

# TRC Power Academy

## Process Excellence



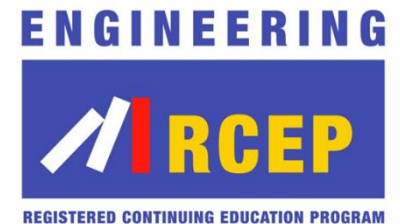
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For more information on confidentiality, privacy, and data security, please search TRCNET for ‘TRC IT Policy’, ‘TRC Information Security Policies’, and ‘Information Classification and Handling’.

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# Safety First – Daily Tailboard

- First Aid
- AED location
- Fire Extinguisher
- Physical address
- In case of emergency
- Volunteers
  - Call 911
  - Meet first responders
  - CPR
- Emergency exits
- Where to gather outside



# Welcome & Introductions

- Your name
- Job title
- Your experience with substation diagrams and schematics

Help your neighbor!



# Logistics & Guidelines

- Arrive to class on time!
- Sign the roster everyday
- Cell phones on silent please
- Restroom locations
- Scheduled breaks and lunch
- Length of training
- Class rules and guidelines



# Agenda / Lessons

- Introduction
- Module 1 – Intro to Site Commissioning Documentation
- Module 2 – Mock Project & Pre-Commissioning Process
- Module 3 – On Site Pre-Commissioning and Commissioning
- Module 4 – Post-Commissioning



# Course Goal/Purpose

Participants learn to safely and systematically plan, draft, execute, and closeout a project by utilizing the T&C process and procedures documentation.



# Learning Objectives

**At the end of this course, participants will be able to:**

## **Module 1 – Intro to Site Commissioning Documentation**

- Describe Site Commissioning documentation and locations
- Describe the Commissioning Services Workflow Process

## **Module 2 – Off Site Pre-Commissioning**

- Explain the Mock Project Goals
- Describe the Off Site Pre-Commissioning Process
- Demonstrate the ability to export, edit, and complete project-specific Off Site Pre-Commissioning documentation

# Learning Objectives Continued

**At the end of this course, participants will be able to:**

## **Module 3 – On Site Assessment and Pre-Commissioning**

- Describe the Site Assessment and On Site Pre-Commissioning Process
- Apply Human Performance tools in a substation
- Demonstrate how to complete project-specific On Site Pre-Commissioning documentation

## **Module 3 – On Site Commissioning**

- Describe the On Site Commissioning Process
- Demonstrate how to complete project-specific On Site Commissioning documentation
- Explain the Testing and Commissioning Process and Procedures
- Perform Testing and Commissioning Process and Procedures  
(i.e., Relay Identification, Isolation, & Restoration)

# Learning Objectives Continued

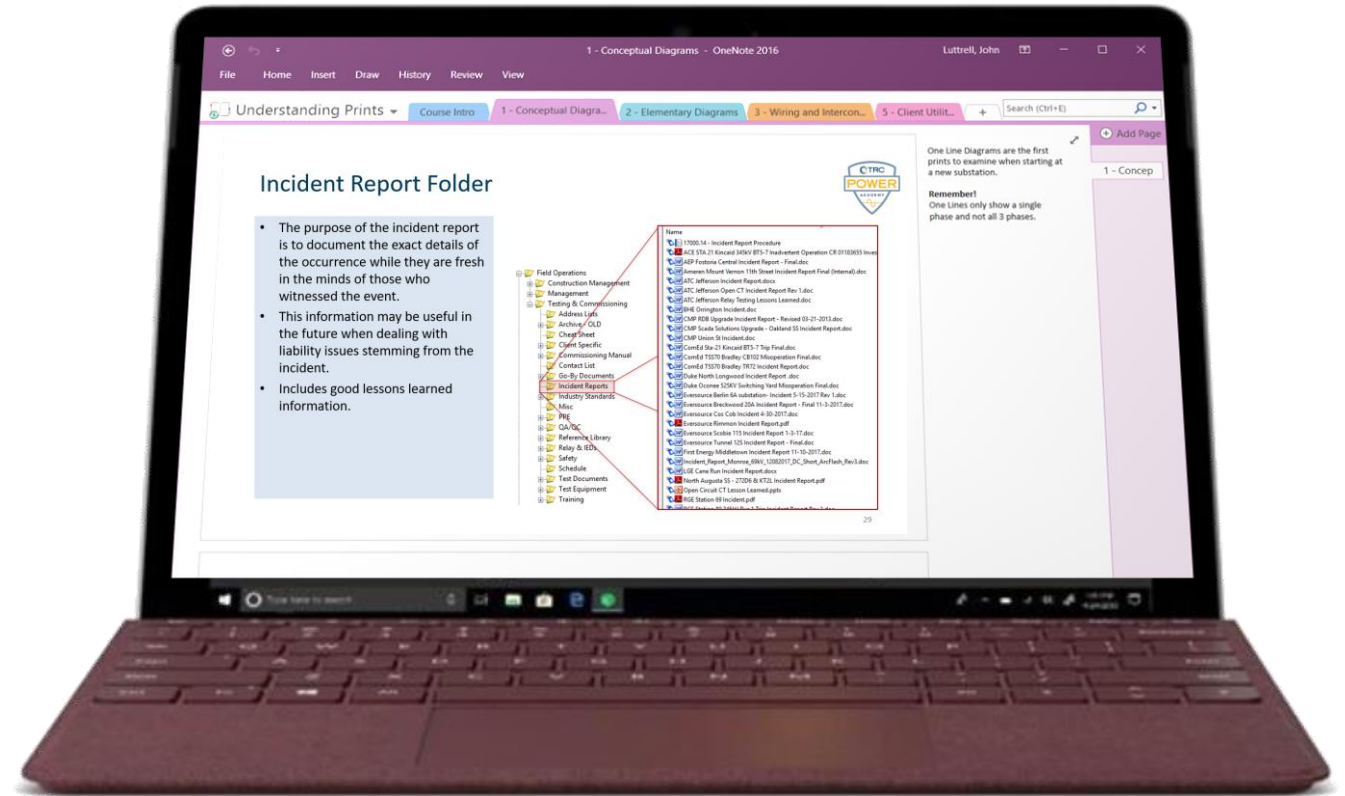
**At the end of this course, participants will be able to:**

## **Module 4 – Post-Commissioning**

- Describe the Post-Commissioning Process
- Demonstrate the ability to complete and upload project-specific Post-Commissioning documentation

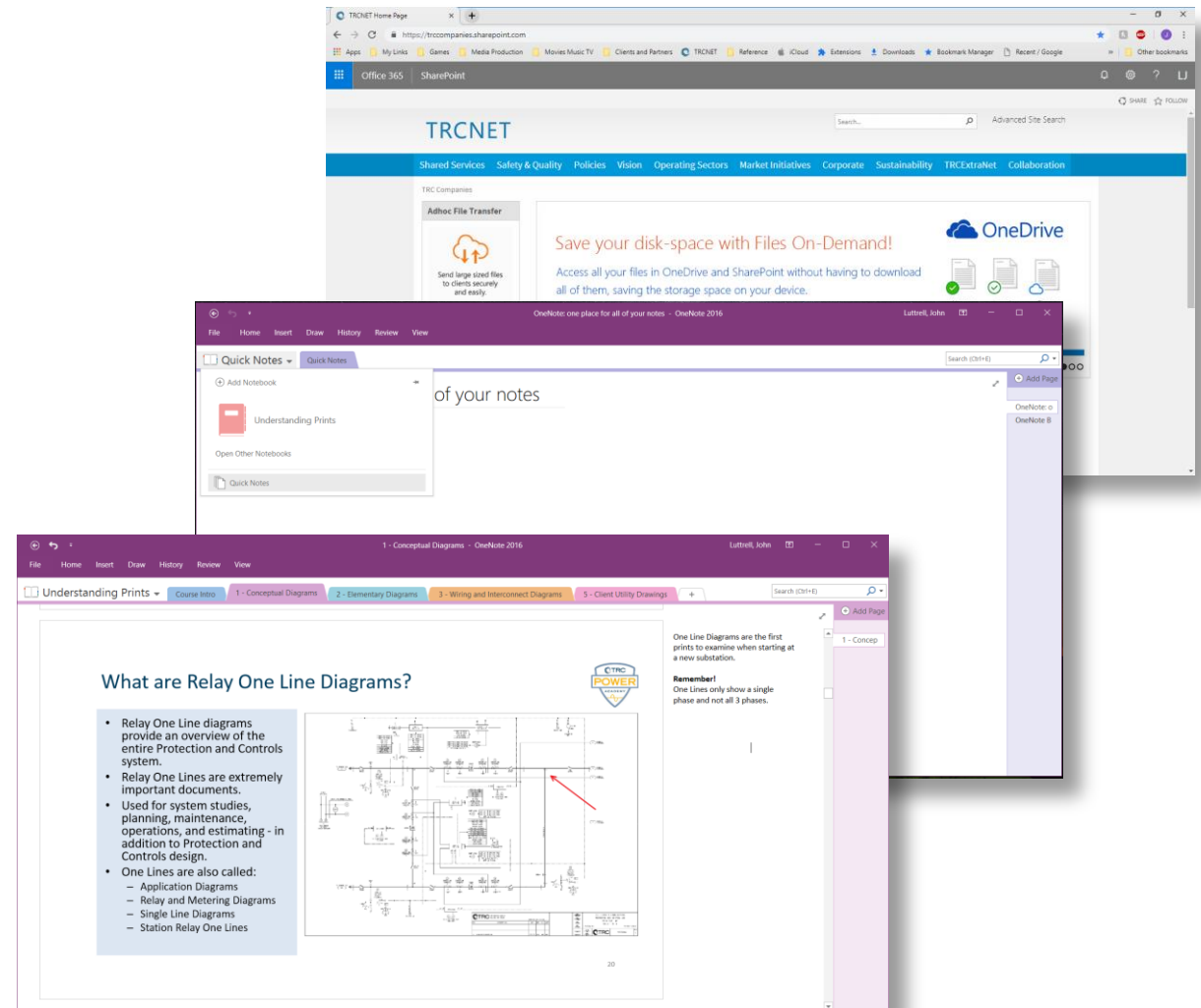
# Course Materials

- Participant Guide
  - OneNote on Surface Go
  - Slides
  - Knowledge Checks
  - Rubrics
  - Assessments
  - Lab exercises
  - References
  - Prints
- Site Commissioning Documentation
  - Go-By Documents
  - 17000 Documentation
- TRC Power Academy Site
  - Additional reference and training material



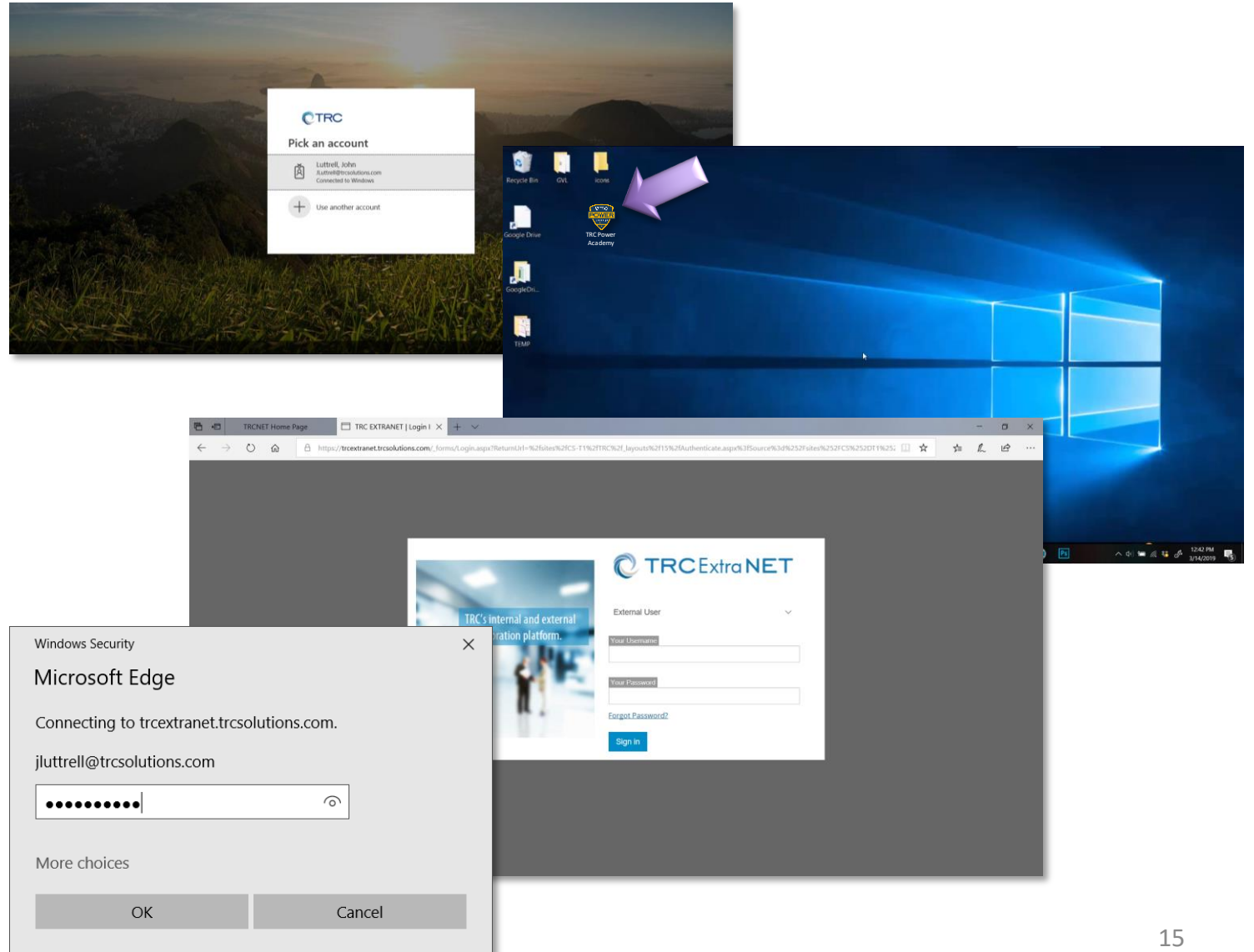
# Getting Started with OneNote on a Tablet

- Login to TRCNET
  - Use your network username and password
- Once logged in, minimize the browser
- Tap the OneNote icon
- OneNote launches
  - Tap drop-down
  - Choose Process Excellence
- Ask for help if you need it
  - Use job aid for tips



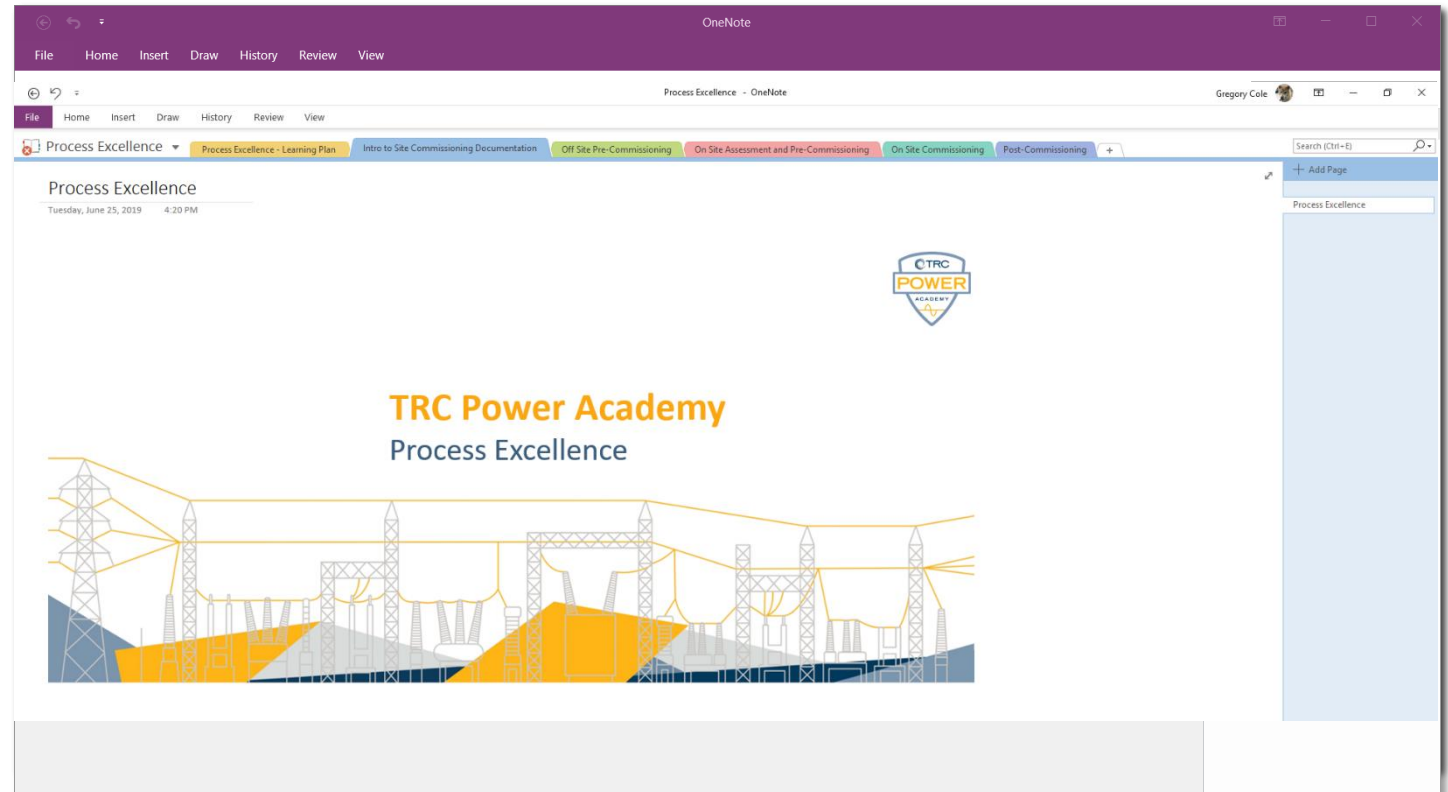
# Getting Started with OneNote on a Tablet

- Login on the Surface Go
  - Use your network username and password
- Go to TRC Power Academy website
  - Tap TRC Power Academy icon on home screen
  - Opens browser to TRC Power Academy website
  - Use your network username and password



# Getting Started with OneNote on a Tablet

- Get the OneNote file for this course
  - Locate and click on course folder in **Course Library**
  - Locate and click on **OneNote** file for course
  - Click **Open** when prompted
  - OneNote launches
  - Click **Create** to unpack the .notebook file and store it in your OneDrive
  - Course opens in **OneNote**
  - Colored tabs for each module



## Tip:

*Course materials with your notes will be stored on your OneDrive, which you can access from anywhere.*



# Using OneNote in Class

- Modules are organized with tabs.
- **Super easy!** Just click in the right margin to take notes.
- When you realize why a topic is important or your **WIIFM\***, write that as a note for the slide.
- Be an **Active Learner!**

17000.02A – Commissioning Services Workflow Diagram

- Illustrates the overall TRC T&C planning process from project conception to completion.
- It is a high-level view showing steps for how to plan, draft, execute, and closeout a project.
- It identifies:
  - Who is involved and when.
  - Clear start points and end points for each step and section.
  - Possible decisions during throughout the planning process.

\* WIIFM – What’s In It For Me!



# KWL / Learning Plan

- Another part of being an active learner is having a **plan to learn**.
- To create a simple Learning Plan, use the KWL approach to capture your goals for each training module.
- **K** = what I **Know**
- **W** = what I **Want** to learn
- **L** = what I **Learned**
- By completing the KWL form, you set your goals for the module and add to your learning plan.
- A set of KWL forms for each module is included in your participant guide.
- Start filling in the KWL form at the beginning of each module starting with what you **Know** and what you **Want** to learn.
- And then complete the form at the end of the module with what you **Learned**.

The screenshot shows a OneNote page titled "Process Excellence" with a date of Thursday, October 18, 2018, at 12:29 PM. The page contains four KWL forms for different modules. Each form has three columns: "Know", "Want", and "Learn".

**1 - Intro to Site Commissioning Documentation**

Know	Want	Learn
•	•	•

**2 - Mock Project & Pre-Commissioning Process**

Know	Want	Learn
•	•	•

**3 - On Site Pre-Commissioning and Commissioning**

Know	Want	Learn
•	•	•

**4 - Post-Commissioning**

Know	Want	Learn
•	•	•



# OneNote in the Cloud

- A big advantage to using OneNote is that your training material and all your notes live in the cloud on TRC's OneDrive.
- You can access it from anywhere and any device by logging in to TRCNET.
- You can also get more training on using OneNote and other Office apps through TRC Learning Center Reference Library.

<https://trccompanies.level0help.com/library>

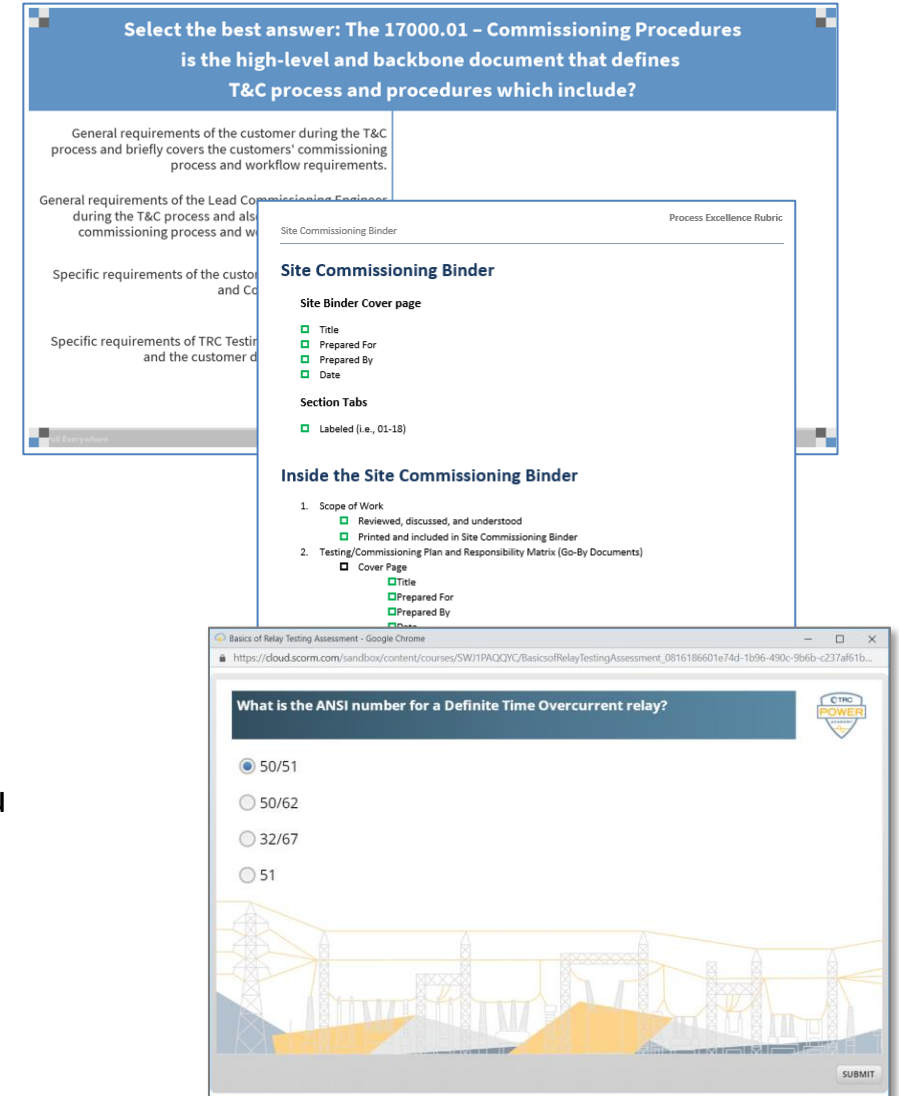
The image is a composite screenshot showing three overlapping windows. The top window is a web browser displaying the TRCNET SharePoint site. The middle window is the OneDrive web interface, showing a list of notebooks including 'John @ Work' and 'TeamsNotebook(SH)'. The bottom window is the OneNote 2016 application, displaying a slide titled 'What are Relay One Line Diagrams?'. The slide contains a bulleted list and a technical diagram of a relay one-line diagram.

**What are Relay One Line Diagrams?**

- Relay One Line diagrams provide an overview of the entire Protection and Controls system.
- Relay One Lines are extremely important documents.
- Used for system studies, planning, maintenance, operations, and estimating - in addition to Protection and Controls design.
- Relay One Lines are also called:
  - Application Diagrams
  - Relay and Metering Diagrams
  - Single Line Diagrams
  - Station One Lines

# Knowledge Checks and Assessments

- **Knowledge checks** are included in each module to help you gauge your understanding
  - Individual and group exercises and questions
    - On tablet, paper, or interactive using Surface hub
    - Friendly competition
  - Trigger discussion
  - Not scored
- **Rubrics** are included for activities
  - *Rubrics identify expectations of quality around a task and defines criteria for grading.*
- An assessment is included at the end the course
  - **Course Web-Based Trainings, Rubrics, and Assessments** confirm that you have successfully completed the goal and learning objectives of the course:
    - Launched from an email link
    - Questions are knowledge- and skills-based
    - Scored questions – 80% score or better to pass
    - For performance-based assessments, you'll be observed and graded by the instructor.



# Module One

## Intro to Site Commissioning Documentation

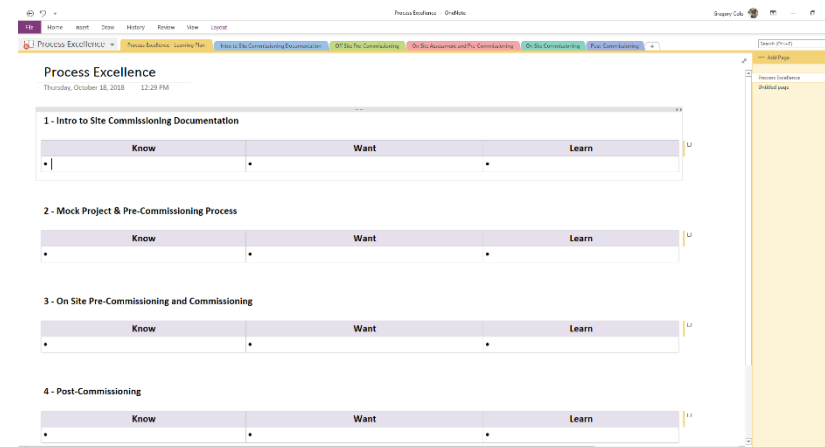


# Module One - Intro to Site Commissioning Documentation

## Learning Objectives

At the end of this module participants will be able to:

- ❑ Describe the Site Commissioning documentation and online locations
- ❑ Describe the Commissioning Services Workflow Process
  - Off Site Pre-Commissioning
    - On Site Pre-Commissioning and Commissioning
    - Site Assessment and Pre-Commissioning
  - Commissioning
  - Post-Commissioning



# ProjectWise Cheat Sheet



# Process Excellence (17k) 17000 Webinars

How many participants completed the four Process Excellence webinars?

This next section of the course specifically covers:

- **ProjectWise Overview by Jason Poissonnier**
- **Part 1 – ProjectWise Cheatsheet and Folder Structure**
- **Part 2 – ProjectWise Commissioning Manual Folder / 17000 Documents**
- **Part 3 – Testing and Commissioning Quality Control Audits Program**

**Part 1 – ProjectWise Cheatsheet and Folder Structure**

Process Excellence 17000 (17k) Webinar

**Modules**

- **Part 1 – ProjectWise Cheatsheet and Folder Structure**
  - **Approximately 30 minutes to complete**
- Part 2 – ProjectWise Commissioning Manual Folder / 17000 Documents
- Part 3 – Testing and Commissioning Quality Control Auditing Program

**Knowledge Check**

- Set of questions based on the webinar content
- Read each question and review all possible answers before answering the question.
- Take your time and don't rush.

**Resources**

- FAQ
- ProjectWise






# ProjectWise Cheat Sheet

- Is our **one stop shop document** for key documents we use that are located within ProjectWise's organization structure. Such as:
  - Engineering
  - Safety
  - Project Management
  - Quality
  - T&C
- It includes hyperlinks and brief statements about the respective folders and documents.
- It will be referred to throughout this video and will be a useful tool during your future projects.

**TESTING AND COMMISSIONING SERVICES**  
**PROJECTWISE CHEAT SHEET**



17000.08 - Requirements for file storage and organization in project specific ProjectWise folders. All projects need to be organized this way.

17000.10 - TRC procedure for microprocessor relay connection, settings implementation, and testing.

17000.11 - Safety documents - Daily  
17000.01. See 17000.07 "Site Commissioning" regarding these sheets. Also include information on safe catch program)

17000.12 - Daily Commissioning Report  
See 17000.07 "Site Commissioning" sheets.

17000.13 - Weekly Commissioning Report  
See 17000.07 "Site Commissioning" sheets.

17000.14 - Incident report procedure.

17000.15 - Procedure for field change orders

[Contact List](#) – Contains contact list for project specific contact lists which are required for projects.


[Go-By Documents](#) – Technical go-bys for projects are compiled from past projects, etc. They can be used as technical references, and they meet the latest T&C standards.

Subfolders include:

- Blank Template for All Documents**
- Commissioning Report** – Example of how to arrange report, take a look at 17000.07
- Health & Safety Plan** – Example HASP
- O&E Plan** – Example O&E Plans, a field plan is for identifying steps to take, and include a place to capture energization
- Resource Matrix** – Example matrix, necessary to do so.
- Safety Tailboard** – Link to the TRC safety tailboard
- Sequence Plan** – Example sequence plan, be sequenced and detailed beyond the simple, intricate outage or installation planning
- Site Binders** – Requirements for site commissioning binder templates for binder cover and divider sheets and must be maintained onsite at all times

Cheat Sheet Page 1 of 3

**TESTING AND COMMISSIONING SERVICES**  
**PROJECTWISE CHEAT SHEET**



Below are ProjectWise links and descriptions for the TRC Field Services ProjectWise folders.

**THESE FOLDERS ARE UPDATED OFTEN SO DO NOT COPY OUT THE DOCUMENTS AND KEEP THEM LOCAL. THESE FOLDERS SHOULD BE MONITORED BY THE EMPLOYEE TO ENSURE THE LATEST INFORMATION IS USED FOR PROJECTS.**

[Testing & Commissioning](#) – Our folder for one stop shopping. Compiled for easy efficient access and reference for T&C employees.

Within this folder is:

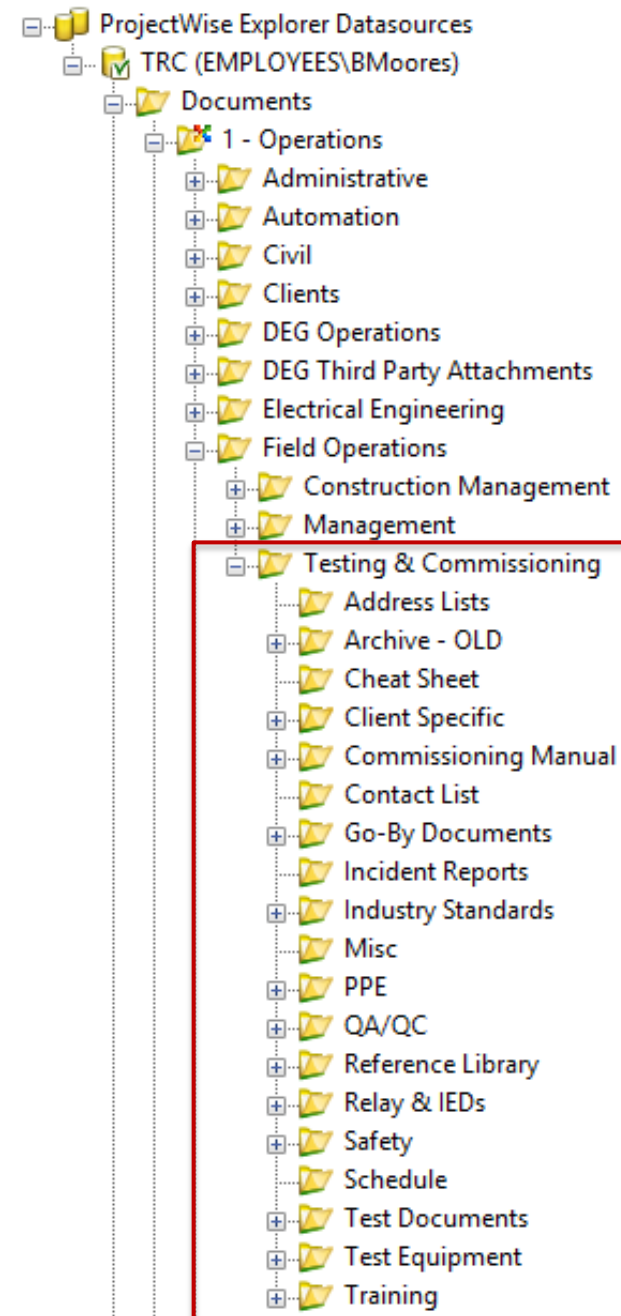
- [Address Lists](#) – CMP, PSNH, PSE&G address lists. If you have more, let us know, we'll add them
- [Archive - OLD](#) – Old data, just for record. Most likely you will not need anything in here.
- [Cheat Sheet](#) – This document.
- [Client Specific](#) – Standards, docs, etc, that are for specific clients. Many clients have their own procedures, processes, and required documentation with regard to testing/commissioning.
- [Commissioning Manual](#) – This is the TRC commissioning procedures manual and all associated appendices. Note that there is a new version of many of the documents, so please be sure to use the latest information. The folder contains "sets" (which are like links) to the actual documents, which reside in other sections of PW. The sets are compiled here for easy access for all and to avoid having documents in multiple locations. Includes:
  - 17000.01 - Main commissioning procedures document with general requirements, commissioning workflow requirements, documentation requirements, and overall roles and responsibilities.
  - 17000.02 - QA/QC process and forms, as identified in 17000.01. These are the risk forms required for use by T&C employees for all projects. These include the TRC T&C work flow diagram, risk assessment forms, daily work plans, isolation forms, and the audit checklist. More information can be found with regard to the specific forms in 17000.07.
  - 17000.03 - Testing and Commissioning Guidelines – TRC specific guidelines for equipment testing and commissioning
  - 17000.04 - Equipment Data Sheets – forms required to capture nameplate information and various test results, as identified in 17000.01. See 17000.07 "Site Commissioning Binders" for additional information regarding these sheets.
  - 17000.05 - Test Certification Sheets – checklists required to certify testing and commissioning activities, as identified in 17000.01. See 17000.07 "Site Commissioning Binders" for additional information regarding these sheets.
  - 17000.06 - Pre-Energization Walkdown Documents – to be used prior to energization of equipment, as identified in 17000.01. See 17000.07 "Site Commissioning Binders" for additional information regarding these sheets.
  - 17000.07 - Requirements for site commissioning and equipment binders. Site binders are required for ALL projects and must be maintained onsite at all times.

Cheat Sheet Page 1 of 3 October 2018



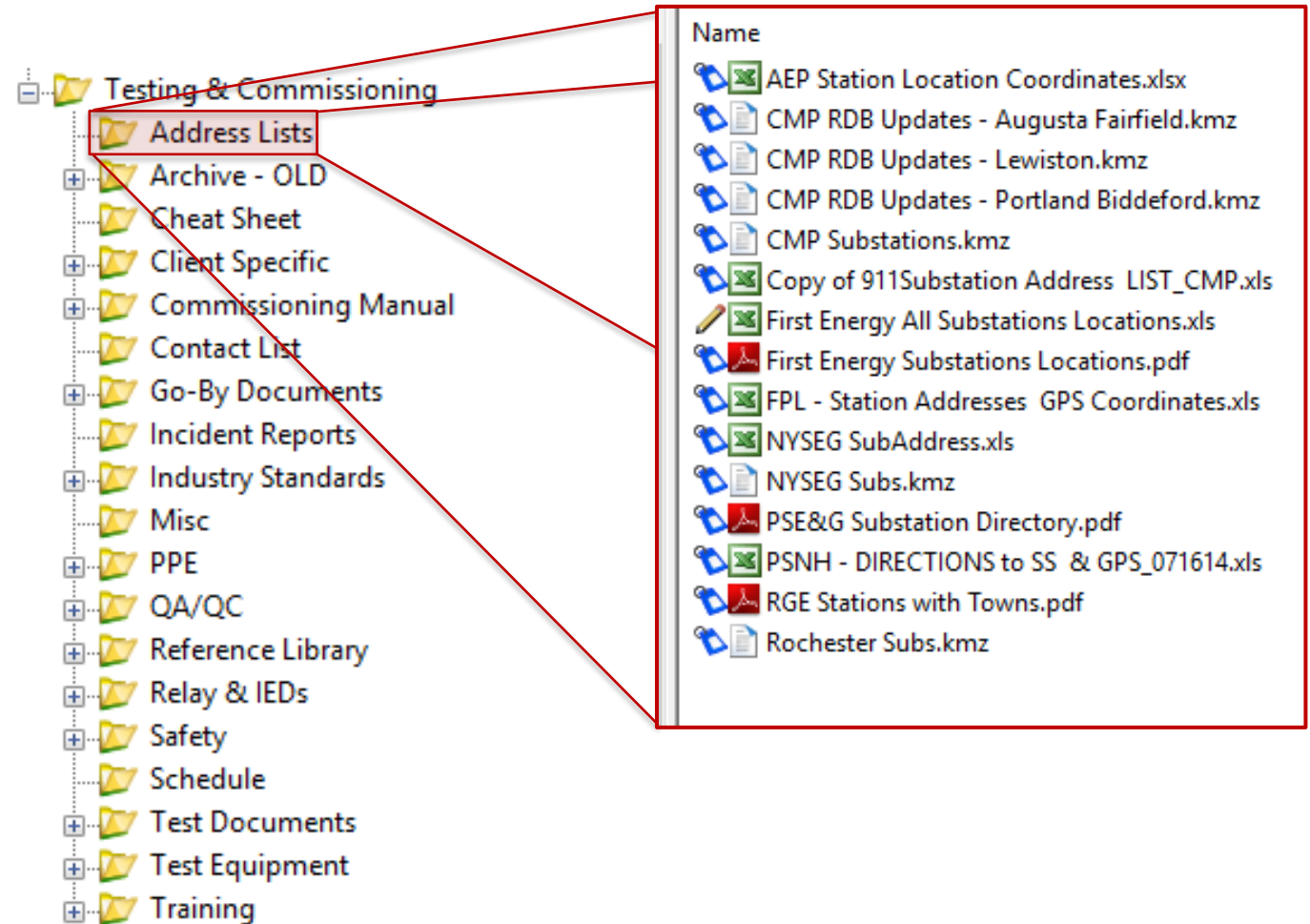
# Testing & Commissioning Folder

- Is our **one stop shop folder** that leads to all of the files you will need to complete your Testing and Commissioning processes and procedures.
- Site Commissioning Documentation
  - Go-By Documents
  - 17000 Documents
  - **Participants are expected to read these documents as they will be assessed on purpose and contents therein.**



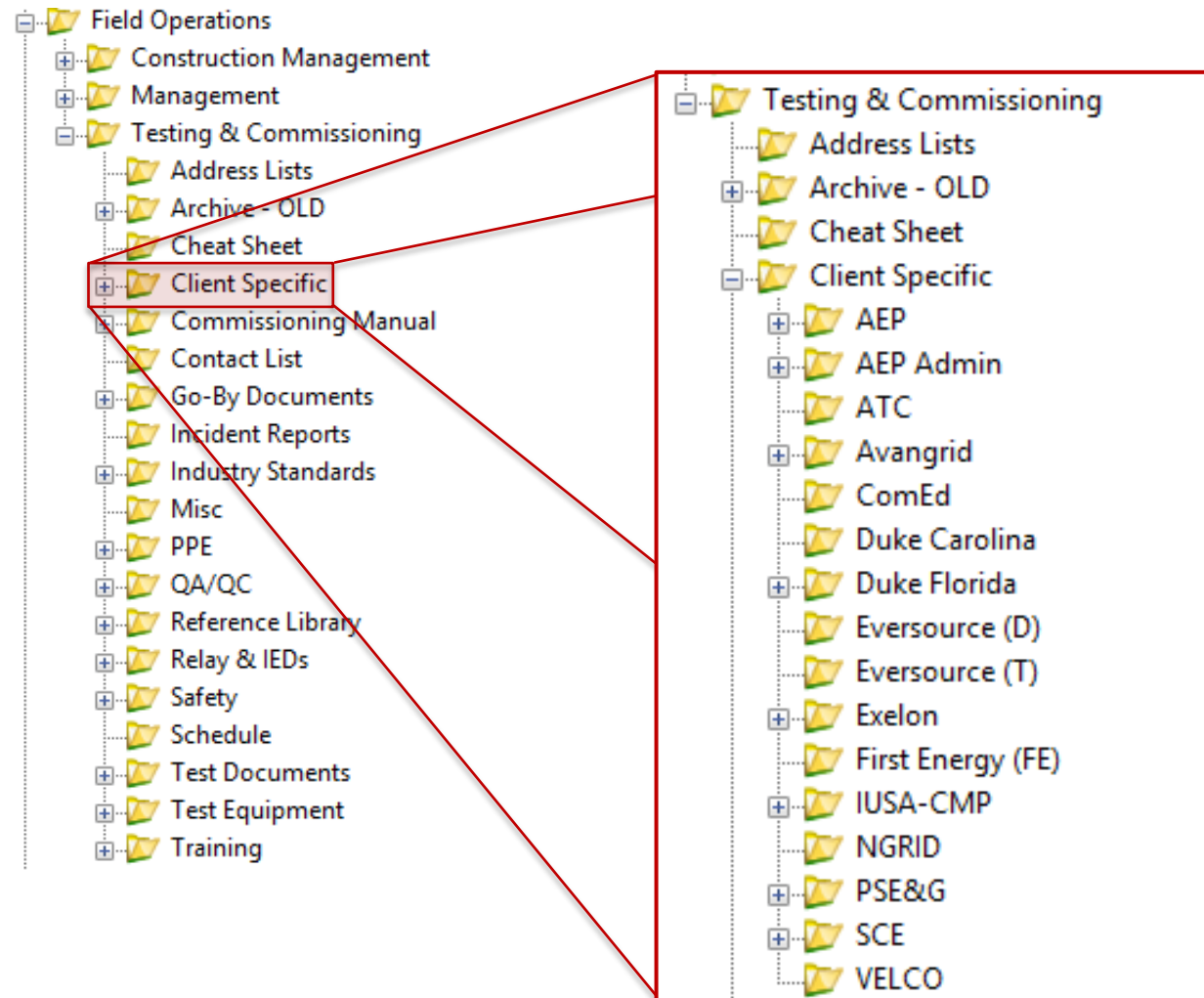
# Address List Folder

- Utility addresses (e.g., CMP, PSNH, PSE&G). If you have more or updated addresses, let us know and we will add them.



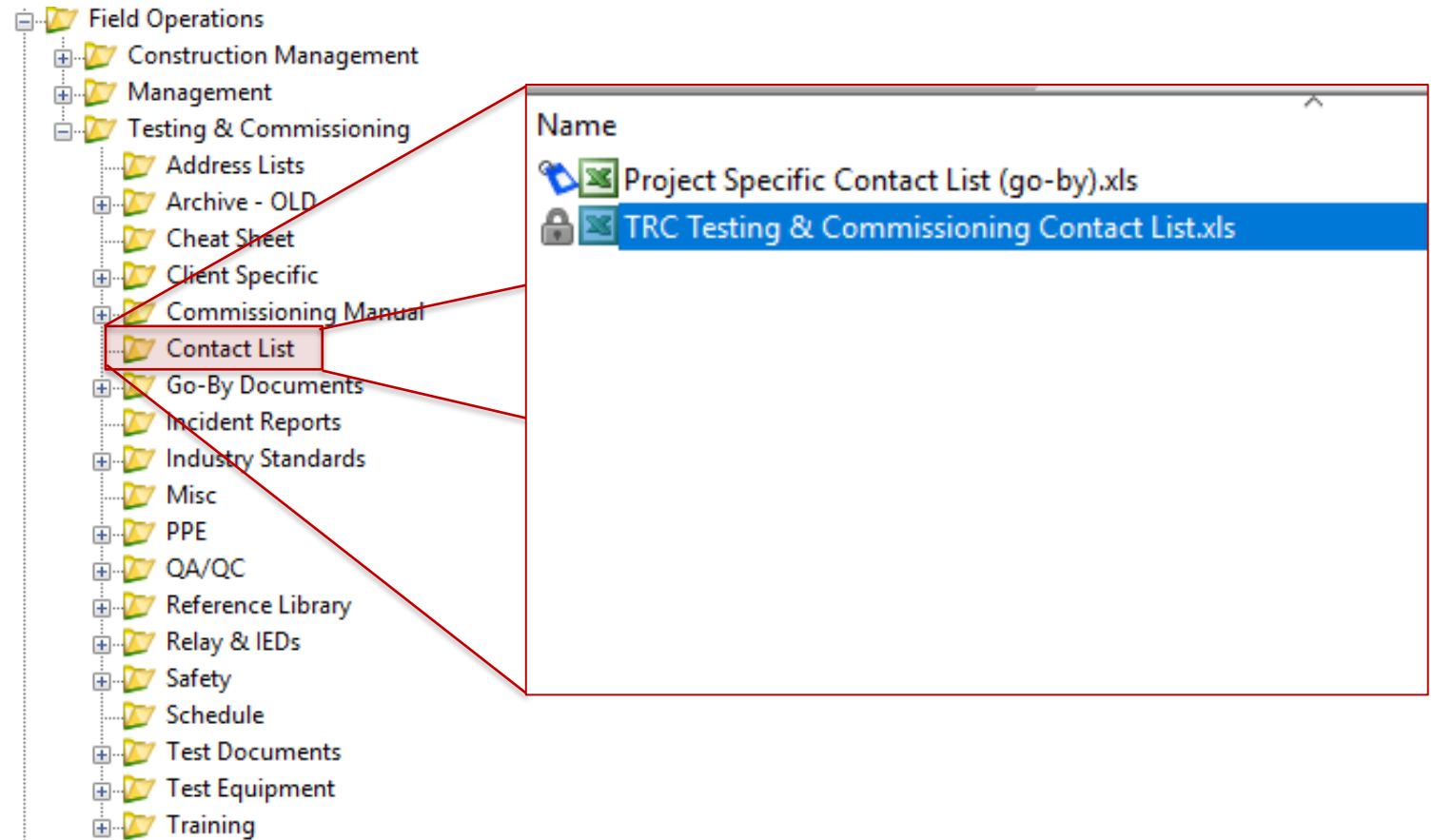
# Client Specific Folder

- Standards and documents that are for specific clients.
- Many clients have their own procedures, processes, and required documentation with regard to testing/commissioning.



# Contact List Folder

- Contains contact list for Testing & Commissioning employees.
- Also contains a Go-By for project specific contact lists which are required for site binders.



# Go-By Documents Folder

- Includes project examples as references to ensure we remain consistent throughout T&C documentation process.
- Use the go-by documents as examples and format them to the latest Testing and Commissioning standards.

**Field Operations**

- Construction Management
- Management
- Testing & Commissioning
  - Address Lists
  - Archive - OLD
  - Cheat Sheet
  - Client Specific
  - Commissioning Manual
  - Contact List
  - Go-By Documents**
  - Incident Reports
  - Industry Standards
  - Misc
  - PPE
  - QA/QC
  - Reference Library
  - Relay & IEDs
  - Safety
  - Schedule
  - Test Documents
  - Test Equipment
  - Training

**Go-By Documents**

- Blank Template for All Documents
- Commissioning Report
- Example PW Project Folder Structure
- Health & Safety Plan
- O&E Plan
- Resource Matrix
- Safety Tailboard
- Sequence Plan
- Site Binders
- Testing and Commissioning Plan (Must Include Matrix)

**TRC LAKEWOOD S/S TESTING & COMMISSIONING PLAN & RESPONSIBILITY MATRIX**

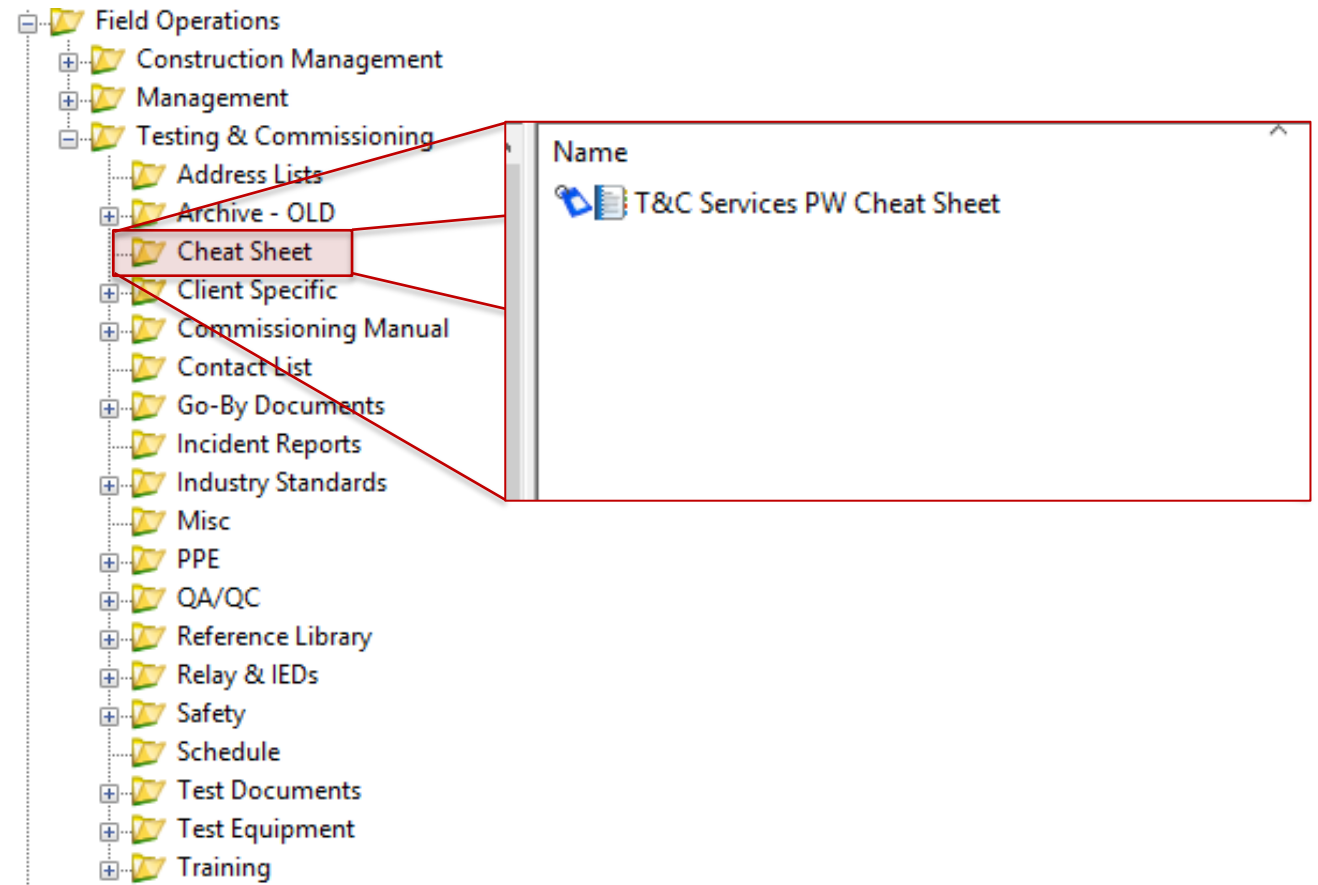
Equipment List	HV Testing	IUSA Test Certification Sheets	Point-to-point Wiring Verification	Functional Circuit Checks	Relay Testing	Relay Test Plans	Automation Supervision
<b>115KV Section 264</b>							
264-2 M.O. Line Switch	TRC	1000-E1-S02_SW_1	TRC	TRC	---	---	TRC
264-2G Ground Switch	TRC	1000-E1-S02_SW_1	TRC	TRC	---	---	TRC
Line CCVTs (3)	TRC	1000-E1-S02_IT_1	TRC	TRC	---	---	TRC
96KV Surge Arrestors (3)	TRC	1000-E1-S02_OA_2	N/A	N/A	---	---	TRC
11KA-K264/T1 SEL 451	---	1000-E1-S04_SP_2	TRC	TRC	TRC	TRC	TRC
11KA-K264/T2 SEL 451	---	1000-E1-S04_SP_2	TRC	TRC	TRC	TRC	TRC
211A-S264 SEL 421	---	1000-E1-S04_SP_2	TRC	TRC	TRC	TRC	TRC
211B-S264 GE D60	---	1000-E1-S04_SP_2	TRC	TRC	TRC	TRC	TRC
Control Cabinet A6,A7,B16	---	1000-E1-S04_SP_1	TRC	TRC	---	---	TRC
<b>115KV Section 241</b>							
241-5 M.O. Line Switch	TRC	1000-E1-S02_SW_1	TRC	TRC	---	---	TRC
241-5G Ground Switch	TRC	1000-E1-S02_SW_1	TRC	TRC	---	---	TRC
Line CCVTs (3)	TRC	1000-E1-S02_IT_1	TRC	TRC	---	---	TRC
96KV Surge Arrestors (3)	TRC	1000-E1-S02_OA_2	N/A	N/A	---	---	TRC
11KA-K241/T1 SEL 451	---	1000-E1-S04_SP_2	TRC	TRC	TRC	TRC	TRC
11KA-K241/T2 SEL 451	---	1000-E1-S04_SP_2	TRC	TRC	TRC	TRC	TRC
211A-S241 SEL 421	---	1000-E1-S04_SP_2	TRC	TRC	TRC	TRC	TRC
211B-S241 GE D60	---	1000-E1-S04_SP_2	TRC	TRC	TRC	TRC	TRC
Control Cabinet A6,A7,B16	---	1000-E1-S04_SP_1	TRC	TRC	---	---	TRC
<b>115KV Bus #1</b>							
Bus CCVT (3)	TRC	1000-E1-S02_IT_1	TRC	TRC	---	---	TRC
VT1 M.O. Disc. Switch	TRC	1000-E1-S02_SW_1	TRC	TRC	---	---	TRC
Buswork	TRC	1000-E1-S02_OA_3	N/A	N/A	---	---	TRC
MS1 M.O. Disc. Switch	TRC	1000-E1-S02_SW_1	TRC	TRC	---	---	TRC

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IFU (2015-06-05)

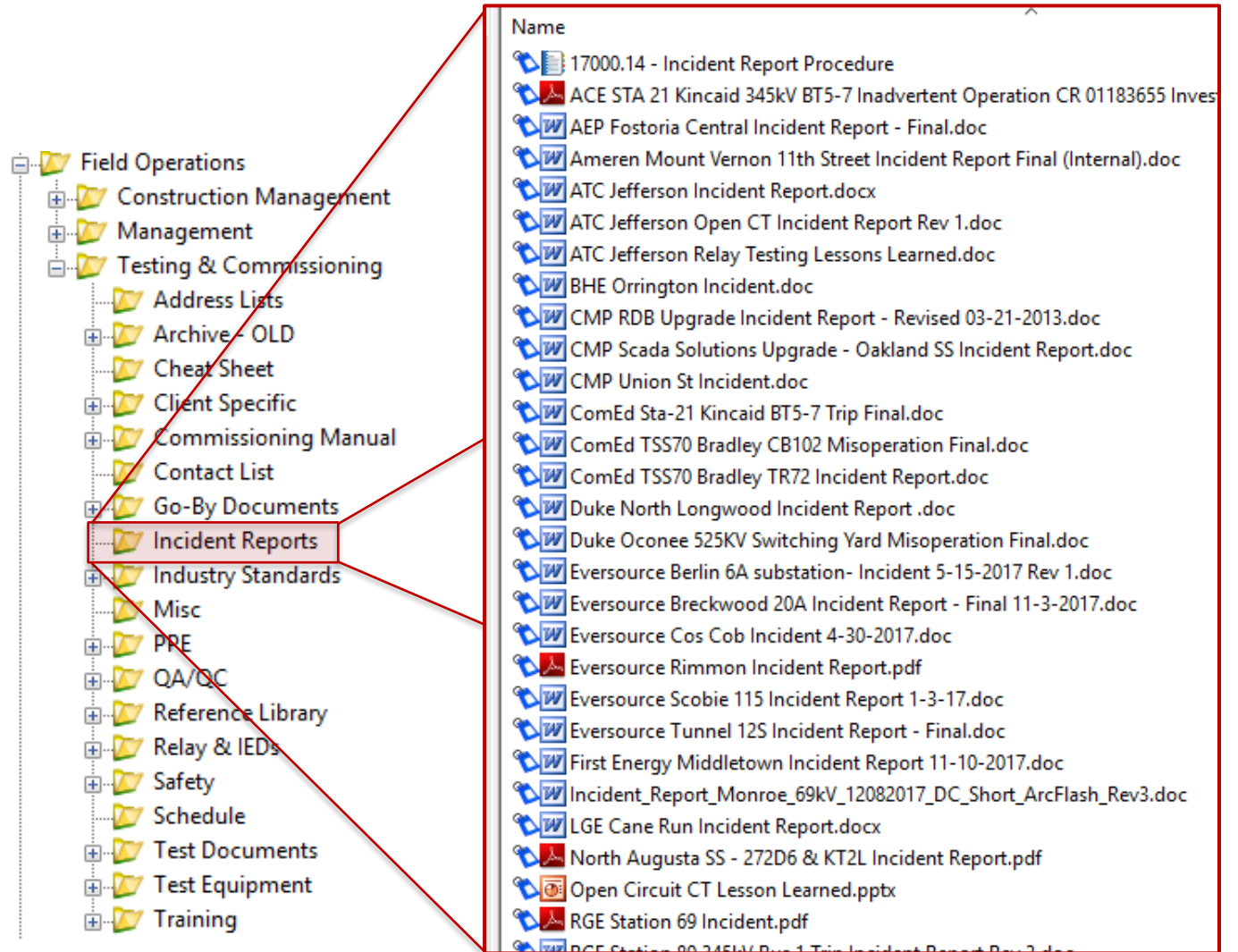
# ProjectWise Cheat Sheet Folder

- This is the location where you can export the cheat sheet incase you need another one.



# Incident Report Folder

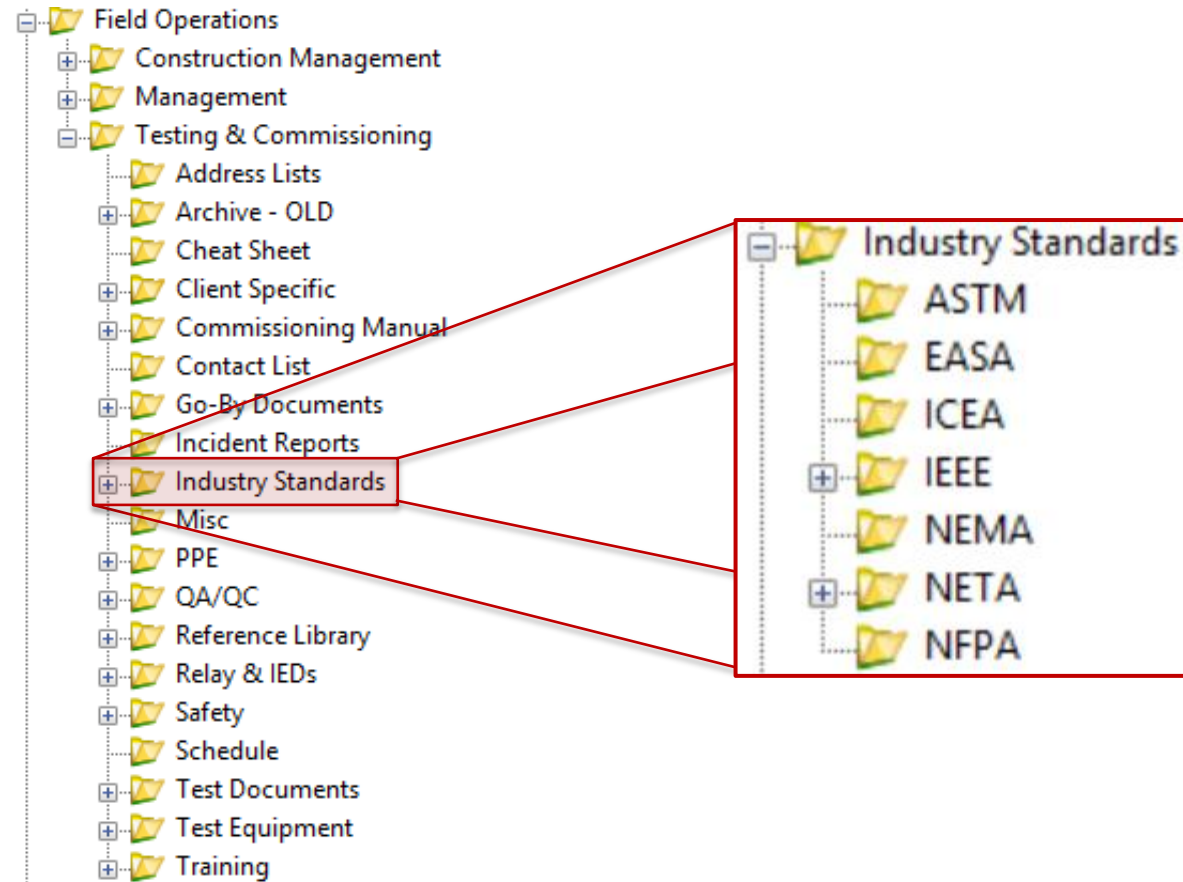
- The purpose of the incident report is to document the exact details of the occurrence while they are fresh in the minds of those who witnessed the event.
- This information may be useful in the future when dealing with liability issues stemming from the incident.
- Includes good lessons learned information.





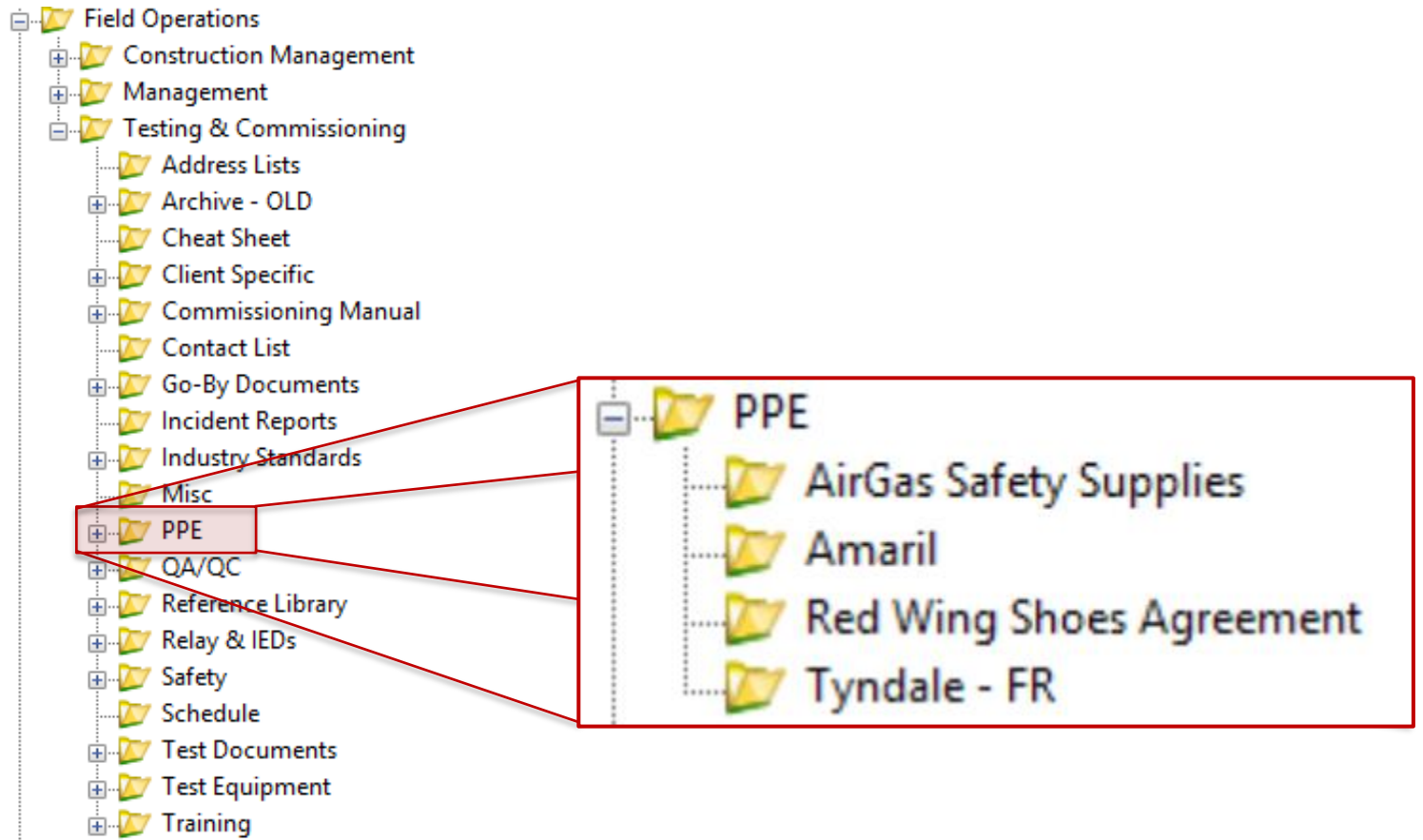
# Industry Standards Folder

- A set of criteria within an industry relating to the standard functioning and carrying out of operations.
- In other words it is the generally accepted requirements followed by the members of an industry.
- Includes latest industry standards for reference.



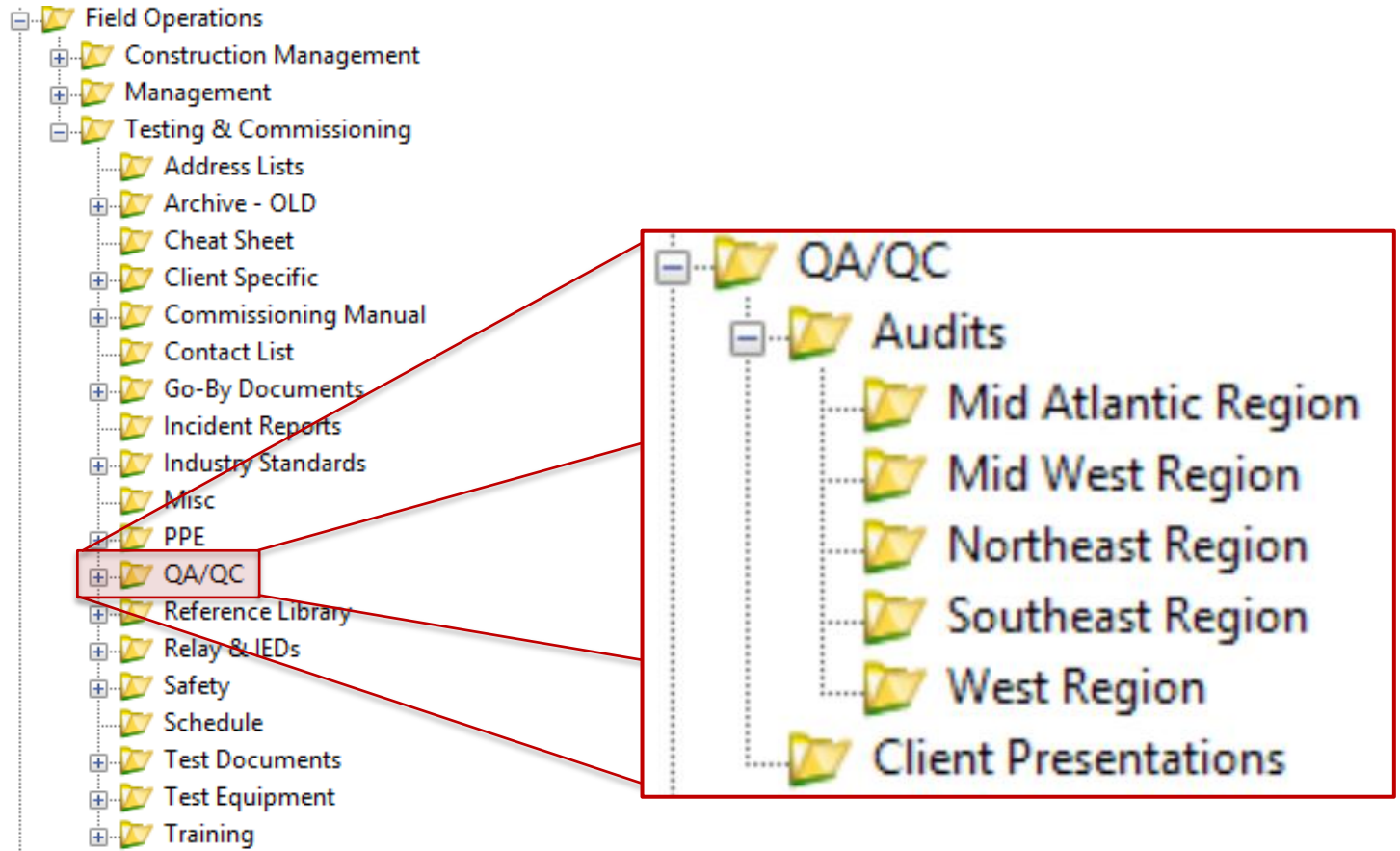
# Personal Protective Equipment (PPE) Folder

- Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests and full body suits.
- Ordering information and catalog for Flame Resistant clothing, Red Wing Boots, and other PPE and safety supplies.



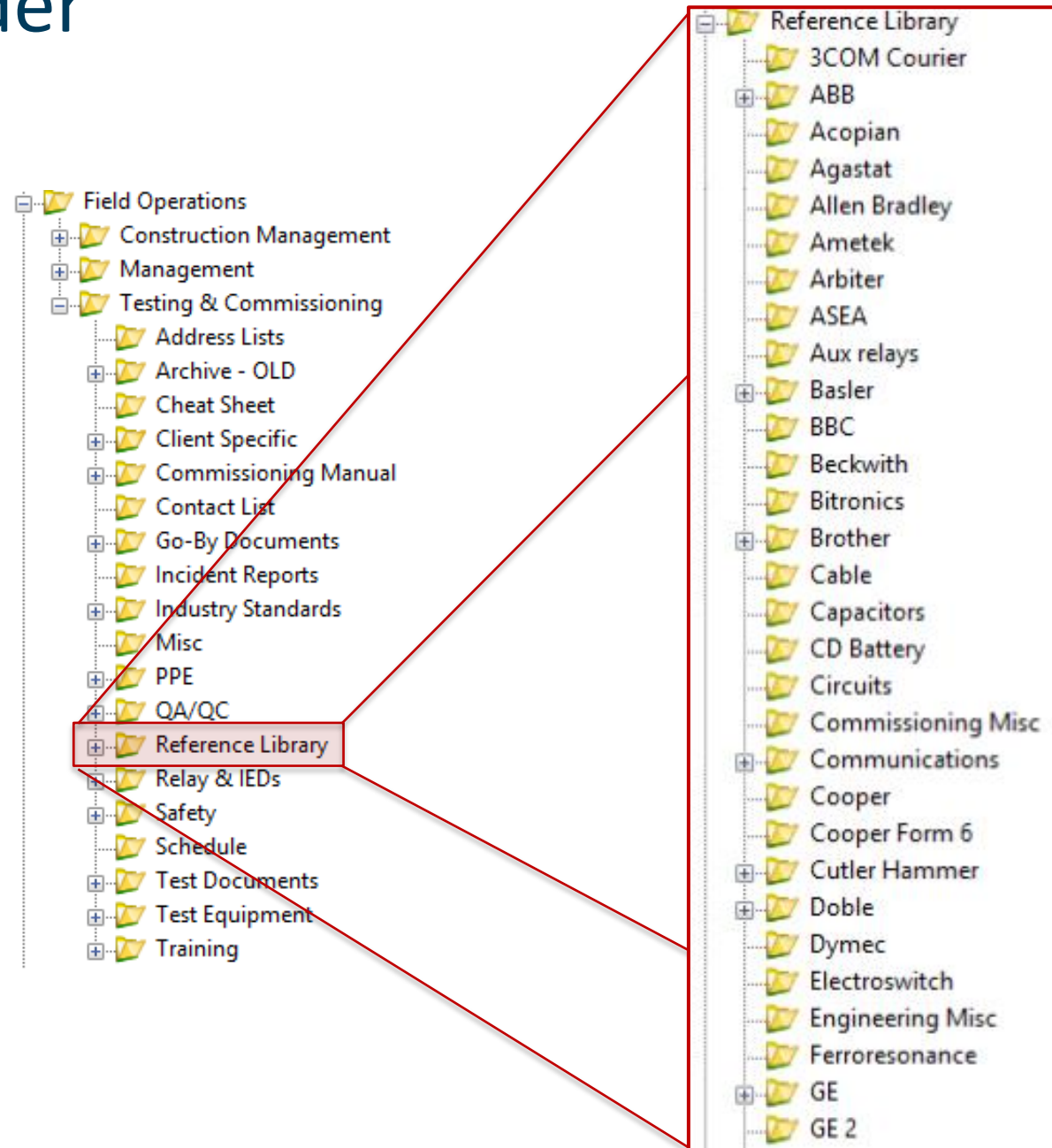
# QA/QC Folder

- Audits organized by regions.
- Client presentations on audit findings.



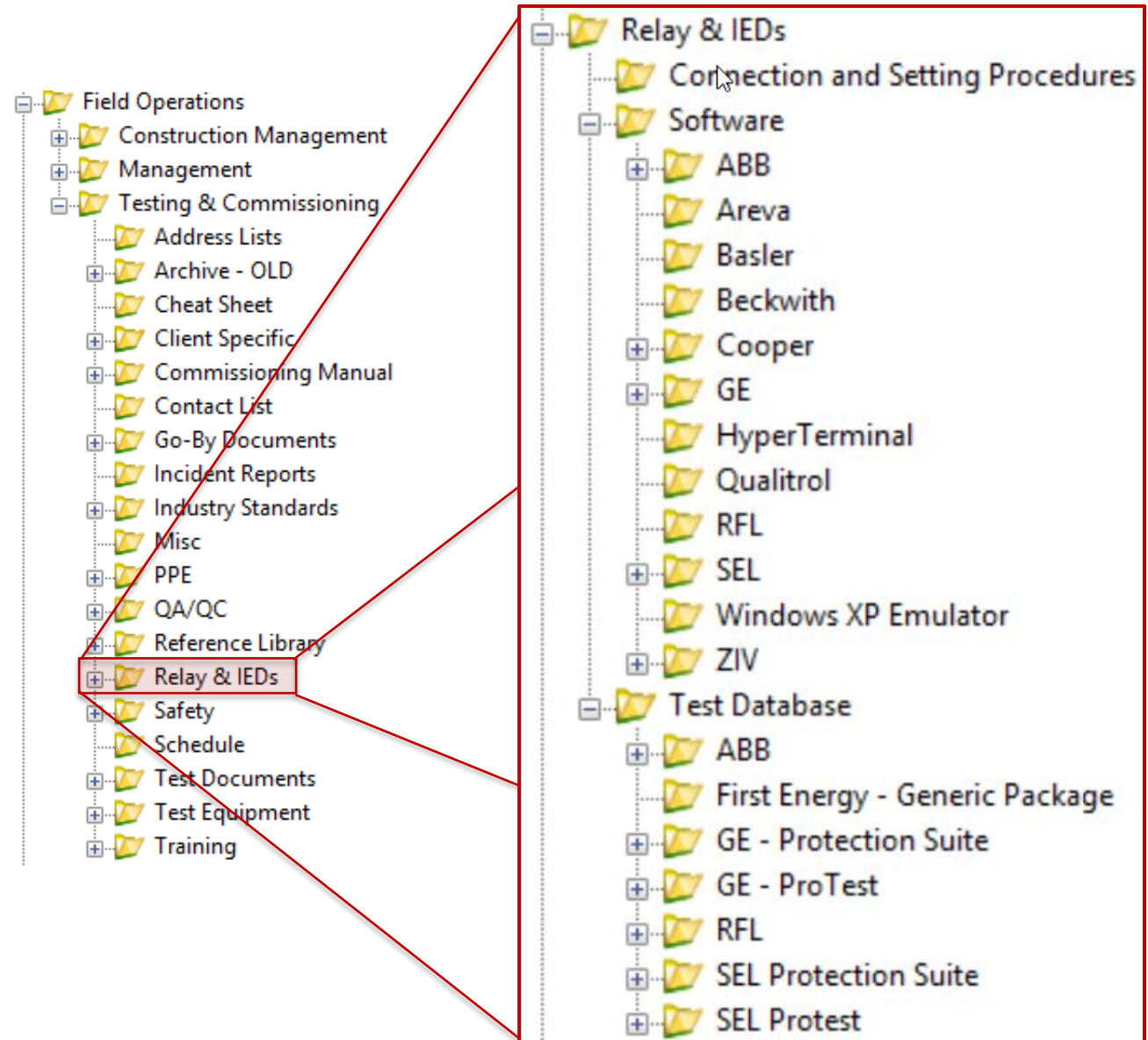
# Reference Library Folder

- Library of reference information such as relay and equipment IDs, catalogs.
- Note that most of these items may not be up to date.
- Please feel free to contribute to this library.



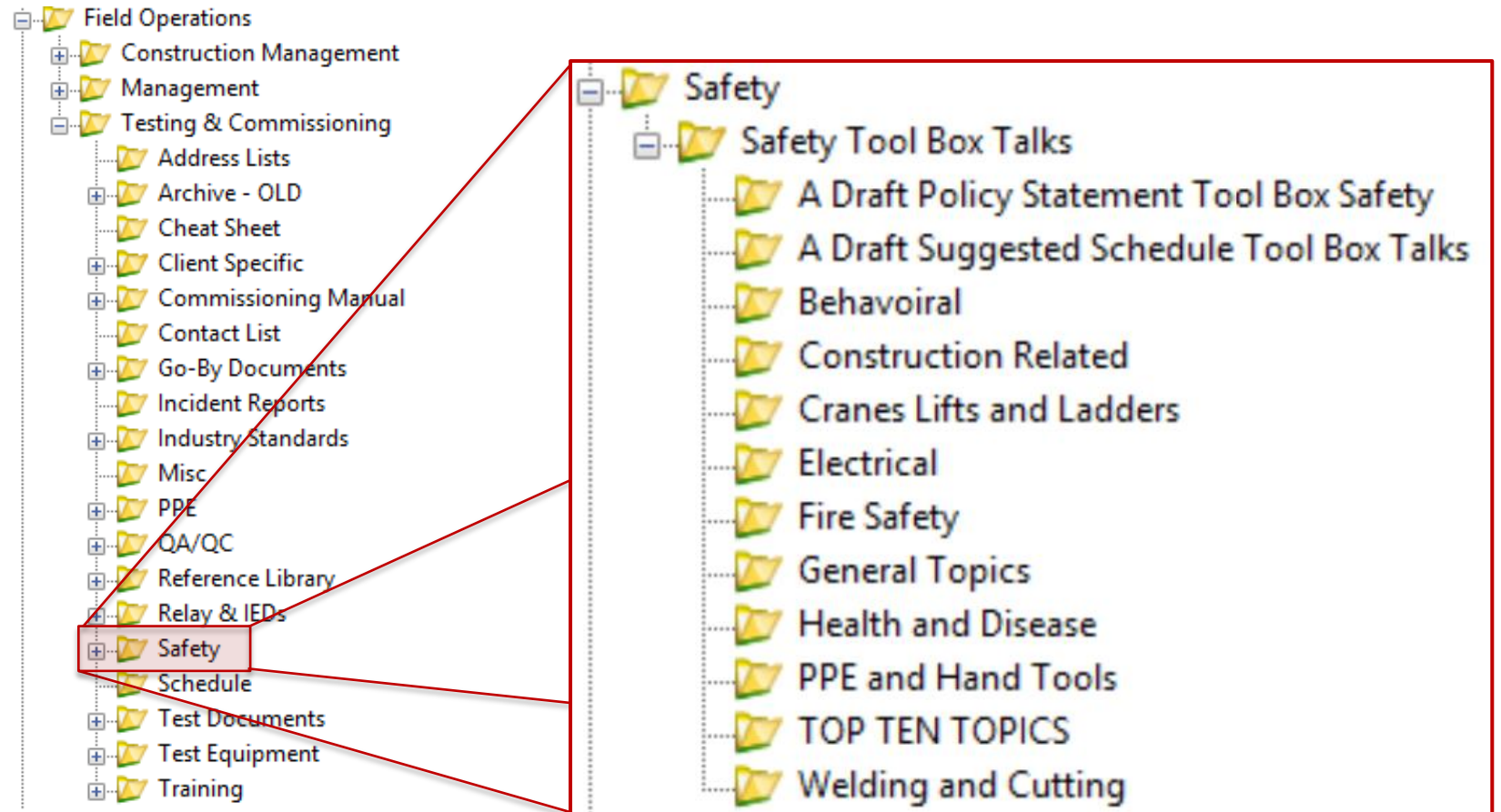
# Relays & IEDs Folder

- Information and procedures regarding connections, software, and testing of relays. Refer to 17000.10 for additional information on microprocessor relay connections
- Subfolders include:
  - Connection and Setting Procedures: Links to connection procedures for many different specific relays as identified in 17000.10.
  - Software: Relay/vendor specific software. Note that there may be newer versions of software.
  - Test Database: Relay specific database of past test plans for reference. Please feel free to add to this.



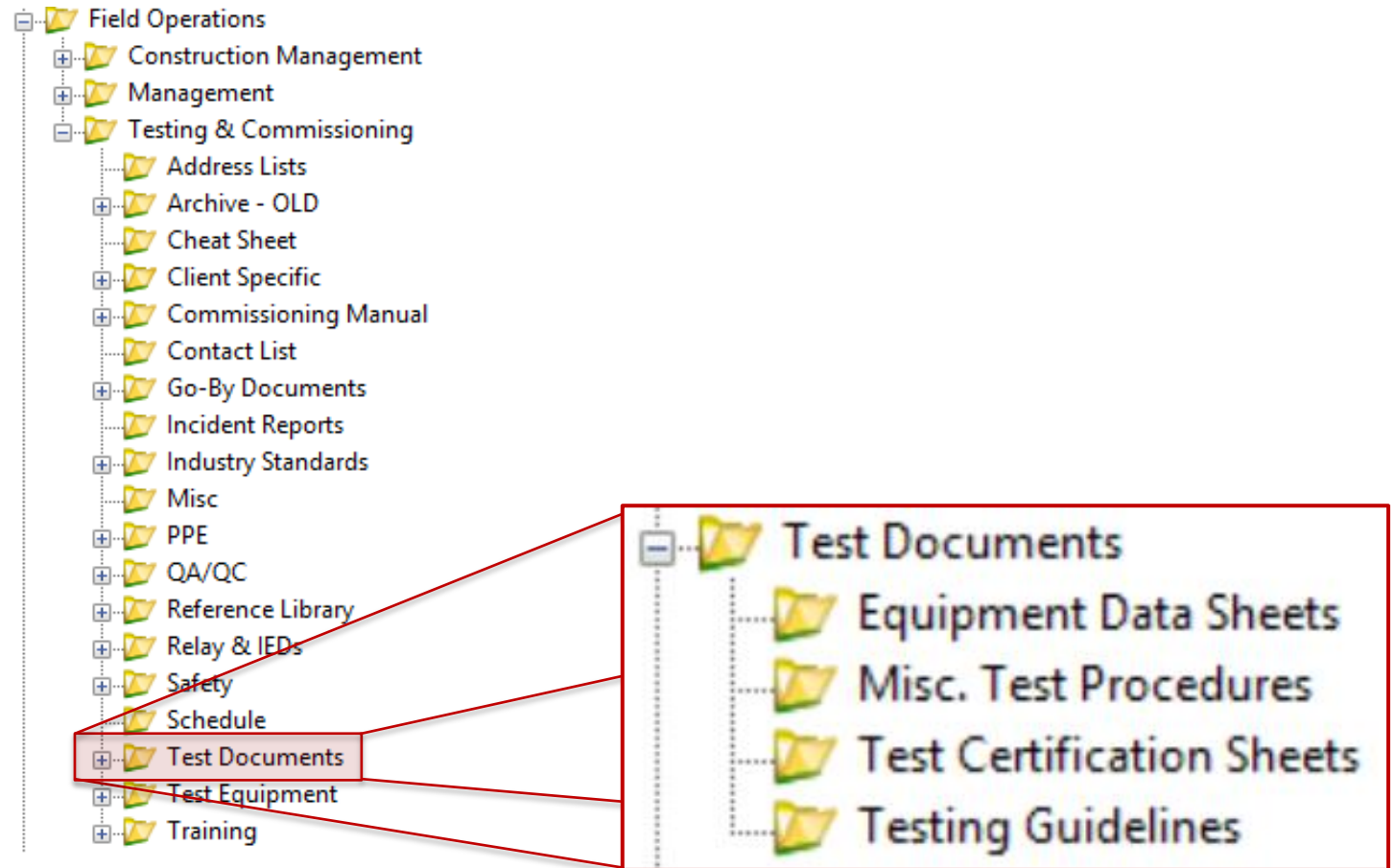
# Safety Folder

- Library of reference information such as PPE, hand tools, and construction related content.
- Note that most of these items may not be up to date.
- Please feel free to contribute to this library.



# Test Documents Folder

- Links to items found in 17000.03, 17000.04 and 17000.05.
- They are included here for quick reference.
- Also includes some miscellaneous test procedures.



# Test Equipment Folder

- Includes the TRC equipment tracking spreadsheet.
- This is a log to be used by the employees to sign-out and sign-in equipment as it is taken from inventory.
- Also includes a list of the employee assigned equipment and calibration dates.
- List of TRC owned Test Equipment:
  - Calc Sheets
  - Manuals
  - Software

The screenshot shows a file explorer interface with the following structure:

- Field Operations
  - Construction Management
  - Management
  - Testing & Commissioning
    - Address Lists
    - Archive - OLD
    - Cheat Sheet
    - Client Specific
    - Commissioning Manual
    - Contact List
    - Go-By Documents
    - Incident Reports
    - Industry Standards
    - Misc
    - PPE
    - QA/QC
    - Reference Library
    - Relay & IEDs
    - Safety
    - Schedule
    - Test Documents
    - Test Equipment** (highlighted)
    - Training

The expanded 'Test Equipment' folder contains the following items:

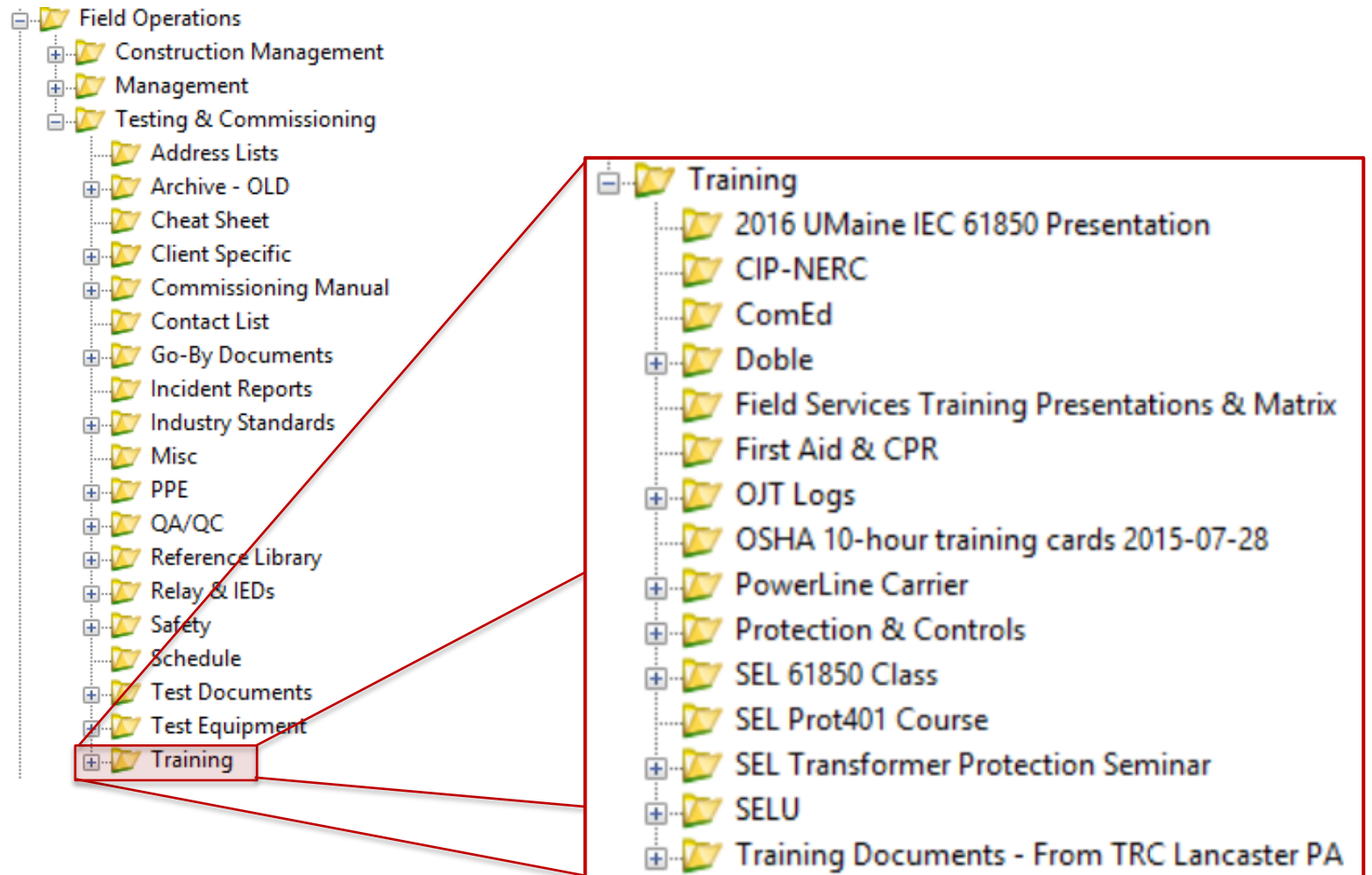
- \_Rental & Support Company Contact Info
- 1 Phase Transformer TTR
- 3 Phase Transformer TTR
- 10 Amp Ductor
- 200 amp Ductor
- AC-DC Power Supply
- AC Voltmeter
- Analog Multimeter
- Battery Capacity Tester
- Bluetooth Serial Adapter
- Breaker Motion Analyzer
- Breaker Simulator
- Buzzers
- Calibrator
- Cameras
- Carrier Equipment
- Carrier Equipment Bags
- Clamp-On Meter
- Communication Test Set
- CT Test Set
- DC High Pot, 15kV
- DC High Pot, 75kV
- DC Power Supply
- Digital Hydrometer
- Digital Multimeters
- Dry Well RTD Calibrator
- Frequency Selective Voltmeter
- Function Generator
- Fused Jumpers
- Gas Dew Point Meter
- Ground Tester
- Impedance Magnitude Meter
- Infrared Thermometer
- Isolation Kits
- LCR Meter

Equipment ID	TRC Asset Tag	Serial Number	Item Description	Manufacturer	Model #	Owner
1029	18392	8660378	Function Generator	Goodwill	GFG-8020G	Lancaster O
1030	18393	2214A30777	AC Voltmeter	Hewlett Packard	400EL	Lancaster O
1031	18394	1208A27665	AC Voltmeter	Hewlett Packard	400EL	Lancaster O
1032	NONE	1230A10236	Test Oscillator	Hewlett Packard	6518	Lancaster O
1033	18362	616	75kV DC High Pot	High Voltage	PTS-75	Lancaster O
1034	11222	CD755G	Relay Test Set	Omicron	CMC 256-6	Newell, Ry
1035	18351	DF400E	Primary Tester	Omicron	CPC300	Lancaster O
1036	18352	GC806K	Primary Tester	Omicron	CPC300	Jordan, Bran
1037	18377	1910	Power Communications Analyzer	PowerComm	PCA 4125	Alvarez, Jo
1038	18395	22010	Power Line Carrier Line Sim.	PowerComm	630	Lancaster O
1039	18396	693	Power Line Carrier Line Sim.	PowerComm	630	Lancaster O
1040	NA	Set 1	PLC Adapter/Connector Set	PowerComm	470	Lancaster O
1041	NA	Set 2	PLC Adapter/Connector Set	PowerComm	470	Lancaster O
1042	18397	12099	Variable Autotransformer	Powerstat	12M215C	Augusta ME, Equip
1043	18398	189670	Pressure Tester	Qualtrol	0-5 PSI	Lancaster O
1044	18348	424	Selective Level Voltmeter	Rycom	6041	Lancaster O
1045	18369	0719047	Digital Hydrometer	SBS	2002	Lancaster O



# Training Folder

- Includes information from past training seminars, in-house TRC protection and control training modules, and additional training documents from our Lancaster office.
- There are also several training modules within the TRC Training Academy.
- This folder will be for items that are not in Power Academy.
- In the future, the folder will be updated/revised.



## What document includes links and descriptions to key TRC Field Services folders and documents?

TRC Testing and Commissioning Contact List

Testing and Commissioning Plan & Responsibility Matrix

T&C Services ProjectWise Cheat Sheet

Index – TRC, IEEE, ICEA, NEMA, NFPA Standards Document

# What ProjectWise folder leads to the TRC equipment tracking spreadsheet, which is used by employees to sign-out and sign-in equipment as it is taken from inventory.

Relays & IEDs Folder

Industry Standards  
Folder

Test Equipment Folder

Go-By Documents Folder

Contact List Folder

# What ProjectWise folder leads to ALL of the files you will need to complete your T&C processes and procedures?

Client Specific Folder

Go-By Documents  
Folder

Safety Folder

Field Services Folder

Training Folder

## The ProjectWise Safety folder is the location for Safety Tool Box Talks for all of the following EXCEPT?

Cranes Lifts and  
Ladders

Historical  
Incident Reports

Fire Safety

PPE and Hand  
Tools

# Field Services

Commissioning Manual Folder



# Process Excellence (17k) 17000 Webinars

This next section of the course specifically covers:

- ProjectWise Overview by Jason Poissonnier
- Part 1 – ProjectWise Cheatsheet and Folder Structure
- **Part 2 – ProjectWise Commissioning Manual Folder / 17000 Documents**
- Part 3 – Testing and Commissioning Quality Control Audits Program


Menu

- PE Webinar II
  - PE 17k Webinar Part II**
    - Webinar Overview
    - Introduction
    - Index & ProjectWise
    - Commissioning Procedures
    - QA/QC Forms & Workflow
    - Site Risk Assessment & Workflow
    - Daily Commissioning Work Plan
    - Isolation Verification
    - T&C Guidelines
    - Equipment Data Sheets
    - Test Certification Sheets
    - Pre-Energization Walkdown
    - Site Commissioning Binders
    - ProjectWise Filing Structure
    - Microprocessor Relays
    - Daily Pre-Job Safety Briefing
    - Safe Catch Report
    - Daily & Weekly Comm. Reports
    - Incident Reports
    - Summary and Quiz




# 17000 – Index of Documents


- The T&C index is a reference that identifies all of the documents used in the testing and commissioning procedures.
- The index defines the documents by:
  - TRC Document #
  - Document Name

		Energy Testing and Commissioning Services	17000.01 Page 28 of 29
		Commissioning Procedures	Revision 01 – May 2017 Internal Use Only

		Energy Testing and Commissioning Services	17000.01 Page 27 of 29
		Commissioning Procedures	Revision 01 – May 2017 Internal Use Only

		Energy Testing and Commissioning Services	17000.01 Page 26 of 29
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17000.06E	WD-04 Motor	17000.04DD	DS-30 Automatic Transfe
17000.06F	WD-05 Circu	17000.04EE	DS-31 Communication D
17000.06G	WD-06 Coup	17000.04FF	DS-32 Switchgear
17000.06H	WD-07 Volta	17000.05	Test Certification Sheets
17000.06I	WD-08 Curre	17000.05A	TC-01 Power Transforme
17000.06J	WD-09 Capa	17000.05B	TC-02 Gas Circuit Breake
17000.06K	WD-10 Surg	17000.05C	TC-03 Oil Circuit Breaker
17000.06L	WD-11 Busw	17000.05D	TC-04 Vacuum Circuit Br
17000.06M	WD-12 Line	17000.05E	TC-05 Air Circuit Breaker
17000.06N	WD-13 Wave	17000.05F	TC-06 Airbreak Switch
17000.06O	WD-14 Prim	17000.05G	TC-07 Hookswitch Disc
17000.06P	WD-15 AC, I	17000.05H	TC-08 Circuit Switcher
17000.06Q	WD-16 Relay	17000.05I	TC-09 Loadbreak Switch
17000.07	Site Commis	17000.05J	TC-10 Coupling Capacito
17000.08	Project Spec	17000.05K	TC-11 Potential Transfor
17000.09	Post-Commis	17000.05L	TC-12 Current Transform
17000.10	Numerical Re	17000.05M	TC-13 Grounding
17000.10A	Relay Inform	17000.05N	TC-14 Capacitor Bank
17000.10B	Schweitzer R	17000.05O	TC-15 Recloser and Con
17000.10C	Schweitzer 1	17000.05P	TC-16 Surge Arrester
17000.10D	Schweitzer 3	17000.05Q	TC-17 Regulator
17000.10E	GE UR Relay	17000.05R	TC-18 Carrier
17000.10F	GE LPS Rels	17000.05S	TC-19 Control & Relay P
17000.10G	Cooper Form	17000.05T	TC-20 SCADA RTU
17000.10H	Basler Relay	17000.05U	TC-21 Tone
17000.10I	Basler BE1-7	17000.05V	TC-22 Events/Fault Reco
17000.10J	ABB REL-30	17000.05W	TC-23 Battery
17000.10K	ABB REL-51	17000.05X	TC-24 Battery Charger
17000.10L	ABB TPU-20	17000.05Y	TC-25 AC Distribution Pa
17000.10M	Alstom LFCE	17000.05Z	TC-26 DC Distribution Pa
17000.10N	RFL-9300 Re	17000.05AA	TC-27 Lighting and Build
17000.10O	ZIV 8BCD Re	17000.05BB	TC-28 Protective Relay
17000.11	Safety Docur	17000.05CC	TC-29 Pilot Scheme
17000.11A	(Tailboard) D	17000.05DD	TC-30 Reclosing
17000.11B	Safe Catch F	17000.05EE	TC-31 Cables
17000.12	Daily Commi	17000.05FF	TC-32 Outdoor Bus Struc
17000.12A	Daily Commi	17000.05GG	TC-33 Mobilization Chec
17000.13	Weekly Com	17000.05HH	TC-34 Energization and I
17000.13A	Weekly Com	17000.05II	TC-35 Automatic Transfe
17000.14	Incident Rep	17000.05JJ	TC-36 Fire Alarm System
17000.14A	Standard Inc	17000.05KK	TC-37 Building HVAC Sy
17000.15	Field Change	17000.06	Pre-Energization Walkdo
17000.15A	Field Change	17000.06A	WD-00 General Informati
17000.15B	Field Change	17000.06B	WD-01 Power Transform
17000.16	New Hire On	17000.06C	WD-02 Circuit Breaker
17000.16A	Onboarding t	17000.06D	WD-03 Manual Disconne

#### 4.0 ADDITIONAL DOCUMENTS AND PROCEDURES

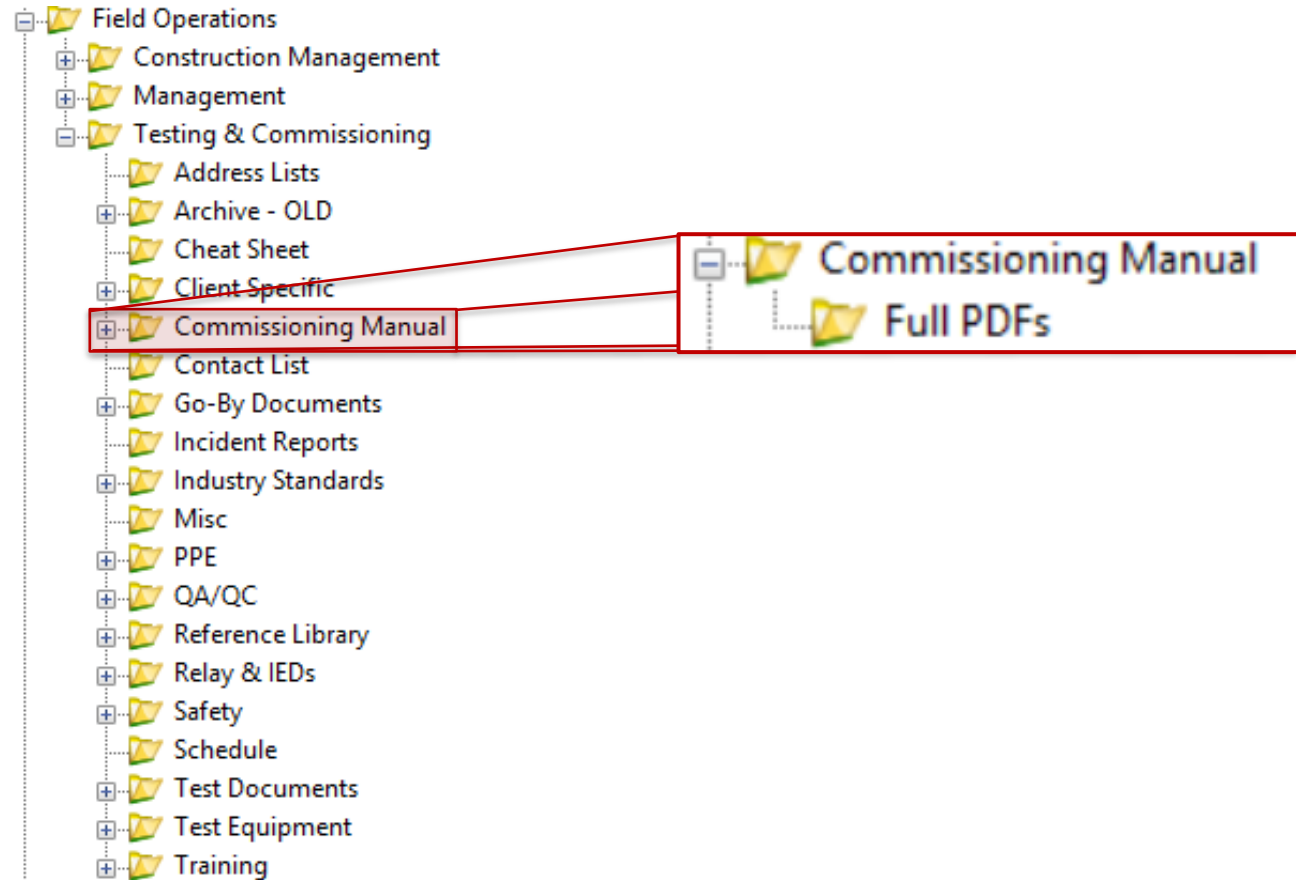
Please reference the following list of documents used in the testing and commissioning process as identified in this document.

TRC DOCUMENT #	DOCUMENT NAME
17000.01	Commissioning Procedures
17000.02	QA/QC Forms
17000.02A	Commissioning Flow Diagram
17000.02B	Site Risk Assessment Form
17000.02C	Daily Commissioning Work Plan Form
17000.02D	Isolation Verification Form
17000.02E	Commissioning Audit Form
17000.02F	Safety Audit Form
17000.03	Testing & Commissioning Guidelines
17000.04	Equipment Data Sheets
17000.04A	DS-01 Power Transformer
17000.04B	DS-02 Gas Circuit Breaker
17000.04C	DS-03 Oil Circuit Breaker
17000.04D	DS-04 Air Circuit Breaker
17000.04E	DS-05 Vacuum Circuit Breaker
17000.04F	DS-06 Airbreak Switch
17000.04G	DS-07 Motor Operated Airbreak Switch
17000.04H	DS-08 Group Operated Airbreak Switch
17000.04I	DS-09 Hookswitch Disconnect Switch
17000.04J	DS-10 Circuit Switcher
17000.04K	DS-11 Load Break Switch
17000.04L	DS-12 Motor Operated Load Break Switch
17000.04M	DS-13 CCVT
17000.04N	DS-14 Potential Transformer
17000.04O	DS-15 Current Transformer
17000.04P	DS-16 Capacitor Bank
17000.04Q	DS-17 Surge Arrester
17000.04R	DS-18 Voltage Regulator
17000.04S	DS-19 Carrier
17000.04T	DS-20 Tone Equipment
17000.04U	DS-21 Batteries
17000.04V	DS-22 Protective Relay
17000.04W	DS-23 Cables
17000.04X	DS-24 Load Checks
17000.04Y	DS-25 Battery Load Test
17000.04Z	DS-26 Line Tuner
17000.04AA	DS-27 Wave Trap
17000.04BB	DS-28 AC Disconnect Panel Switch
17000.04CC	DS-29 DC Disconnect Panel Switch



# 17000 – Commissioning Manual Folder

- Includes the TRC commissioning procedures manual and all associated appendices.
- Includes the T&C Document Index
- New versions of many of the (PDF) documents are uploaded so be sure to use the latest information.
- The folder contains “sets” or links to the (MS Word) documents, which reside elsewhere in ProjectWise.



# 17000.01 – Commissioning Procedures

- High-level and the backbone document that defines T&C process and procedures.
- Section 2.0
  - Identifies general requirements of the Lead Commissioning Engineer (LCE) during the T&C process.
- Section 3.0
  - Covers more specific commissioning process and workflow requirements.
- **Be sure to read this!**

Energy Testing and Commissioning Services		17000.01 Page 1 of 29
Commissioning Procedures		Revision 01 – May 2017 Internal Use Only

Energy Testing and Commissioning Services		17000.01 Page 9 of 29
Commissioning Procedures		Revision 01 – May 2017 Internal Use Only

**1.0 INTRODUCTION**

This document describes the responsibilities, procedures, and workflow for the successful testing and commissioning of electric systems. The Lead Commissioning Engineer (LCE) is responsible for the planning and execution of all testing and commissioning activities. The LCE shall be completed safely and to the required standards. The LCE shall establish a sound and effective working relationship with the Construction Manager(s), Owner, Engineer(s), and other project personnel. Every Lead Commissioning Engineer shall provide the necessary guidance to promote a team environment.

TRC Testing and Commissioning procedures are detailed in this document. Please reference Section 4 of this document for more information on TRC Testing and Commissioning procedures.

**2.0 GENERAL REQUIREMENTS**

The following sections identify general requirements for the Lead Commissioning Engineer during the testing and commissioning process and workflow requirements.

**2.1 Safety**

Safety is the primary responsibility of every individual involved in the testing and commissioning process. All personnel must follow and abide to the procedures set forth in the Safety Management System (HSMS). TRC's HSMS can be found in TRCNet.

The Lead Commissioning Engineer has the responsibility to ensure the safety of their staff and the craft workers. The LCE shall ensure that all personnel are properly trained and equipped. The LCE shall ensure that all personnel are properly trained and equipped. The LCE shall ensure that all personnel are properly trained and equipped. The LCE shall ensure that all personnel are properly trained and equipped.

Another important aspect of safety concerns the testing and commissioning of existing in service equipment and systems. It is vitally important that every member of the project team be trained and have access to the Site Risk Assessment and Work Plan. These documents detail the project goals and minimize the potential for unintended operations.

**3.0 COMMISSIONING PROCESS, ROLES, AND RESPONSIBILITIES**

The principal responsibility of a Lead Commissioning Engineer (LCE) is to ensure that all testing and commissioning has been safely and successfully completed for all equipment and systems prior to energization in accordance with the guidelines and procedures. The Lead Commissioning Engineer takes a leadership role in the planning and execution of the entire commissioning process in accordance with the guidelines and procedures.

A formalized commissioning process shall be utilized to ensure safety and a high level of consistency and accuracy. Refer to Commissioning Flow Diagram 17000.02A for high-level overview of the expected process.

**3.1 Off-Site Pre-Commissioning**

The off-site pre-commissioning process begins when the final Engineering Design Package and Project Documents have been released for construction and use. The Lead Commissioning Engineer utilizes this phase of the project to become familiarized with the details of the project, identify any potential issues, and to develop Commissioning and Outage & Energization Plans for submission to the owner for review and approval.

**3.1.1 Project Documents**

All project contract documents shall be reviewed for any project specific responsibilities specified in addition to those mentioned in this document. A detailed review of the design documents shall be performed to become familiarized with the overall project.

**3.1.2 Project Kickoff Meeting**

The Lead Commissioning Engineer shall attend a formal project kickoff meeting, which is conducted to bring the entire project team together to review the project scope and schedule. The kickoff meeting will include:

- Drawing review, discuss any potential issues.
- Constructability review, coordinate construction activities, discuss any potential issues.
- Materials and any potential delivery issues.
- Schedule review, mobilization plan, discuss any potential issues.

**3.1.3 Testing and Commissioning Plan**

The Lead Commissioning Engineer is responsible for developing a specific plan identifying the necessary steps to successfully complete the construction, testing and commissioning as identified in the project documents, scope of work, and design drawings.

The plan shall be broken down by equipment and/or system and shall provide a detailed list of testing and commissioning steps and sequences, while also providing information with regard to risks associated with personnel safety and owner utility system integrity (risk of mis-operation).



# 17000.02 – QA/QC Forms

- T&C personnel shall utilize the QA/QC documents and forms (i.e., 17000.02 A-F) during the T&C process.
- These forms and Human Performance Tools reduce the risks and hazards to personnel and equipment and system mis-operation.
- These are required by T&C employees for all projects.



## Critical Thinking:

What may be some ways our QA/QC Forms may influence T&C Engineers?

**SITE RISK ASSESSMENT FORM**

DATE: 2/7/2018  
 CUSTOMER: TRC  
 PROJECT NAME: Relay Set  
 SITE/LOCATION: Training Lab  
 TRC PROJECT NUMBER: 261735  
 CUSTOMER PROJECT MANAGER: Joe Client  
 TRC PROJECT MANAGER: Jason Ho  
 TRC LEAD COMMISSIONING ENGINEER: B. Moores

**PERSONNEL QUALIFICATIONS**  
 Provide name and title of all personnel involved and any additional individuals and their related qualifications. The goal is to identify tasks. Lack of or incorrect qualifications shall be considered risk to be mitigated.

Name	Company	Role
Brian Moores	TRC	LE
Joe Engineer 1	TRC	CE
Joe Engineer 2	TRC	IR

Risk Mitigation Details:  
 Joe Engineer 1 has little experience in an in-service substation, supervision of the LCE. He will not be touching any in-service

---

**ISOLATION VERIFICATION FORM**

DATE: 2/6/2018  
 CUSTOMER: TRC  
 PROJECT NAME: Relay Settings Change  
 SITE/LOCATION: Training Lab, Lancaster PA  
 TRC PROJECT NUMBER: 261735  
 TRC LEAD COMMISSIONING ENGINEER: B. Moores

**ISOLATION PLAN FOR:** 50/62BF-K123 SEL-351S CABINET #1

Step #	Brief Description of Circuit to be Isolated	Points of Isolation (Knife blades, Feeder Breakers, Fusing)	Drawing Reference Number(s)	Isolated (Initial and Date)	Restored (Initial and Date)
1	TRIP TC1-K123 OUT101	Cabinet #1 TD1-50/62BF-K123 Blade B Blade C	11570010		
2	TRIP 86BF-K123 OUT102	Cabinet #1 TD1-50/62BF-K123 Blade D Blade E	11570010		
3	RECLOSE K123 OUT103	Cabinet #1 TD1-50/62BF-K123 Blade F	11570010		

**DAILY COMMISSIONING WORK PLAN FORM**

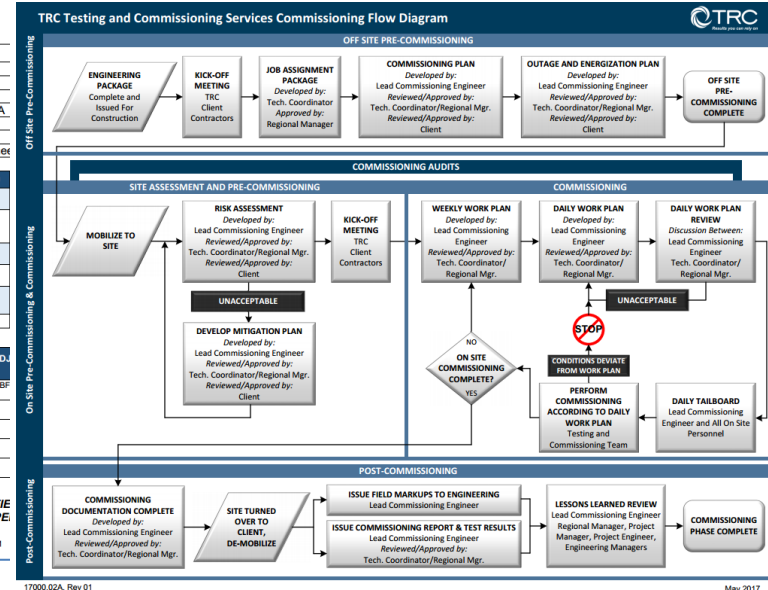
DATE: 2/8/2018  
 CUSTOMER: TRC  
 PROJECT NAME: Relay Settings Change  
 SITE/LOCATION: Training Lab, Lancaster PA  
 TRC PROJECT NUMBER: 261735  
 TRC LEAD COMMISSIONING ENGINEER: B. Moores  
 ADDITIONAL TRC PERSONNEL: Joe Engineer 1, Joe Engineer 2

	Complete	Verified
All prints associated with the day's activities have been assembled and reviewed with all personnel involved with the testing and commissioning.	X	JE1
The craft personnel involved with the work at the site have been made aware of the testing and commissioning activities that will occur and the impact it may have on their work and/or safety.	X	JE1
All personnel involved with the commissioning activities are familiar with the protection and control circuit(s) design intent.	X	JE1
All pieces of equipment or systems involved with commissioning have been identified.	X	JE1
All personnel on site are clear with their roles and responsibilities in the daily activities?	X	JE1
All test equipment is on site for daily activities and is properly calibrated.	X	JE1

EQUIPMENT/CIRCUITS TO BE TESTED	HIGH LEVEL DESCRIPTION OF TESTING/COMMISSIONING TO BE PERFORMED	A.D.
50/62BF-K123 SEL-351S Relay, Cabinet #1	Isolate Relay, Perform Settings Changes, Test Changes, Restore Relay	86BF

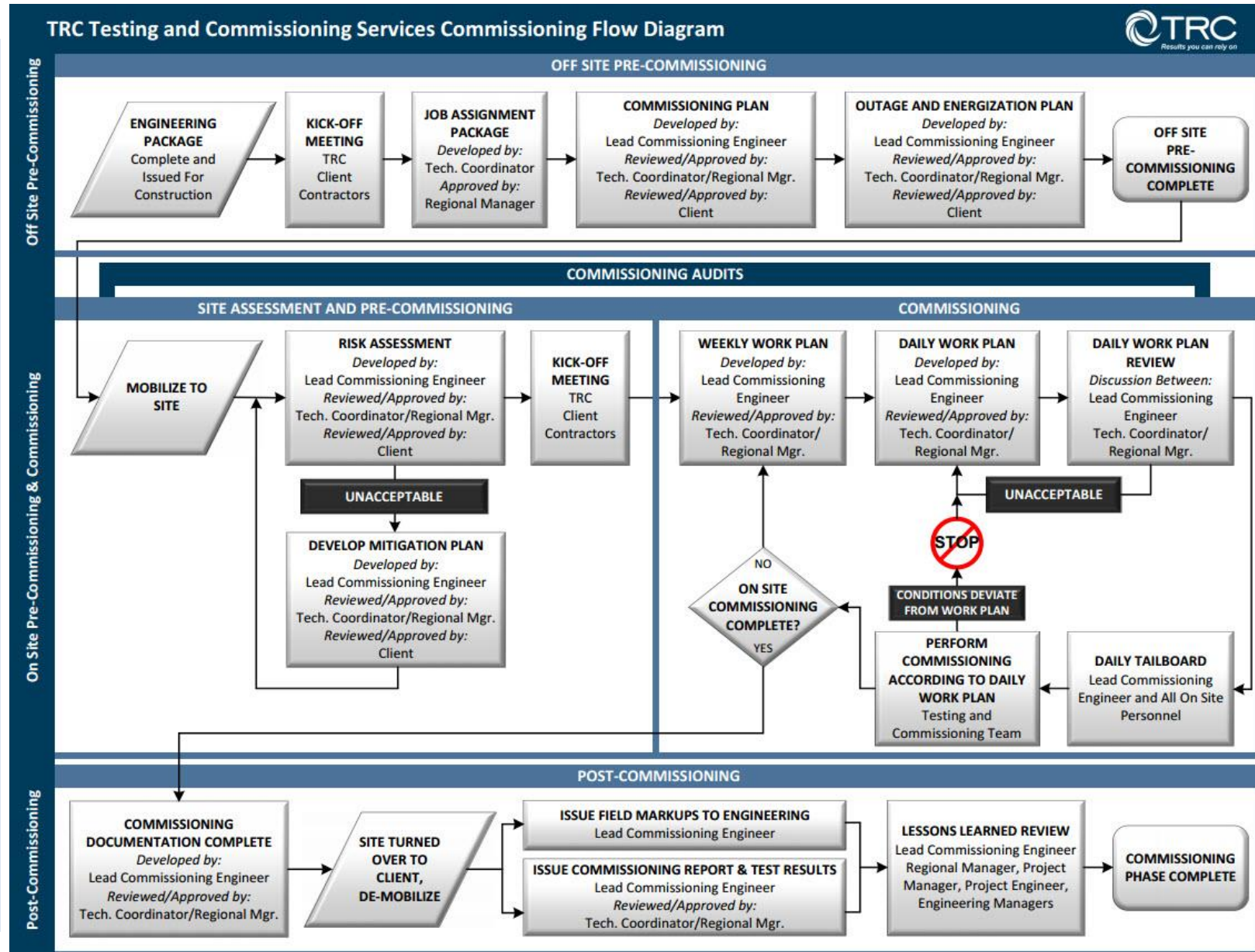
**ONCE WORK HAS BEGUN, IF THE ABOVE PLAN NEEDS TO BE MODIFIED WITH THE APPROPRIATE MANAGEMENT AND TEAM PERMISSIONS**

17000.02C, Rev 01 Page 1 of 1



# 17000.02A – Commissioning Services Workflow Diagram

- Illustrates the overall TRC T&C planning process from project conception to completion.
- This workflow diagram will be discussed in detail in the coming slides.



# 17000.02B – Site Risk Assessment Form

- Identifies onsite additional risks associated with a project and mitigation plan.
- To be completed at initial mobilization and prior to any work beginning.
- Clearance of Equipment (Safety Zone) *as stated in Scope of Work.*
- Or updated whenever a major change in site conditions.

**CLEARANCE OF EQUIPMENT (SAFETY ZONE)**

Review the primary and secondary clearance zones and identify any unclear or unmet clearance zones and provide details on how risk is to be mitigated.

Primary Equipment Clearance Zones Identified: \_\_\_\_\_  
 Primary Equipment Clearance Holder: \_\_\_\_\_  
 Secondary Equipment Clearance Zones Identified: \_\_\_\_\_  
 Secondary Equipment Clearance Holder: \_\_\_\_\_

Risk Mitigation Details: \_\_\_\_\_

---

Review and discuss site environment with the contractor. Transmission or distribution service shall be maintained.

Brownfield Site?  Yes (Risk)  No

In Service Equipment adjacent to project?  Yes  No

Potential for Disruption of Transmission or Distribution Service?  Yes  No

Risk Mitigation Details: Isolation, identify and communicate with those involved in the project to mitigate inadvertent disruption of in service equipment.

---

Review TRC and client required planning, identification, isolation, and barricading procedures to be mitigated.

Proper Isolation Procedures to be used?  Yes  No

Proper Barricading Procedures to be used?  Yes  No

Proper Identification Procedures to be used?  Yes  No

Risk Mitigation Details: All systems being worked on shall be verified against the existing drawings, caution tape, etc. will be in place around equipment and panels being worked on.

**PROJECT DRAWING**

Review the drawings and literature on site to ensure the most up to date "ISSUED FOR CONSTRUCTION" drawings are used. Drawings shall be updated to reflect current site conditions, and all additional versions of drawings, incomplete packages, outdated drawings, etc. shall be removed from the site. If risk is identified, provide details on how risk is to be mitigated.

Complete IFC package of "Working Drawings"?  Yes  No

Verified Against Transmittal?  Yes  No (Risk)

Single Set of Drawings in use?  Yes  No (Risk)

All construction markups on "Working Drawings"?  Yes  No

Do station copies have markups that were not considered in the drawings?  Yes  No

Instruction Books/Manuals/Vendor Drawings for all equipment on site?  Yes  No

Risk Mitigation Details: \_\_\_\_\_

**UNEXPECTED SITE CONDITIONS**

Review the site for any unexpected conditions, other project work, or other risks. If risk is identified, provide details on how risk is to be mitigated.

Is there any other work, projects, etc. being performed at this site?  Yes  No

Any evidence of unfinished projects?  Yes (Risk)  No

Any drawings from ongoing or unfinished projects that can be used?  Yes  No

Is the site generally disorganized or chaotic?  Yes (Risk)  No

Risk Mitigation Details: \_\_\_\_\_

**PERSONNEL QUALIFICATIONS**

Provide name and title of all personnel involved and any additional commentary regarding the expectations of the individuals and their related qualifications. The goal is to identify all team members as qualified for their respective tasks. Lack of or incorrect qualifications shall be considered risk. If risk is identified, provide details on how risk is to be mitigated.

Name	Company	Title	Qualified?
Brian Moores	TRC	Lead Commissioning Eng.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Risk)
Joe Engineer 1	TRC	Commissioning Engineer	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (Risk)
Joe Engineer 2	TRC	Relay Test Engineer	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Risk)
			<input type="checkbox"/> Yes <input type="checkbox"/> No (Risk)
			<input type="checkbox"/> Yes <input type="checkbox"/> No (Risk)
			<input type="checkbox"/> Yes <input type="checkbox"/> No (Risk)
			<input type="checkbox"/> Yes <input type="checkbox"/> No (Risk)
			<input type="checkbox"/> Yes <input type="checkbox"/> No (Risk)

Risk Mitigation Details: Joe Engineer 1 has little experience in an in-service substation. He is here to observe only and will be under the direct supervision of the LCE. He will not be touching any in-service systems.

17000.02B, Rev 01

17000.02B, Rev 01

Page


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# 17000.02D – Isolation Verification Form

- Identifies system isolation and restoration points and most importantly, records them!
- Means for peer review in the isolation and restoration process.
- Isolation prevents inadvertent trips to in-service circuits and/or remote circuits at other substations.



**ISOLATION VERIFICATION FORM**

<b>DATE</b>	2/6/2018
<b>CUSTOMER</b>	TRC
<b>PROJECT NAME</b>	Relay Settings Change
<b>SITE/LOCATION</b>	Training Lab, Lancaster PA
<b>TRC PROJECT NUMBER</b>	261735
<b>TRC LEAD COMMISSIONING ENGINEER</b>	B. Moores

ISOLATION PLAN FOR:		50/62BF-K123 SEL-351S CABINET #1			
Step #	Brief Description of Circuit to be Isolated	Points of Isolation (Knife blades, Feeder Breakers, Fusing)	Drawing Reference Number(s)	Isolated (Initial and Date)	Restored (Initial and Date)
OUTPUTS					
1	TRIP TC1 K123 OUT101	Cabinet #1 TD1-50/62BF-K123 Blade B Blade C	11570010		
2	TRIP 86BF-K123 OUT102	Cabinet #1 TD1-50/62BF-K123 Blade D Blade E	11570010		
3	RECLOSE K123 OUT103	Cabinet #1 TD1-50/62BF-K123 Blade F Blade G	11570010		
4	OUT104 SPARE	Cabinet #1 TD1-50/62BF-K123 Blade H Blade I	11570010		
5	LOP ALARM OUT107	Cabinet #1 TD2-50/62BF-K123 Blade E Blade F	11570010		
6	RELAY ALARM OUT108	Cabinet #1 TD2-50/62BF-K123 Blade G Blade H	11570010		
7	OUT105 SPARE	Cabinet #1 TD2-50/62BF-K123 Blade A Blade B	11570010		
CONTINUED NEXT PAGE					

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