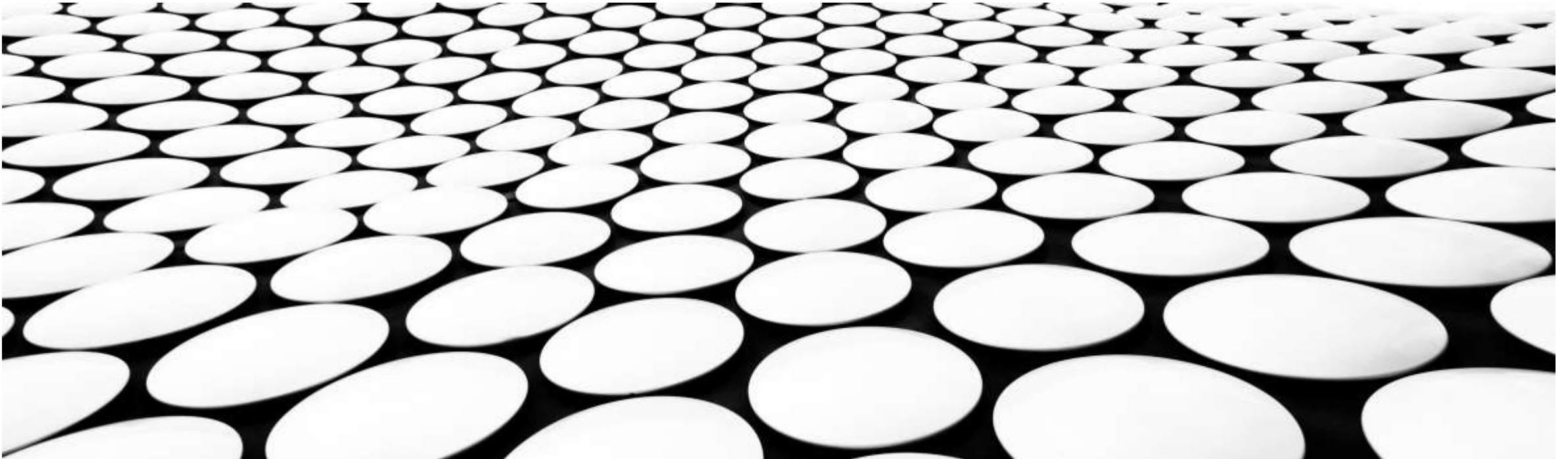


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IEEE STNP TASK FORCE

# **CORROSION EFFECTS ON SUBSURFACE TRANSFORMERS & NETWORK PROTECTORS**

*SPRING 2021 MEETING*



# CORROSION TASK FORCE

## SPRING 2021

### Meeting Agenda

#### 1. Initial Tasks

- a) Call to Order, Introductions & Rosters
- b) Call for Patent Claims & Copyright Notice
- c) Review of [Fall 2020 Meeting Minutes](#) & Approval
- d) Review of Meeting Agenda & Approval

#### 2. Historical Corrosion Reports ⇒

#### 3. 3D CT-scan Stainless-Steel Pitting Corrosion Analysis ⇒

#### 4. Task Force Next Steps? ⇒

## FALL 2020 MEETING AGENDA IEEE/PES TRANSFORMER COMMITTEE STNP CORROSION TASK-FORCE

Location: Online Virtual Meeting  
Webex Meeting Rooms  
Date: Tuesday, April 27<sup>th</sup>, 2021  
Time: 2:20 → 3:35PM  
CENTRAL TIME ZONE

### Agenda Items

#### 2:20 → 2:30 Initial Tasks

- Call to Order, Introductions & Rosters
- Call for Patent Claims & Copyright Notice
- Review of [Fall 2020 Meeting Minutes](#) & Approval
- Review of Meeting Agenda & Approval

Online Meeting  
Webex Meeting Room  
Session 2  
[\(see meeting details\)](#)

#### 2:30 → 2:35 Historical Corrosion Reports

- Public release of 1968 GE corrosion report. This report is the origin of AISI 409 for 1-phase submersibles. (Also see [IEEE Transactions Article](#))
- 1972 [IEEE Transaction Article](#) detailing enclosure material history since early 1900's
- Request in-progress to release 1991 GE/ConEd corrosion report evaluating different stainless steel alloys

#### 2:35 → 2:50 Review of 3D CT-scan analysis of stainless-steel pitting corrosion from hardware compatibility testing

- Analyzed samples were from material compatibility corrosion experiment reported in F20 meeting

#### 2:50 → 3:30 Task Force Next Steps

- Should we pursue a PAR for a Guide, or simply provide general recommendations to STNP?
- Review initial draft of recommendations & request for volunteers to write recommendations

#### 3:30 → 3:35 Conclusion & Summary of Action-Items

# CORROSION TASK FORCE

## SPRING 2021

Membership = 36, Quorum = 19

<b>Martin</b>	<b>Bachand</b>	<b>Roger</b>	<b>Hayes</b>	<b>George</b>	<b>Payerle</b>	<b>Paul</b>	<b>Su</b>
Juan Carlos	Cruz Valdes	<b>Ramadan</b>	<b>Issack</b>	<b>James</b>	<b>Ratty</b>	<b>Liz</b>	<b>Sullivan</b>
<b>Thomas</b>	<b>Dauzat</b>	<b>Robert</b>	<b>Kinner</b>	<b>Pedro</b>	<b>Salgado</b>	<b>Michael</b>	<b>Thibault</b>
<b>William</b>	<b>Elliott</b>	<b>Brad</b>	<b>Kittrell</b>	<b>Adam</b>	<b>Sewell</b>	<b>Robert</b>	<b>Tinsley</b>
<b>Matthew</b>	<b>Enders</b>	<b>Brian</b>	<b>Klaponski</b>	<b>Avijit</b>	<b>Shingari</b>	<b>Alan</b>	<b>Traut</b>
<b>Benjamin</b>	<b>Garcia</b>	<b>Justin</b>	<b>Minikel</b>	<b>Audrey</b>	Siebert-Timmer	<b>John</b>	<b>Vartanian</b>
<b>Zoran</b>	<b>Goncin</b>	Michael (Tyler)	<b>Morgan</b>	<b>Igor</b>	<b>Simonov</b>		
<b>Chris</b>	<b>Guertin</b>	<b>Daniel</b>	<b>Mulkey</b>	<b>Jonathan</b>	<b>Sinclair</b>		
<b>Said</b>	<b>Hachichi</b>	<b>Aniruddha</b>	<b>Narawane</b>	<b>Edward</b>	<b>Smith</b>		
<b>Jane</b>	<b>Hall</b>	<b>Dwight</b>	<b>Parkinson</b>	<b>Travis</b>	<b>Spoone</b>		

Membership Addition Rules:  
Membership Retention Rules:

Request Membership  
Attended 3 of the last 5 meetings

## PARTICIPANTS HAVE A DUTY TO INFORM THE IEEE

- Participants shall inform the IEEE (or cause the IEEE to be informed) of the identity of each holder of any potential Essential Patent Claims of which they are personally aware if the claims are owned or controlled by the participant or the entity the participant is from, employed by, or otherwise represents
- Participants should inform the IEEE (or cause the IEEE to be informed) of the identity of any other holders of potential Essential Patent Claims

**Early identification of holders of potential  
Essential Patent Claims is encouraged**

# WAYS TO INFORM IEEE

- **Cause an LOA to be submitted to the IEEE-SA (patcom@ieee.org); or**
- **Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or**
- **Speak up now and respond to this Call for Potentially Essential Patents**

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair

# OTHER GUIDELINES FOR IEEE WG MEETINGS

- **All IEEE-SA standards meetings shall be conducted in compliance with all applicable laws, including antitrust and competition laws.**
  - **Don't discuss the interpretation, validity, or essentiality of patents/patent claims.**
  - **Don't discuss specific license rates, terms, or conditions.**
    - Relative costs of different technical approaches that include relative costs of patent licensing terms may be discussed in standards development meetings.
      - **Technical considerations remain the primary focus**
  - **Don't discuss or engage in the fixing of product prices, allocation of customers, or division of sales markets.**
  - **Don't discuss the status or substance of ongoing or threatened litigation.**
  - **Don't be silent if inappropriate topics are discussed ... do formally object.**

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For more details, see *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and *Antitrust and Competition Policy: What You Need to Know* at <http://standards.ieee.org/develop/policies/antitrust.pdf>

# PATENT-RELATED INFORMATION

The patent policy and the procedures used to execute that policy are documented in the:

- ***IEEE-SA Standards Board Bylaws***  
(<http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6>)
- ***IEEE-SA Standards Board Operations Manual***  
(<http://standards.ieee.org/develop/policies/opman/sect6.html#6.3>)

Material about the patent policy is available at  
<http://standards.ieee.org/about/sasb/patcom/materials.html>

**If you have questions, contact the IEEE-SA  
Standards Board Patent Committee  
Administrator at [patcom@ieee.org](mailto:patcom@ieee.org)**

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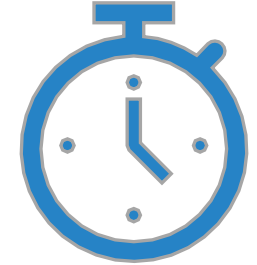


# IEEE SA COPYRIGHT POLICY

- The IEEE SA Copyright Policy is described in the IEEE SA Standards Board Bylaws and IEEE SA Standards Board Operations Manual
  
- IEEE SA Copyright Policy, see  
Clause 7 of the IEEE SA Standards Board Bylaws  
<https://standards.ieee.org/about/policies/bylaws/sect6-7.html#7>  
Clause 6.1 of the IEEE SA Standards Board Operations Manual  
<https://standards.ieee.org/about/policies/opman/sect6.html>
  
- IEEE SA Copyright Permission
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- IEEE SA Copyright FAQs
- <http://standards.ieee.org/faqs/copyrights.html/>
  
- IEEE SA Best Practices for IEEE Standards Development
- [http://standards.ieee.org/develop/policies/best\\_practices\\_for\\_ieee\\_standards\\_development\\_051215.pdf](http://standards.ieee.org/develop/policies/best_practices_for_ieee_standards_development_051215.pdf)
  
- Distribution of Draft Standards (see 6.1.3 of the SASB Operations Manual)
- <https://standards.ieee.org/about/policies/opman/sect6.html>

# CORROSION TASK FORCE

## *SPRING 2021*



### Historical Corrosion Reports

- 1968 GE corrosion report for 1-phase submersibles
  - This report is the origin of AISI 409....but it also recommends the use of zinc galvanic (“sacrificial”) anodes
  - Results also published in [1968 IEEE Transactions Article](#) by Gary Nonken, GE
- 1972 summary of subway tank material history since early 1900’s
  - Report details original tanks constructed of cast iron, and evaluations on “new” materials beginning in 1950’s
  - Most cost-effective solution was found to be molten zinc coated mild-steel (15 year average life)
    - Pre-dates adoption of “copper bearing steel”
    - Zinc coating was effectively just an anode
  - [1972 IEEE Transaction Article](#) by John Donnelly, Boston Edison
- 1991 GE/ConEd Corrosion Resistant Submersible Network Transformer Study
  - Evaluated “copper-bearing steel”, 409, 430 302, 304L, 316L, and other non-ferrous alloys to with testing per NACE, ASTM, etc
  - Request in-progress to release to task-force...

**CORROSION TASK FORCE  
SPRING 2021**

**REPORT ON 3D CT (X-RAY) SCAN**

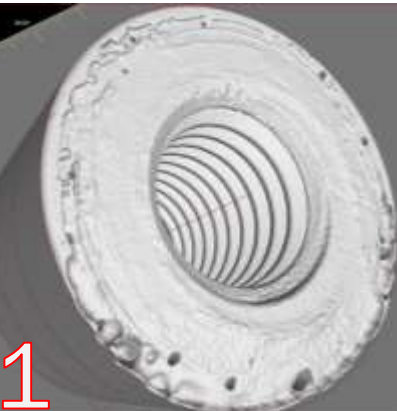
**Bare Copper Cathode**



**Coated Copper Cathode**



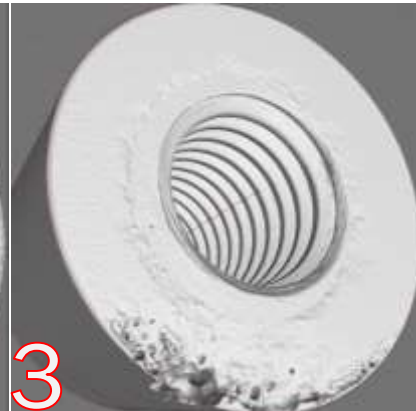
**No Copper Cathode**



Silicon-Bronze Bolt & Washer



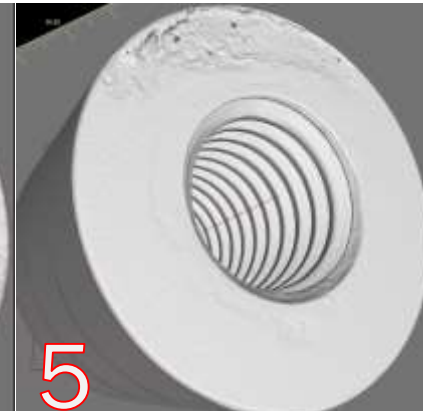
Stainless-Steel Bolt & Washer



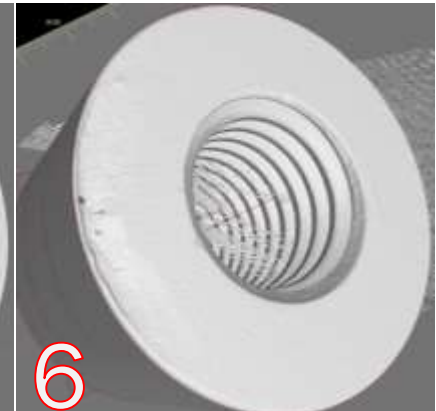
Silicon-Bronze Bolt & Washer



Stainless-Steel Bolt & Washer



Silicon-Bronze Bolt & Washer




Stainless-Steel Bolt & Washer

# CORROSION TASK FORCE

## SPRING 2021

### NEXT STEPS?

- Task-Force Recommendations?
- Draft Recommendations submitted to Task-Force 
- Review & seek volunteers to revise draft recommendations?

### STNP Subsurface Equipment Corrosion Task-Force Recommendations

#### 1 Purpose:

- 1.1 Provide guidance and technical references for utilities, and other owners of equipment in subsurface vaults, including measurements & classifications to define corrosive environments, strategies to mitigate corrosion in the vault, guidance on equipment enclosure specifications, cathodic protection, additional test methods, and technical references. Typical equipment includes Subsurface & Network Transformers, Network Protectors, any related equipment & conductors, and the vault itself.

#### 2 Define the Environment

#### 3 Vault Considerations

#### 4 Equipment Enclosures with Superior Corrosion Resistance

#### 5 Guide to Cathodic Protection (“Sacrificial Anodes”)

#### 6 Simulated Vault Corrosion Testing

#### 7 Standards & References



# CORROSION TASK FORCE

## *SPRING 2021*



### Summary & Next Actions:

- Assignments & Action-Items
- Interim meetings (prior to F21 meeting)?

