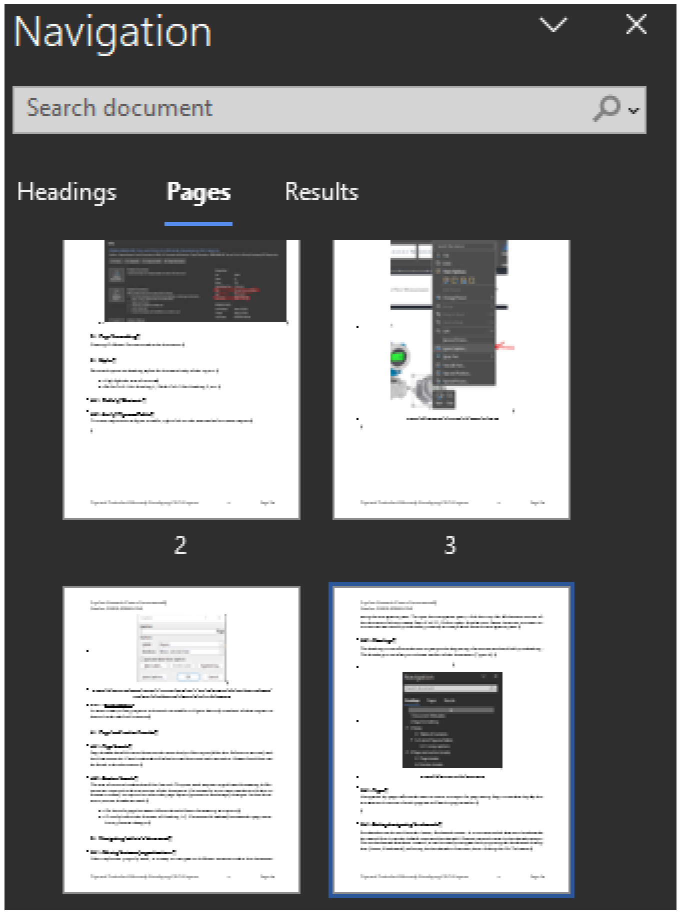

Figure 9 – Navigation by page

Setting/navigating bookmarks

Bookmarks can be set from the Insert, Bookmark menu. It is recommended that new bookmarks be named (don't use the default generated bookmark). Spaces cannot be used in bookmark names. Once a bookmark has been created, it can be easily navigated to by opening the bookmark dialog box (Insert, Bookmark), selecting the bookmark of interest, then clicking the Go To button.

The go to feature (F5) can also be used to navigate to bookmarks.

Split screen

When editing interrelated content in two sections of the same document, the split screen mode (Ctrl+Alt+s) can be used. An examples of content where split screen mode is helpful is populating the acronym/glossary/nomenclature tables as content is added to the main body of the report. Each time a new item is added to the main body of the report, the split screen makes it is easy to add it to the corresponding acronym/glossary/nomenclature table.

Equations

Example equation

The example directly below is an example of an equation. The equation is placed in a two cell table with hidden borders. This allows the equation number to be displayed near the right margin. The equation numbers and references to the equations are automatically updated using this process. The equation below can be copied into your report to get the base formatting and modified as needed for content. After adding new equations, it is a good idea to update all fields in the document (see section below ***Updating all fields***) before the equations are cross-referenced in the text.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad \text{Eq 3}$$

Where:

x is the independent value in a second order polynomial equation.
a is the coefficient associated with the square of x^2.
b is the coefficient associated with x.
c is the offset value.

Cross-references

Using cross-references (found on the References ribbon in the Captions section) within a document is a good way to dynamically link content within a document. As new figures/tables/equations are added to a document, the corresponding references are automatically retained and are easily updated.

Note, as new figures are added, the content in existing cross reference content may be incorrect. This is easily rectified by updating all fields (see section below ***Updating all fields***). There is the possibility that a cross-reference can get broken; in those cases the cross-reference content will be replaced with '**Error!**' as described in more detail in section below ***Finalizing a document***.

Updating all fields

All fields in a document can be updated by following the steps:

- Select the entire contents of the document (Ctrl + a).
- Update (F9).
- If prompted for updating only the page numbers or the entire table, select the entire table (**Figure 10**). It is possible that this prompt may appear more than once during an update.

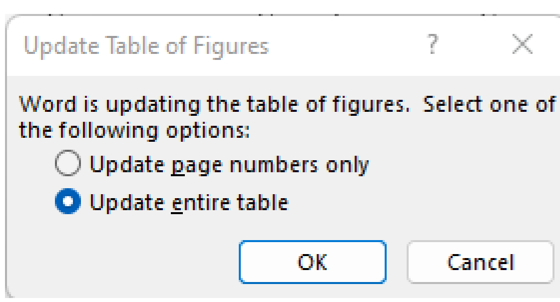

Figure 10 – Updating the entire table

- Double click the header and repeat the steps to select and update all content.

- Note, if the document contains section breaks with different headers or footers between sections, you may have to repeat this step for each section.

- Double click the footer and repeat the steps to select and update all content.

References

It is strongly encouraged that authors utilize the built-in Citations & Bibliography functions in Word.

Finalizing a document

When the final edits are done, this sequence of steps should be used to finalize the document:

1. Scan the document (using the navigation page layout is helpful for this, see section 0 Pages) and manually fix formatting issues such as:
    a. Blank pages
    b. Figures that cross page breaks
    c. Incorrect layout (landscape/portrait).
    d. Verify graphics are legible and complete.
2. Update all fields in the document (see above section ***Updating all fields***).
    a. Search for broken links (search for 'error!').
    b. Delete the error content and replace with the correct cross-reference.
3. Update the cover page:
    a. The release date.
    b. The revision content in the revision table.

Shortcut keys for Microsoft Word

Word has many shortcut keys that can save significant time over using the corresponding mouse/menu clicks. Examples include copy (Ctrl+c), cut (Ctrl+x), and paste (Ctrl+v). For a comprehensive list of shortcuts, see the Microsoft website. Many of these shortcut keys also work in other Microsoft applications (e.g., Excel, PowerPoint). Shortcut keys that are most commonly used include:

Category	**Action**	**Shortcut**[12]

[12] Shortcuts refer to the US keyboard layout, they may not work on other keyboard layouts. The plus sign (+) in the shortcut indicates that multiple keys must be pressed at the same time; a comma (,) in a shortcut indicates that

File management	Open a document	Ctrl+o
	Create a new document	Ctrl+n
	Save the document	Ctrl+s or Shift+F12
Find/replace	Find and/or replace text	Ctrl+f, Ctrl+g, or F5
Formatting	changing title case from upper, lower, and sentence case.	Shift+F3
	Center align the selected text	Ctrl+e
	Set selected text to/from bold	Ctrl+b
	Set selected text to/from italic	Ctrl+i
	Set selected text to/from underline	Ctrl+u
	Toggle selected text to Heading 1	Ctrl+Alt+1
	Toggle selected text to Heading 2	Ctrl+Alt+2
	Toggle selected text to Heading 3	Ctrl+Alt+3
	Style separator	Ctrl+Alt+Enter
Hyperlinks	Add a hyperlink to a selection of text	Ctrl+k
Navigation	Go to the top of the document	Ctrl+Home
Split window	Toggle a window split	Ctrl+Alt+s
Undo/redo	Undo the last action	Ctrl+z
	Redo/repeat the last action	Ctrl+y
	Cancel a command	Esc

multiple keys must be pressed in the specified order. When a standard shortcut key includes an alpha key (a through z) uppercase or lower case can be used (e.g., Ctrl+A is the same as Ctrl+a).

Advanced users/features

Setting default paste mode and other advanced options

See Word Options (Advanced) - Microsoft Support.

Heading levels/styles

You should not change the heading styles from those defined in the PRCI skeleton. Some of the heading styles can be readily toggled using shortcut keys, see 0 Shortcut keys for Microsoft Word.

Sharing a document for multi-user editing

Sharing a document can be more efficient than emailing the document. This can allow multiple users to edit/comment the same document rather than trying to merge edits sent via email or file transfer back into a single master document. Sharing for multi-user editing is only possible if the document is saved in a OneDrive or SharePoint folder. If using the desktop application, the file can then be shared using the menu items, File, Info, Share. Then enter email address of those to share the document with and set the corresponding permissions followed by clicking the send button. It should be noted that network security for some users may prohibit access to shared documents.

Multi-level lists, bullet formatting

To change the default formatting of multi-level lists and bullets, see Define new bullets, numbers, and multilevel lists - Microsoft Support.

Creating an index

An index is not required as part of PRCI's report specification, but it is likewise not prohibited. Having an index can be useful for the reader. Word has a process to automate words would be included in the index. If an index is used, it should be placed at the very end of the document.

Version compare

To compare the differences between two documents, see Compare and merge two versions of a document - Microsoft Support. Version compare is useful to marked the difference between two documents or to efficiently merge different revisions of the same document.

Appendix H – Revisions

Version	Date of Last Revision	Revised by	Comments
F01	2/18/2010	Unknown	Adapted from *PRCI Final Report Specification*
F02	6/25/2013	Choquette	Updated format and software specifications
F03	8/2/2013	Choquette	Revised graphics, added header and footer
F03	8/23/2013	Choquette	Revised to add file naming conventions and other
F03	1/12/2015	Choquette	Revised title names to be compatible with SharePoint, miscellaneous clarifications
F04	11/11/2015	Choquette	Added restrictions to title lengths and characters
F05	12/1/2015	Choquette	Changed cover page
F06	12/10/2015	Choquette	Removed project team requirement
F07	8/12/2016	Choquette	Added JIP/consortium and updated disclaimer
F08	3/16/2017	Choquette	Minor changes and update of disclaimer
F09	11/16/2018	Fields	Modification of Project Team and order change of recommendation/conclusion sections
F10	9/4/2019	Choquette	Added project team review prior to drafting the final report, limiting the font style for the headers and main body text, guidance on using equations, information on when/if the project team should be excluded, and information about embedded videos.
F11	5/12/2020	Choquette	Updated the software section, added data section.
F12	6/6/2021	Choquette	Added additional detail on software development and updated Title Name Restrictions. Updated Excel support requirements from 2007 to 2016, Specified that compressed files should use the .zip format.
F13	4/28/2022	Choquette	Removed need for testing on Windows 7/8, added Windows 11. Added that a review of the user interface is required prior to full development, and that the interface is to be branded as a PRCI product. Added additional information the type of content desired in the Recommendations section of research reports.
F14	10/22/2022	Choquette	Minor wording change (e.g., shall changed to must). Additional details on numbering for subheadings. Additional guidance for the abstract development. Added that host sites should not be specifically named. Added an example of how nomenclature is formatted. Minor changes to the Executive Summary. Removed the Value to Members section. Significantly revised the recommendations section to include specific guidance on how the end user would use the research

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			and/or drafting language for recommended practices or standards; recommendations for follow-on research is not to be included in this section. Examples of equation formatting was updated; examples of the equations are required in an Excel spreadsheet. Removed compiled flash format as a valid video format (.SWF) Software specifications were modified to include single sign-on user authorization via SAML, Other modifications include development in ASP.NET Core framework using Razor components, MVC or Blazor. APIs can be used based on REST using JSON. Software documentation will follow the PRCI report specification. More detail was added to naming conventions.
F15	4/24/2023	Choquette	Added more detail on the use of page/section breaks. Allows for acronyms that can be found in dictionaries to be excluded from being in the list of acronyms and spelled out on first use. A target audience is now required as part of the Executive Summary. Incorporated end user license agreements for spreadsheets and software.
F16	8/7/2023	Choquette	Revised table on cover page, added additional detail on document titles. Added Tips and Tricks to Appendix G based on the new report skeleton. Added a note that some cover pages may require additional content.
F17	9/20/2023	Choquette	Updated EULA.
F18	12/11/2023	Choquette	Revised Recommendations section to remove conflicting language and add more clarification.
F19	7/25/2024	Lam	Added Section 5, Use Restrictions Updated Appendix B, Disclaimer to include Use Restrictions and added Software Disclaimer Updated Section 3, Software User Manuals to include Software Disclaimer requirement Updated heading of Appendix F to Title and File Name Guidance Updated broken hyperlinks Made EULA last revised date static Added to W (webinar) to Appendix D, Catalog Numbers
F20	6/5/2025	Lam	Updated EULA

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F21	7/30/2025	Choquette, Lam, Hofmann	Additional details in the Abstract and Introduction sections on expected content for those sections including a problem statement and target audience as a requirement in the abstract. Added to Report format section concerning usage of Report skeleton/template and how to update Document properties with corresponding info about report. Clarification to use built-in Citations & Bibliography functions in Word for References. Clarification on Catalog numbers. Updated Report Disclaimer. Added requirement to include corresponding Excel Spreadsheet as a deliverable when equations are developed as part of the research. Added that database field descriptions include engineering units where applicable. Added testing desktop software applications via a virtual machine. Added software testing requirements. Added to Applied Software Technology Requirements.
F22	9/3/2025	Lam	Added links to EULA Excel tab and PDF to be included in zipped package when a Spreadsheet product is a project deliverable Updated Report Disclaimer
F23	10/15/2025	Choquette Lam	Added Use of AI Technologies section and updated Report and Software Disclaimers with respect to use of AI technologies Updated Recommendations and Conclusions sections Updated Acknowledgments section: By default, all project team members will be listed in the final report; however, inclusion in this list is strictly voluntary. The research contractor must confirm if any of the project team members would like to be excluded from the project team list.