Chairman: **George Payerle**

Vice-Chair: **Tony Reiss**

Meeting Date: March 13, 2024 Location: Vancouver, BC Time: 11:00 – 12:15

Meeting Administration:

Meeting Opened at 11:01 PST

- Sign In - 2 attendance rosters distributed
- Chairman's Comments - small enough group so introductions were made
- Quorum Determination, member list
  - 36 members, 19 needed for quorum - 19 in attendance
- Present agenda for approval
  - Motion to approve - Dave Blew, 2nd - Igor Simonov - Unanimous approval
- Approval of the Fall 2023 minutes
  - Motion to approve - Mark Faulkner, 2nd - Dan Schwartz - Unanimous approval
- Announce new members Piotr Blaszczyk, Daniel Posadas, James Spaulding, Travis Spoone, William Whitehead
  - New members were recognized by the Chair and welcomed by those in attendance
- WG chairs be sure to note specifically which previous meeting minutes you are approving when you approve mites of previous meeting.
  - Chairman clarified - if a group hasn't met in several meetings, please reference back to the last meeting minutes (Fall/Spring and year)
- Does anyone request SC membership? Indicate on roster.
  - Stated at start of roster circulation

Meeting attendees

Members Present

* Sanford	Fong	
Benjamin	Garcia	Southern California Edison
Carlos	Gaytan	Prolec GE
Kenneth	Hampton	Baltimore Gas & Electric
Ramadan	Issack	American Electric Power
Alejandro	Macias	CenterPoint Energy
Daniel	Mulkey	Mulkey Engineering Inc.
Vinay	Patel	Consolidated Edison Co.
George	Payerle	Carte International Inc.
Clemens	Reiss IV	Custom Materials, Inc.
Dan	Schwartz	Quality Switch, Inc.

Jeremy	Sewell	Quality Switch, Inc.
Adam	Sewell	Quality Switch, Inc.
Igor	Simonov	Toronto Hydro
Travis	Spoone	EATON Corporation
Alan	Traut	Howard Industries
* Jeremy	Van Horn	IFD Corporation
John	Vartanian	National Grid
Joshua	Verdell	ERMCO
Michael	Zarnowski	Carte International

Guests Present

* Jared	Bates	Oncor Electric Delivery
Paulo	Bautista	Enmax
Kevin	Biggie	Weidmann Electrical Tech.
Jeffrey	Brooks	Power Engineers
Noah	Chesser	Oncor Electric Delivery
Sanford	Fong	Georgia Power Co.
Michael	Gonzales	Southern California Edison
Luke	Grandbois	IFD Technologies
Didier	Hamoir	Transformer Protector Corp
Adam	Klaponski	Carte International
David	Lin	IFD Technologies
Jinesh	Malde	M&I Materials Inc.
Nicholas	Manske	Oncor Electric Delivery
Fernando	Meza	Power Partners, Inc.
Justin	Minikel	EATON Corporation
Daniel	Posadas	Prolec-Celeco
Sherif	Salem	Eersource Energy
Fernando	Salinas	Power Partners, Inc.
Russell	Sewell	Quality Switch, Inc.
Audrey	Siebert-Timmer	IFD Technologies
Fernando	Tirado	Prolec GE
Malia	Zaman	IEEE
* = requested member-ship		

Working Groups Report:

- **C57.12.23 Single-Phase Submersible Transformers** working group –

• Alan Traut, Chairman,

  • Revision due date: 12/31/2028

  • PAR Approval Date:

  • PAR Expiration Date: 12/31/28

Stage:

Presented by Alan Trout - 3/13/24

PC57.12.23 – Single Phase Submersible Transformers
March 11, 2024
Vancouver, BC Canada
Chair: Alan Traut, Howard Industries
Vice-Chair: OPEN
Secretary: George Payerle, CARTE International (acting)

Call to order
The meeting was called to order by the Chair at 11:00AM PDT on Monday, March 11, 2024.

Essential patent statement and copyright slides.
There was a call for essential patent claims by the Chair. There were none brought forward. The Chair announced if there was one to inform the Chair. The IEEE copyright slides were shown to the WG. No copyright issues were identified in the material presented at the meeting.

Chair Report
Chair is seeking volunteers for vice-chair and secretary. See chair if interested. C57.12.23 was published in 2018 and will expire in 2028. The present PAR was approved 2-15-2024 and expires 12-31-2028 so there are 8 in-person meetings available to work on the revision. The chair is targeting to vote to send the document to ballot in Fall of 2027.

Membership & Quorum
Since this is the first meeting of the WG under the present PAR, 42 of the 61 attendees requesting membership at this meeting were granted immediate membership. Therefore, 100% quorum was declared. The meeting attendance is shown below.

Nabi	Almeida	Prolec GE	Member
Stephen	Ashcraft	Hitachi Energy	Guest
Alex	Ayada	Power Partners	Guest
Jared	Bates	Oncor Electric Delivery	Member
Piotr	Blaszczyk	Specialty Transformer Components	Member
Jeffery	Brooks	Power Engineers	Member
Jim	Cai	JSMP Transformer	Member
Noah	Chesser	Oncor Electric Delivery	Vice Chair
Janet	Crockett	Fayetteville PWC	Guest
Tony	DiBiase	Temple (Canada)	Guest
Sanford	Fong	Georgia Power	Member
John	Fraser	IFD Technologies	Guest
Kevin	Frye	Central Moloney Inc	Guest
Benjamin	Garcia	Southern California Edison	Member
Hector	Garza	Orto	Guest
Carlos	Gaytan	Prolec GE	Member
Ali	Ghafourian	H-J Family of Companies	Member
Stephen	Gilbert	IFD Technologies	Guest
Michael	Gonzales	Southern California Edison	Member
Luke	Grandbois	IFD Technologies	Guest
Kenneth	Hampton	Baltimore Gas & Electric	Member
Ramadan	Issack	American Electric Power	Member
Adam	Klaponski	Carte International Inc.	Member
Brian	Klaponski	Carte International Inc.	Member
Gilbert	Kozer	Northeast Transformer	Member
Patrick	Kozer	Northeast Transformer	Member
Angela	Leigl	EATON Corporation	Guest
David	Lin	IFD Technologies	Guest
Alejandro	Macias	CenterPoint Energy	Secretary
Nicholas	Manske	ONCOR Electric Delivery	Member
Fernando	Meza	Power Partners	Member
Tyler	Morgan	Duke Energy	Member

Daniel	Mulkey	Mulkey Engineering Inc.	Member
Martin	Munoz	Orto	Member
Daniel	Oh	Hyundai	Guest
Joel	Pacas	IFD Technologies	Guest
Besjan	Pajaziti	Brockhaus Measurements	Guest
Vinay	Patel	Con Edison of NY	Member
George	Payerle	Carte International Inc.	Member
Daniel	Posadas	Prolec Celeco	Member
Jarrod	Prince	ERMCO	Member
Robert	Reepe	Georgia Power Co.	Guest
David	Rohrer	First Energy	Member
Mason	Rush	Central Moloney	Member
Fernando	Salinas	Power Partners	Member
Russ	Sewell	Quality Switch	Guest
Audrey	Siebert-Timmer	IFD Technologies	Member
Igor	Simonov	Toronto Hydro	Member
Jimmy	Smith	Howard Industries	Member
Shankar	Subramany	KEMA Netherlands	Member
Jesse	Theberge	Temple (Canada)	Guest
Michael	Thibault	Pacific Gas & Electric	Member
Tim	Tillery	Howard Industries	Member
Alan	Traut	Howard Industries	Chair
Steve	Tsai	JST Power Equipment	Member
Reinaldo	Valentin	Duke Energy	Member
Jeremy	Van Horn	IFD Technologies	Member
John	Vartanian	National Grid	Member
Joshua	Verdell	ERMCO	Guest
Shelby	Walters	Howard Industries	Member
Bruce	Webb	Knoxville Utilities Board	Member
Alan	Wilks	Consultant	Guest
Michael	Zarnowski	Carte International Inc.	Member

Approval of agenda

The Chair sent out the Agenda prior to the meeting for review. A motion was made to approve the agenda (Ben Garcia/Shelby Walters). Agenda was unanimously approved.

Approval of previous meeting minutes

The chair presented minutes from that last meeting in Spring 2018. A motion was made (Dan Mulkey/Ben Garcia) to approve the previous meeting minutes. The motion passed unanimously.

Old Business

The chair presented the unresolved or rejected comments from balloting of the previous revision of the standard. These comments are marked in the present draft and will be evaluated during the draft review.

New Business – Review of draft 1.0

Introduction - The first paragraph of the Introduction is a re-statement of the document's scope. This paragraph is unnecessary and will be deleted. The last paragraph of the Introduction states that the last revision was 2019. This is incorrect and will be changed to 2018.

Clause 1.2 Purpose - The purpose technically has not changed but the wording was modified slightly to match C57.12.24-2023.

Clause 5.5 Reference Temperature – During the ballot of the previous revision a comment was submitted to change the reference temperature to 20C plus the average winding rise as it is in C57.12.80. This standard assumes an average ambient of 30C therefore the clause will remain as-is in the published document. The current wording also allows for the use of designs utilizing higher temperature insulation systems with higher winding rise.

Clause 6.1 Low frequency dielectric test – The Chair will review the wording of this paragraph compared to other standards for single phase applications, eg, C57.12.90, C57.12.38, C57.12.20. Chair to report at the next meeting.

Terminal designations – The Chair suggested that we standardize on terminal designation using letter and number without using subscripts. Eg, H2 vs H_2. Members agreed to make this change.

Clause 7.2.2 LV terminals, Fig 2 and Fig 3 – The Chair will compare this document to C57.19.02 and bring recommendations back to the WG at the next meeting. The Chair will also check the referenced standard for LV cable leads to make sure it is current.

Table 4 Low voltage terminal sizes – Table 4 refers to an H spade but Fig 3 refers to a 4-hole spade. Members agreed to change Table 4 to 4-hole spade for consistency.

Clause 7.3 Accessories - Should we add components, e.g fuses, that appear in other standards? Task force #1 will look into this and provide recommendations at the next meeting.

Clause 7.5 Transformer tank integrity – Task force #2 will compare this clause with C57.12.39 and recommend changes , eg, incorporate 12.39 by reference. This includes PRV requirements when a PRV is specified. The dynamic tank integrity test reference is changed from C57.12.20 to C57.12.39.

Clause 7.6.1 Tank materials – Task force #1 will compare to C57.12.24 and recommend changes at the next meeting.

New Business - Rectangular Tanks
During the 2018 revision, the subject of adding rectangular tank designs was tabled due to lack of time to properly address the topic. Should this construction be added to the standard?

Mike Thibault/Dan Mulkey - PG&E has a rectangular design, it is used by used by a few other utilities including Fort Collins, and CenterPoint. The current users probably don't need advice on that as they have their own specifications. The only reason to include would be if new users wanted to start using a rectangular tank. Rectangular tanks may have a safety advantage over round tanks because they can flex and bulge to handle rapid pressure increases. Mike Thibault, will come back at the next meeting and do a presentation on the PG&E experience with rectangular tanks.

New Business – Task force assignments
Two new task forces were formed to address issues identified in the draft. The Chair will coordinate with the task force leaders for presentation at the Fall 2024 meeting.

Task force #1 will compare C57.12.23 and C57.12.24 and recommend changes to 12.23 building on the work previously done on the revision to 12.24. Members are:
Dan Mulkey (Chair)
Nabi Almeida
Alex Macias
Fernando Meza
Ali Ghafourian
Mike Thibault

Task force #2 will compare the tank integrity requirements in 12.23 to 12.39 and recommend changes to 12.23. They will also look at the benefits of rectangular tank construction vs round tank. Members are:
Carlos Gaytan (Chair)
Jeremy vanHorn
John Vartainian
Vinay Patel

The Chair will make the changes approved today and send the draft out for general comment among the meeting participants.

Next meeting
October 27 - 31, 2024 in St Louis, MO

The meeting adjourned at 12:05 pm PDT.

- **C57.12.24 Three-Phase Submersible Transformers** working group –
  Ben Garcia, Chairman; Tom Dauzat, Vice Chair; George Payerle, Secretary
  - Published: 2023
  - Revision Due Date: 12/31/**2033**
  - PAR Approval Date:
  - PAR Expiration Date:

Presented by Ben Garcia - 3/13/24

Working group did not meet. The work has been published. Congratulations to the WG for their efforts!

- **C57.12.40 Secondary Network Transformer** working Group – John Vartnian, Chairman, Dan Schwartz, Secretary
  - Published 2017
  - Revision due date: **12/31/2027**
  - PAR Approval Date: 8/31/2012
  - PAR Expiration Date: **12/31/2025**

Stage: Submitted to Revcom on RevCom Agenda 04-May-2017

Presented by John Vartanian - 3/13/24

Members Present	**Company**
John Vartanian (Chair)	National Grid
Dan Schwartz (Secretary)	Quality Switch
Nabi Almeida	Prolec GE
Piotr Blaszczyk	Specialty Transformer Components LLC
Dave Blew	Retired (Former PSE&G)
Douglas Craig	Richards Manufacturing Co.
Mark Faulkner	Eaton Corporation
Brian Klaponski	Carte International Inc
Gilbert Kozer	Northeast Transformer Services
Patrick Kozer	Northeast Transformer Services
Alex Macias	CenterPoint Energy
Vinay Patel	Consolidated Edison of NY
George Payerle	Carte International Inc.
James Ratty	Richards Manufacturing Co.
Adam Sewell	Quality Switch
Jeremy Sewell	Quality Switch
Russell Sewell	Quality Switch
Igor Siminov	Toronto Hydro
Travis Spoone	Eaton Corporation
Mike Zarnowski	Carte International Inc

Guests Present	**Company**
*Javier Arteaga	Hitachi Energy
*Jeffrey Brooks	Power Engineers
Jim Cai	JSHP Transformer
*Sanford Fong	Georgia Power
*Orlando Giraldo	The HJ Family of Companies
Didier Hamoir	Transformer Protector Corp.
Adam Klaponski	Carte International Inc.

Nicholas Manske	Oncor Electric Delivery
Fernando Meza	Power Partners
*Daniel Posada	Prolec Celeco
Audrey Siebert-Timmer	IFD Technologies
*Jimmy Smith	Howard Industries

*Requested Membership

1) The group met on Tuesday, March 12, 2024 at 11:00 AM PST with 19 members and 12 guests. Six (6) guests requested membership. Quorum was achieved with 20/29 (69%) of members present.
2) A call for patents was made; none were mentioned.
3) Copyright requirements were reviewed by the Chair.
4) Introductions were made by all attendees.
5) The agenda and the previous minutes from October 24, 2023 were presented for approval. Motion to approve was made by Dave Blew and seconded by Alex Macias. Both were approved unanimously.
6) The Chair reviewed that the PAR extension was approved and remains active through the end of 2025.
7) Old Business
    a. The Chair reviewed the PAR timeline.
    b. The Chair noted that the current revision (D2) is in ballot for final approval.
8) New Business
    a. It was recommended by George Payerle to remove two members as they will no longer be attending Transformer Committee meetings.
    b. Presentation by Martin Bachand from Cloverdale Paint, Inc on submersible enclosure coatings.
9) The meeting was adjourned at 11:42 AM PST with the next meeting set for St. Louis, MO on October 29, 2024.

Respectfully submitted,
D. Schwartz, Secretary

- **C57.12.44 Secondary Network Protectors** working group –
  Mark Faulkner, Chairman, Alex Macias, Secretary
    - Revision due date: **12/31/2024**
    - PAR Approval Date: **3/26/2015**
    - PAR Expiration Date:

Stage: In ballot resolution

Document #:	**C57.12.44**		
Document Title:	**STANDARD REQUIREMENTS FOR SECONDAY NETWORK PROTECTORS**		
Chair:	**Mark Faulkner**	**Vice-Chair**	**n/a**
Secretary	**Alex Macias**		

Current Draft Being Worked On: DRAFT 13 **Dated:** March 12, 2024

Meeting Date: March 11, 2024 **Time:** 4:45PM – 6PM CT

Meeting Attendance

Activity Name: C57.12.44 WG Secondary Network Protectors
Activity ID:
Number of Members in Activity = 16
Number of Members Present = 14
Quorum Present = 87.5%
Number of attendees = 25

Mark Faulkner-	Eaton	member
Dan Mulkey-	Mulkey Eng	member
Brian Klaponski-	Carte	member
Douglas Craig-	Richards Manufacturing	member
George Payerle-	Carte	member
James Ratty-	ETI-NJ	member
Jeremy Sewell-	Quality Switch	member
Travis Spoone-	Eaton	member
Dan Schwartz-	Quality Switch	member
Michael Zarnowski-	Carte International	member
David Blew-	DS Blew Consulting	member
Alejandro Macias -	CenterPoint Energy	member
John Vartanian-	National Grid	member
Igor Simonov-	Toronto Hydro	member
Jeffrey Brooks-	Power Engineers	guest
Nabi Almeida-	Prolec Energy	guest
Malia Zaman-	IEEE	guest
Tony Reiss-	Customer Materials	guest
Vinay Patel-*	Con Edison	guest
Javier Arteaga-*	Hitachi Energy	guest
Justin Minikel-	EATON	guest
Daniel Posadas-*	Prolec GE	guest
Jim Cai-	JSHP Transformers	guest
Adam Klaponski-	Carte	guest
Sanford Fong-	GA Power	guest

Meeting Minutes:

The minutes shall record the essential business of the Working Group, including the following items at a minimum:

1. Meeting called to order
    a. 4:45 PM

2. Introduction of all attendees

3. Quorum Verification
    a. Quorum was confirmed via count and presentation of current WG names

4. Membership
    a. No new members since last meeting
    b. The following have requested for WG membership; attendance will be reviewed (minimum 2 of last 3 meetings)
        i. Vinay Patel
        ii. Javier Arteaga
        iii. Daniel Posadas

5. Confirmation of the essential patent statement and responses
    a. No conflicts; presented to group

6. Copyright requirements were reviewed by the Chair
    a. No conflicts; presented to group

7. Approval of minutes of the previous meeting held on October 23, 2023, 1:45 – 3PM at Kansas City, MO.
    a. Minutes presented to group.
    b. Motion to approve Michael Zarnowsk, 2nd David Blew
    c. Minutes approved unanimously.

8. Approval of agenda for this meeting.
    a. Agenda presented to group.
    b. Agenda approved unanimously.

9. Meeting Discussion
    a. Attendees Informed
        i. Approval of Par extension to 12/31/2024.
        ii. At this time the Draft 12 has been edited to reflect all the changes made and those accepted from the 69 comments returned on the initial ballot by CRG (Comment Resolution Group). Technical items were presented to the WG for resolution.
        iii. D12 will be rename D13 for re-circulation ballot.
        iv. Comment Resolution Group (CRG) reminder are Mark Faulkner, Doug Craig, Dan Mulkey and Cory Morgan
    b. Members were asked to email Alex Macias their emails as a means to verify information on file.

10. Meeting adjourned approximately 5:30 pm

11. Fall Meeting
    a. St. Louis, MO.
    b. Dates: October 27-31, 2024

Submitted by: Mark Faulkner

Date: 3/13/2024

 C57.167 Guide for Monitoring Distribution Transformers working group –
Gary Hoffman, Chairman, Mike Thibault, Secretary o Revision due date: **N/A – new standard**

- o PAR Approval Date: **6/14/2018**
- o PAR Expiration Date: **12/31/2022**

Reports to Distribution subcommittee, No presentation at this meeting 3/13/2024

PC 57.12.53 Guide for mitigating corrosion on subsurface transformers
Will Elliott, Chair; Avijit Shingari, Vice-chair; Audrey Siebert-Timmer, secretary
PA R Approval Date: **2/23/2022**

- o PAR Expiration Date: **12/31/2026**

Document #:	**PC57.12.53**		
Document Title:	**C57.12.53 Guide on Mitigating Corrosion on Subsurface Transformers and Network Protectors**		
Chair:	**Will Elliott**	**Vice-Chair**	**Micheal Zarnowski**
Secretary	**Audrey Siebert-Timmer**	**Per Cent Complete**	**80%**
Current Draft Being Worked On:	**Draft 3**	**Dated:**	**December 2023**
Meeting Date:	**March 12, 2024**	**Time:**	**4:45 PM PST**

Attendance:	**Members**	**15**	
	Guests	**29**	
	Total*	**44**	

Attending Members:

Nabi Almeida, Prolec GE
Dave Blew, Consultant
Douglas Craig, Richards Manufacturing Co.
John Harley, First Power Group LLC
Brian Klaponski, Carte International Inc.
Tyler Morgan, Duke Energy
George Payerle, Carte International Inc.
Daniel Posadas, Prolec Celeco
James Ratty, Electronic Technology Inc.
Dan Schwartz, Quality Switch, Inc.
Adam Sewell, Quality Switch, Inc.
Jeremy Sewell, Quality Switch, Inc.
Audrey Siebert-Timmer, IFD Corporation
John Vartanian, National Grid
Michael Zarnowski, Carte International Inc.

Attending Guests:

Javier Arteaga, Hitachi Energy
Alex Ayala, Power Partners
Jeffrey Brooks, Power Engineers
Sami Debass, Epri
Jeffrey Door, The H-J Family of Companies
Didier Hamoir, Transformer Protector Corp
Sanford Fong, Georgia Power Co.
Jean Phillipe Gagnon, Qualitrol
Benjamin Garcia, Southern California Edison
Carlos Gaytan, Prolec GE
Michael Gonzales, Southern California Edison
Luke Grandbois, IFD Corporation
Ken Hampton, Baltimore Gas & Electric
Ramadan Issack, American Electric Power
Adam Klaponski, Carte International Inc.
Petra Labbe, Sherwin-Williams
Tiffany Lucas, Prolec GE
Alejandro Macias, Centerpoint Energy
Fernando Meza, Power Partners
Vinay Patel, Consolidated Edison Co. of NY
Jarrod Prince, ERMCO
Clemens Reiss IV, Custom Materials
Russ Sewell, Quality Switch, Inc.
Igor Simonov, Toronto Hydro
Michael Thibault, Pacific Gas & Electric
Fernando Tirado, Prolec GE
Alan Traut, Howard Industries
Reinaldo Valentin, Duke Energy
Shelby Walters, Howard Industries

Subsurface Transformers and Network Protectors
Subcommittee Meeting Minutes

Meeting Minutes:

1. Micheal Zarnowski called the meeting to order at 4:45 PM PST.

2. Opening remarks and introductions were made.
    i. AMS system has been discontinued. Paper rosters were circulated.

3. Micheal Zarnowski reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.

4. Membership changes were noted:
    i. Added: **Verena Pellon, Daniel Posadas, James Ratty, Pedro Salgado**
    ii. Changed to Guest: **None**

5. Quorum was verified. The working group consisted of **23** members, requiring **12** for quorum. **15** members were counted at the start of the meeting. Attendance records later confirmed **15** members attended.

6. Micheal Zarnowski requested approval of the Fall 2023 Minutes. **Dave Blew made a motion to approve the Fall 2023 Minutes. Second by George Payerle. Motion was unanimously approved.**

7. Micheal Zarnowski requested approval of the Spring 2024 Agenda. **Brian Klaponski made a motion to approve the Spring 2024 Agenda. Second by George Payerle. Motion was unanimously approved.**

8. Old Business:

    i. Micheal Zarnowski review PAR scope: limited to transformers and network protectors in subsurface structures.

    ii. Micheal Zarnowski presented taskforce findings formed to consider improvements to the definitions for submersible enclosure and vault
        a. Taskforce members included: Tom Dauzat, Will Elliott, Tiffany Lucas, Dan Mulkey, George Payerle, John Vartanian, Mike Zarnowski.
        b. **Brian Klaponski made a motion to accept the presented submersible enclosure definition with the addition of "physically" before the word protects. Second George Payerle. Motion unanimously approved.**
        c. **Nabi Almeida made a motion to accept the presented vault definition with the following modification to the last part of the definition "that contains and protects electrical and related equipment from public access." Second by Brian Klaponski. Motion unanimously approved.**
        d. The definitions approved in the meeting are:
            1. Submersible Enclosure: The case or housing (i.e., tank) that surrounds and physically protects the internal components of the transformer or network protector from the environment, including occasional or continuous submersion.
            2. Vault: A structure with access for authorized personnel, which may be subsurface or above grade, that contains electrical and related equipment from public access.

    iii. Glenn Stark, a materials engineering consultant, gave a presentation to the group on corrosion. A summary of the topics presented are listed below. The presentation will be shared with the group.
        a. Corrosion Resistance of Copper Bearing Steels

1. Also known as Weathering Steels
2. These materials are not suitable for continuous submersion (at any level) as crevice corrosion will occur.

b. Galvanic / Dissimilar Metal Corrosion
   1. Dissimilar metals form a battery, the “least noble” metal will corrode. (i.e. Copper / Copper alloy components interact with steel enclosure. Copper will be the cathode, low alloy steel will become the anode.)
   2. Magnesium is the most active / least noble. This is why it is often used in cathodic protection.
   3. Group asked if zinc primer / zinc rich paints are beneficial. Glenn Stark commented that only the portion of the zinc that is directly in contact to the steel provides cathodic protection. For this reason, these products act more like a coating / barrier.
   4. Glenn Stark commented that Section 5.1 in the guide advising user to coat all bare metal is a good suggestion.
   5. Glenn Stark commented that Section 5.2 in the guide to electrically insulate dissimilar metals is good but generally not feasible with grounding systems. Recommends that if you can’t keep two dissimilar metals separate to remove the corrosive environment. One method is applying electrical contact grease (i.e. NO-OX).

c. Stainless Steels
   1. Five main families of stainless steels: austenitic (Type 3XX series), ferritic, duplex, martensitic, precipitation-hardening. The most common stainless steel is austenitic 304.
   2. All stainless steel needs 12 weight % of Cr in it. The Cr on the surface of the Stainless Steel will bond to oxygen and form chromium oxide. This becomes a barrier. If this coating it broken / scratched it will then form a new barrier.
   3. Type 304, good generic corrosion resistance in atmospheric environments. Is susceptible to pitting corrosion, specifically in marine environments.
   4. Type 316, 2.5 weight % of Mo. It has an upper limit, raw substrate cannot withstand really aggressive marine / road salt / fertilizer environments (i.e. 250 m from the ocean with no maintenance / cleaning of the surface).
   5. Coatings are your first line of defense. However, if the coating fails you can get preferential corrosion in these areas. This is why it is important to inspect your coatings and maintain them on a regular basis.
   6. For these extreme environments, you need to do a site-specific assessment with a corrosion engineer. There is no silver bullet that can address all problems as every case is unique (unless you make everything out of Platinum $$$$).
   7. In general, austenitic stainless stress are known to suffer from stress corrosion cracking. It is recommended to stay away from the 300 series steels in stagnate marine environments.
   8. Glenn Stark recommended that Section 6.2.2 in the guide can be further developed to provide a formal framework to help users properly access what conditions they are dealing with. This will help the metallurgist in figuring out what materials makes sense.

d. Fabrication of Stainless Steel
   1. Must be completely segregated from carbon steel, only stainless steel wire brushes, wheels and blast media can be used. Many manufactures spray paint stainless steel tools green.

2. Carbon contamination interrupts the normal self- passivating behavior of stainless steel. The transferred carbon will then start to corrode which will then transfer to the stainless steel. Carbon steel effectively poisons the stainless steel.
3. You can use the same tools on different grades of stainless steel (i.e. does not matter if the stainless steel is 304 or 316).
4. When you weld stainless steels often you can get segregation in the heat affected zones (HAZ). To mitigate this manufacture forces oxidation using a chemical after welding (artificial passivation). If the chemical is not completely removed this will cause a problem. It is important to have good washing and rinsing protocols. Don't rely on blasting to remove those chemicals. Wash rinse and neutralize if possible.

e. Microbiologically Influenced Corrosion (MIC)
   1. This can occur in almost any environment (including drinking water systems on the chlorinated side). Our chances of eliminate this is zero.
   2. To address this, you need to identify the species that are involved, this determines the mitigation plan.

f. Group discussion
   1. The group asked Glenn Stark to comment on cathodic protection. Glenn Stark commented that these systems need to be monitored and maintained (regardless if it is an active or passive system). These systems are not a set it and forget it, you need an active annual maintenance / monitoring program.
   2. The group asked if 304L and 316L perform differently. Glenn Stark responded the "L" stands for low carbon (makes it easier to weld). The corrosion behavior of these materials are roughly the same for 304 and 316.
   3. The group asked if there are guidelines available for the welding process. Glenn Stark commented that this ultimately ties to the ASTM material standard. The ASTM range for various metals is too big. Can have fabrication challenges if you receive metals on the low end, the middle range is ideal. However, mills will be targeting just above the minimum as it cost more to hit the middle. Get stainless steels from reputable suppliers that is delivering clean stainless steel. Get the mill certifications.
   4. The group asked what equipment can be used to validate steel content. Glenn Stark commented that there are lot of handheld units that can identify heavy elements, but carbon (a light element) can be tested by sending a sample to a lab. Carbon ultimately is what the welding engineer needs to know.

iv. Group discussed next steps.
   a. Nabi Almeida suggested we could go out for a straw ballot to collect more feedback from members.
   b. Brian Klaponski suggested we should incorporate the presented learnings into the guide including possibly adding an annex specifically for fabricating stainless steels.
   c. **Brain Klaponski made a motion to generate a taskforce to review the information presented and come back to the group with recommendations on how to incorporate into the current draft. Second by Nabi Almeida. Motion unanimously approved.**
      1. Task force members include: Tiffany Lucas (chair), Nabi Almeida, John Vartanian, Will Elliott, Mike Zarnowski, Audrey Siebert-Timmer, Vinay Patel.
      2. Glenn Stark volunteered to participate in the task force in a technical advisor (non-voting) role.

9. New Business:

i. No new business was discussed.

10. Next meeting: October 29, 2024 in St. Louis, Missouri, USA.
    i. The following attendees requested membership and will be added to membership for the Fall 2024 meeting:
        a. Javier Arteaga, Hitachi Energy
        b. Jeffrey Brooks, Power Engineers
        c. Vinay Patel, Consolidated Edison Co. of NY
        d. Igor Simonov, Toronto Hydro
        e. Reinaldo Valentin, Duke Energy

11. **The meeting was adjourned at 6:02 PM PST.**

Submitted by: Audrey Siebert-Timmer

Date: 03/12/2024

Old Business:

None

New Business:

- Dan Mulkey - reminder to WG going to ballot. Please send him a membership list since spreadsheets are being developed to help notify members. Color wheel examples were shown on IEEE site that show the proper stages with links to requirements.
- Brian Klaponski - consider creating a document to help with corrosion issues
- George Payerle - reminder about signing the card for Greg Anderson
- George Payerle - 5 or 6 years as Chairman, so there will be a leadership change once reviewed/approved by the Transformer Committee Chairman

Next meeting:

October 30, 2024 St Louis, MO at 11am

Meeting adjourned at 11:26 PST

Respectively submitted by George Payerle - 3/13/2024