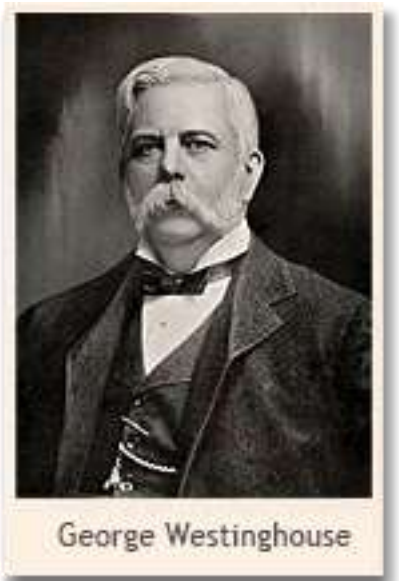

CROWN ELECTRIC
ENGINEERING & MANUFACTURING, L.L.C.

A direct successor to the **Westinghouse Iso Phase Bus** Plant in Cinn Ohio


George Westinghouse

Certificate of Registration

This certifies that the Quality Management System of

Crown Electric Engineering & Manufacturing LLC

175 Edison Drive
Middletown, Ohio, 45044, United States

has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 9001:2008

Scope of Registration:

Design, fabrication, assembly, installation and refurbishment of isolated phase bus; bus duct; custom NEMA enclosures; switchgear; match and line; power houses; transformer and generator throats; forced air cooling units and fabrication and assembly of customer parts and systems.

Certificate Number:	C0164276-IS3
Certificate Issue Date:	26-APR-2016
Registration Date:	29-MAY-2016
Expiration Date *:	14-SEP-2018

Carl Blazik,
Director, Technical
Operations & Business Units,
NSF-ISR, Ltd.

NSF International Strategic Registrations

789 North Dixboro Road, Ann Arbor, Michigan 48105 | (888) NSF-9000 | www.nsf-isr.org

Authorized Registration and /or Accreditation Marks. This certificate is property of NSF-ISR and must be returned upon request.
*Company is audited for conformance at regular intervals. To verify registrations call (888) NSF-9000 or visit our web site at www.nsf-isr.org

Credentials


24/7

Private Ownership

We pick up the phone after 5pm

513-312-8527

Chad Shell

914-968-4440

Bruce Hack

Owners – Crown Electric

In 2006
Crown Electric built
the **Newest IPB factory** in North America


FUTURE HOME OF
CROWN ELECTRIC
Fabricators to the Utility Industry
Design/Build contracting by...
CINCINNATI
COMMERCIAL
CONTRACTING

In 2010 – in the middle of the worst recession the US has had since the Great Depression **Crown Electric doubled our factory** and added 6,500 sq. ft. of office space.

And 50,000 sq ft of fenced in area for delivery staging.

Crown Electric is partnered with some of the Industry's largest OEM's

Crown Electric furnishes and installs IPB for GE Generator Circuit Breakers

Crown Electric furnishes and installs IPB for Siemens Energy Services

Crown Electric is the industry's successor to Westinghouse and their Circular Non Seg Bus Duct

HIGH AMPERAGE CIRCULAR NON-SEG BUS

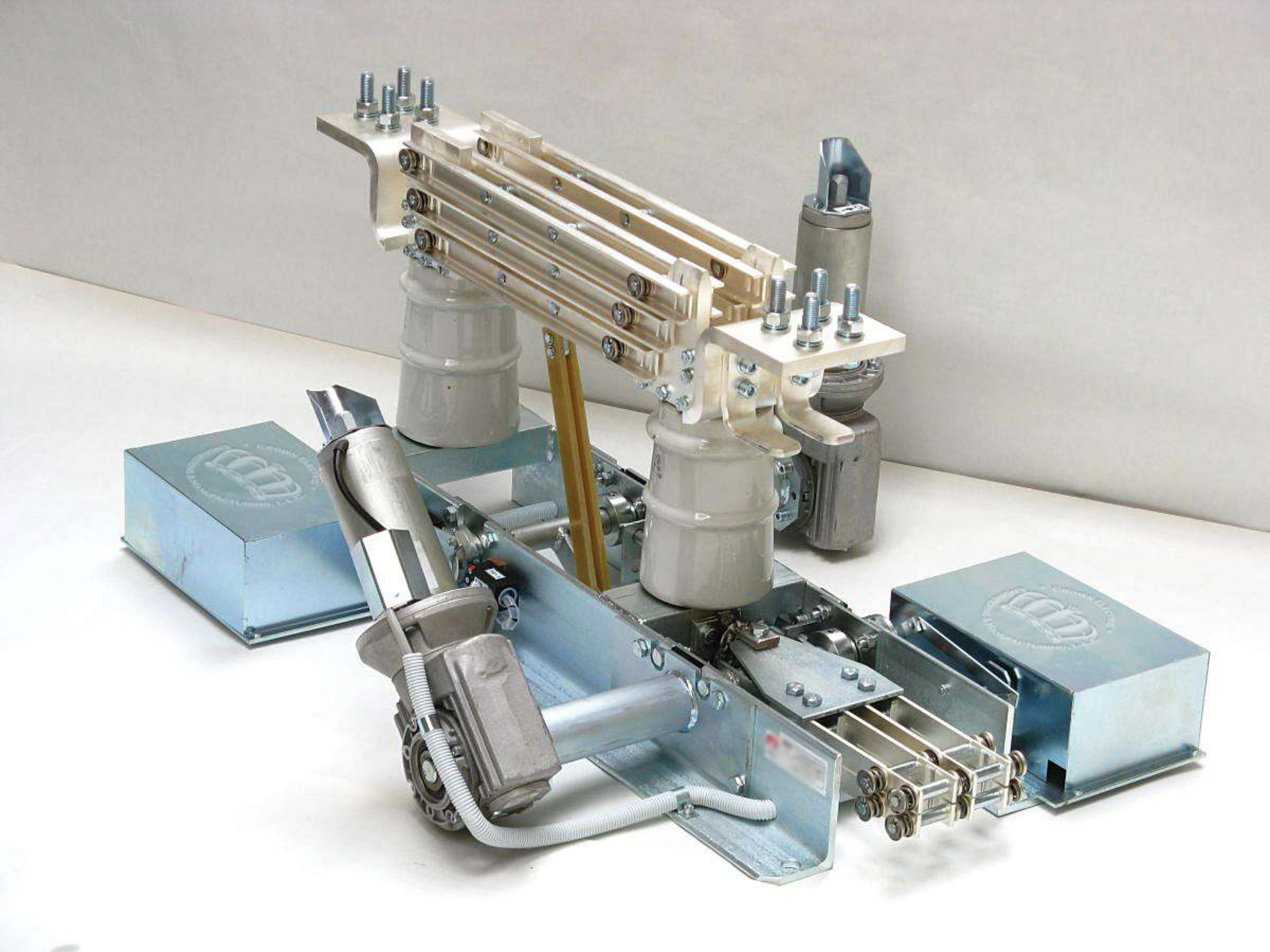
"Built Like Iso-Phase; Competitive with Non-Seg"

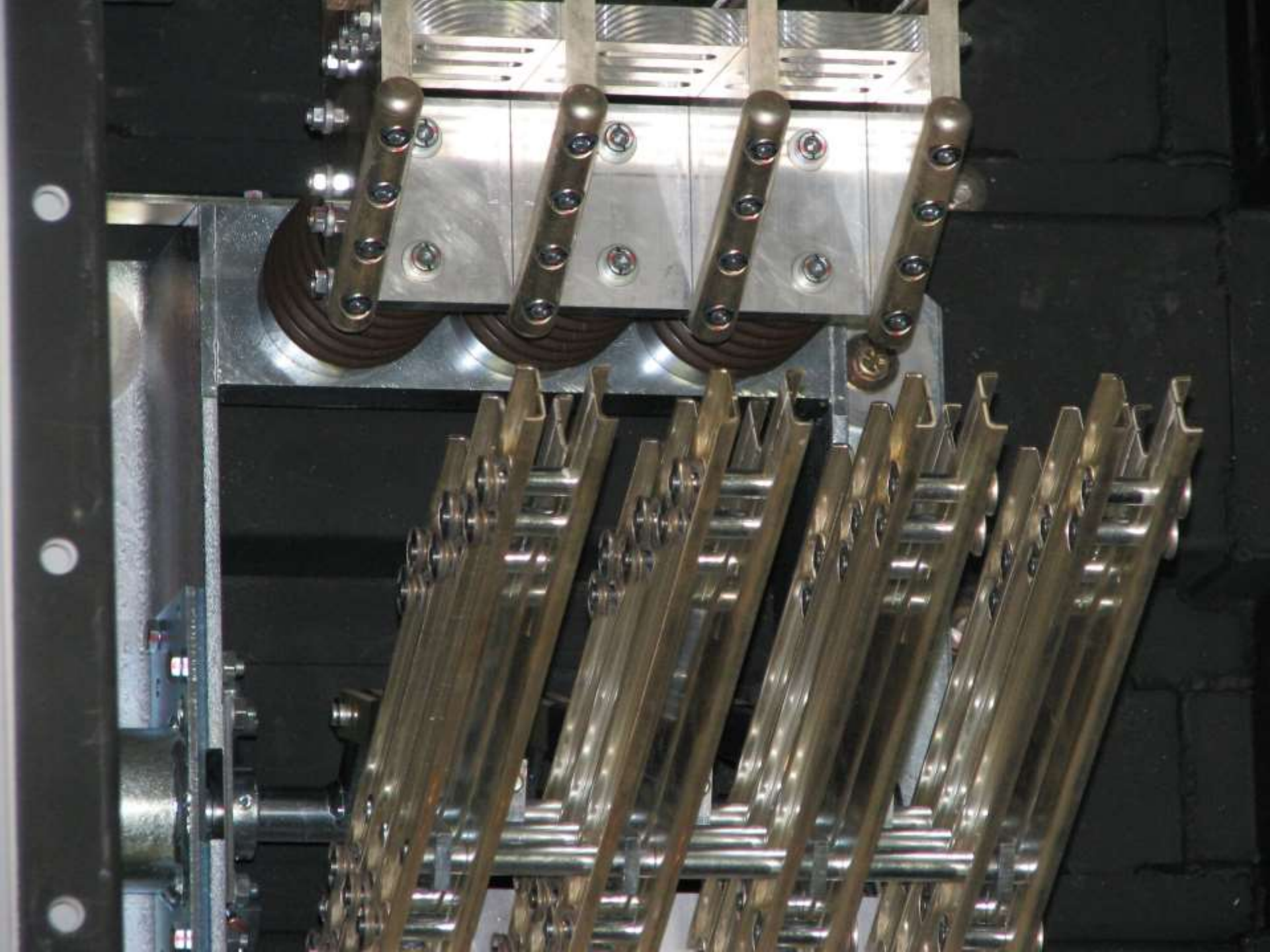
Crown Electric Engineering and Manufacturing LLC designs, fabricates,
and installs Iso Phase Bus and Circular Non-Seg Bus Systems.
Crown also maintains and upgrades IPB for most domestic legacy installations.

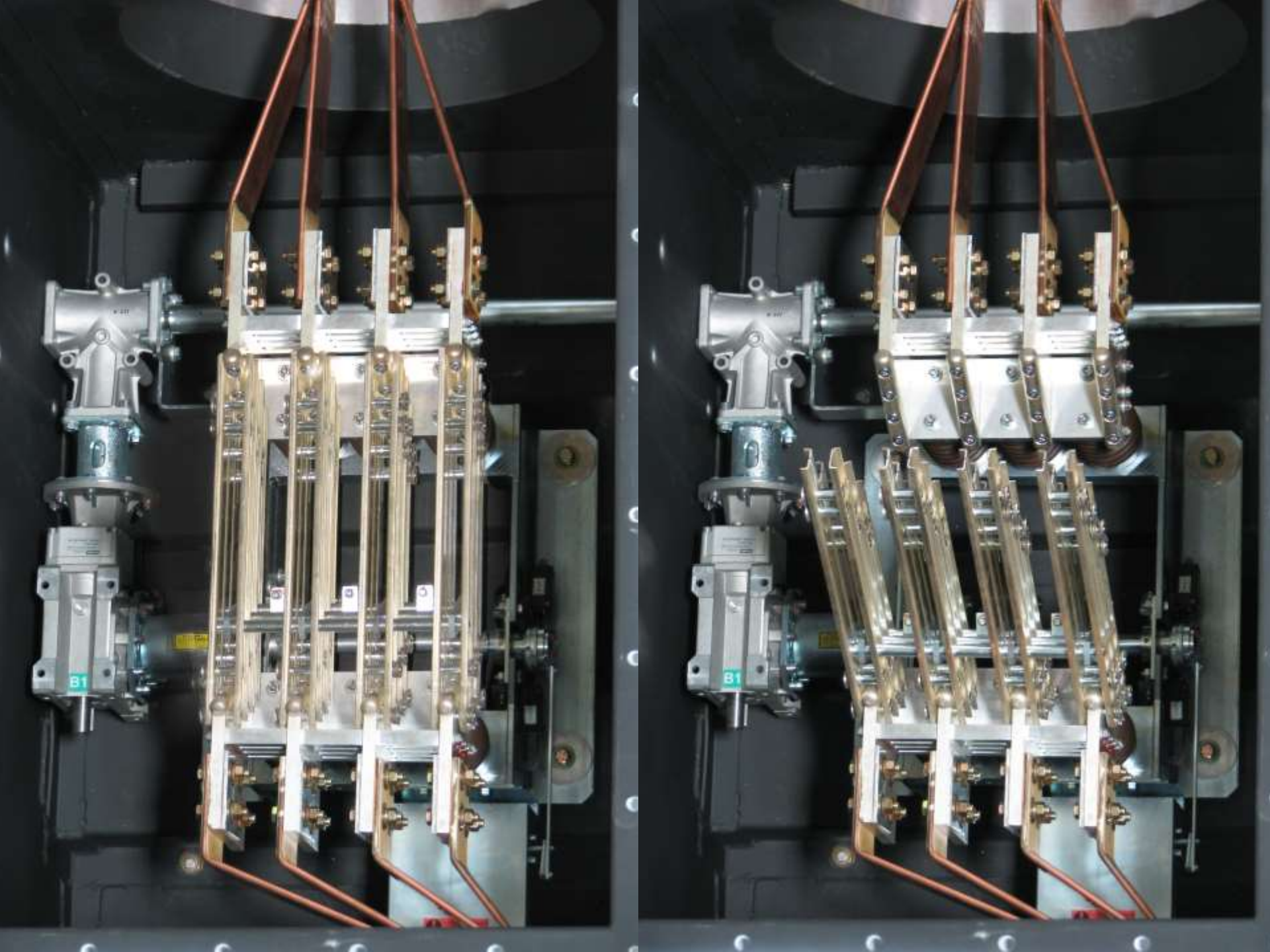

45t
60t
75t


CROWN ELECTRIC
EST. 1987
ENGINEERING & MANUFACTURING, L.L.C.

Crown Electric introduced its own line of Disconnect Switches to 30,000 Amps



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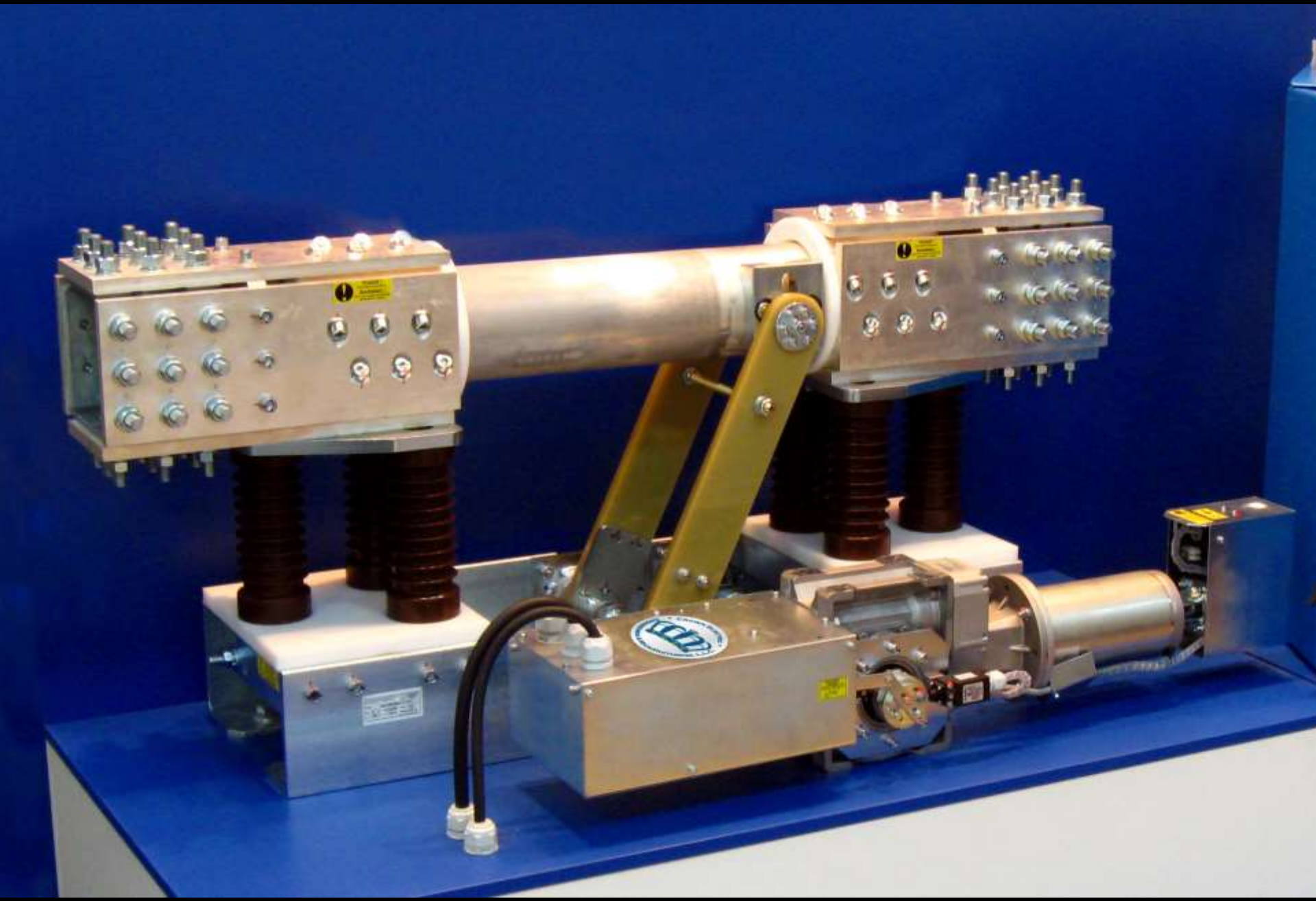
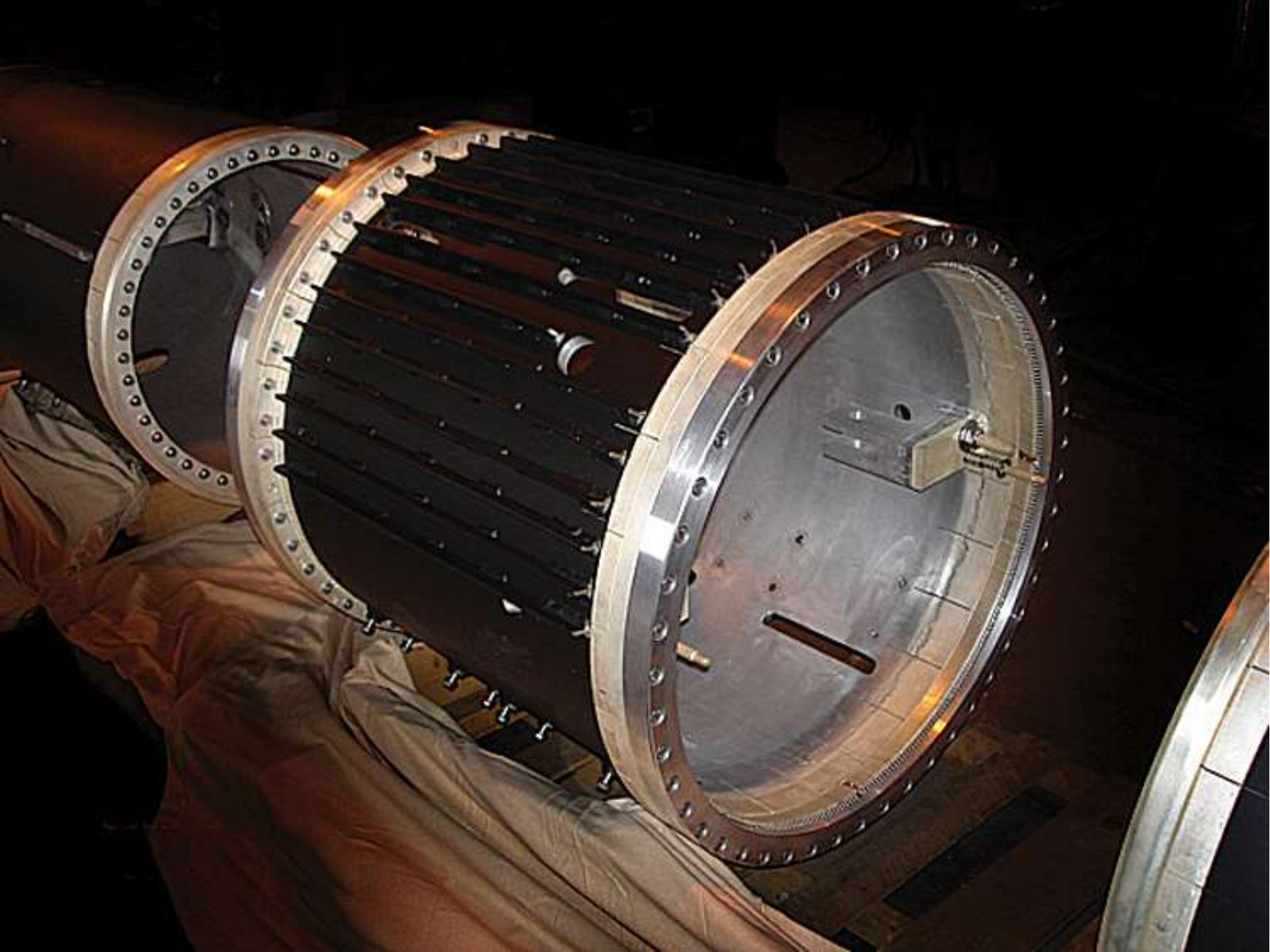




Crown Electric developed the Joule-ious 105 online thermal monitor

CROWN ELECTRIC

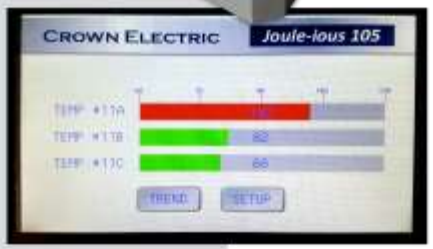
Joule-ious 105

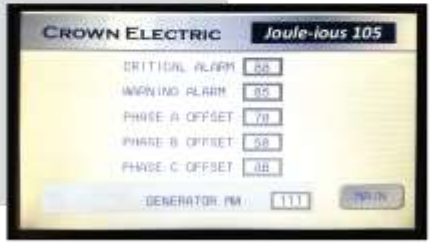
Iso Phase Bus - On-Line Thermal Monitor

Protect Your Assets

Iso Phase Bus - Real Time Monitoring
Includes generator and GSU Tx bushing connections

- 24/7 monitoring, data logging, annunciation and alarming.
- Infrared temperature sensor provides accurate "no touch" temperature readings.
- Visual indication for critical alarm levels on each phase.
- 15 minute data point trending with 1 year of data storage.
- Wide angular eyeball mounting bracket allows for easy installation and positioning.
- Analog and digital communication available.





Joule-ious 105 - Spec chart

Power Supply: 2A at 120V
Temperature Rating 45C
IR Sensor:
Monitoring Range: 0 – 200C
Accuracy: 2%
Spot Size: 12:1
Options:

- 65C Temperature Rating
- Additional 3 temperature sensors
- Generator MW input (4-20mA)
- Alarm Output

Custom high angular ball mount

Crown Electric offers the ***Joule-ious 105*** On Line thermal monitoring system for both new and retrofit IPB applications.

The ***Joule-ious 105*** is a ruggedized, high accuracy infrared, touch-less thermal sensing system.

Joule-ious 105 sensors are mounted on the Iso Phase Bus enclosures pointing at the conductor where it adjoins with the major capital equipment (Generators and GSU transformers).

The ***Joule-ious 105*** continuously monitors, logs, reports and annunciates IPB temperature at each surveillance point.

Multiple pre-alarms and alarm levels are fully programmable.

Reporting and alarming can be local, remote, wired or wireless.

Rugged and easy to install sensors

Now IPB Temperature Monitoring is easy and in your hands.

CROWN ELECTRIC ENG. & MFG. LLC

IPB and More

- Disconnect Switches
- Generator Breakers
- Full Turn-key Installation
- On-Line Thermal Monitoring
- Engineering Upgrade Studies
- Replacement and Uprated IPB Coolers

Fabricators to the Utility Industry

513 539-7394

175 Edison Dr. • Middletown, OH 45044
www.crown-electric.com
sales@crown-electric.com

Crown Electric is the only North American IPB manufacturer with full factory based field service and installation capabilities.

Crown Electric

the people who build your IPB, install your IPB


CROWN ELECTRIC
EST. 1981
ENGINEERING & MANUFACTURING, L.L.C.

Crown Electric provides material & services to the nuclear industry

A POWER Engineering Publication

NPI NUCLEAR POWER INTERNATIONAL MAGAZINE®

Nuclear execs discuss the industry's past, present & future

A look inside an iso bus failure at Callaway
Automated callouts reduce wait times
Lasers cut decommissioning dangers

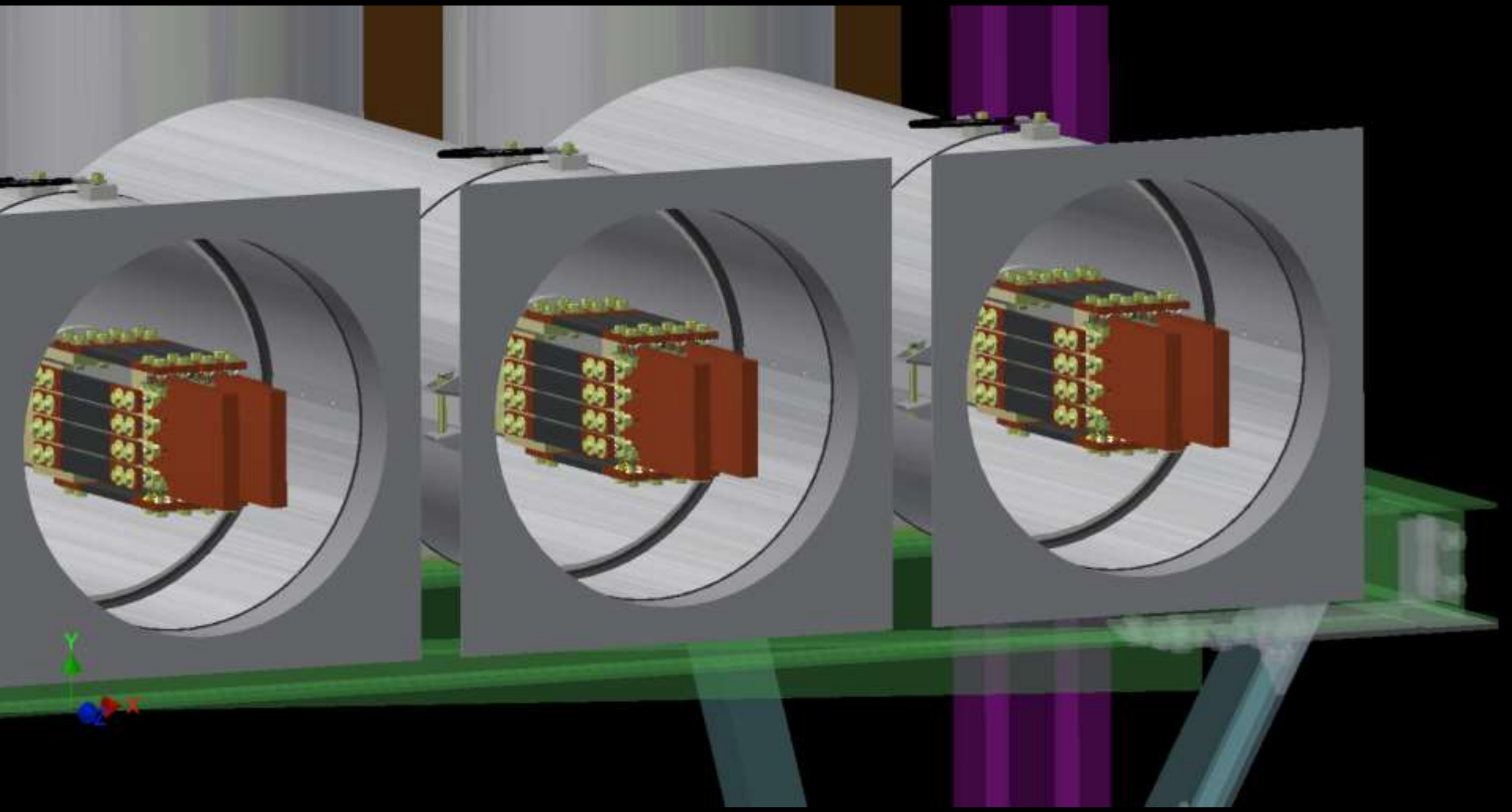
Photo courtesy: IAEA - Fukushima Nuclear Plant

Departments

Features


07/30/2013

Engineering submittals in 3D CAD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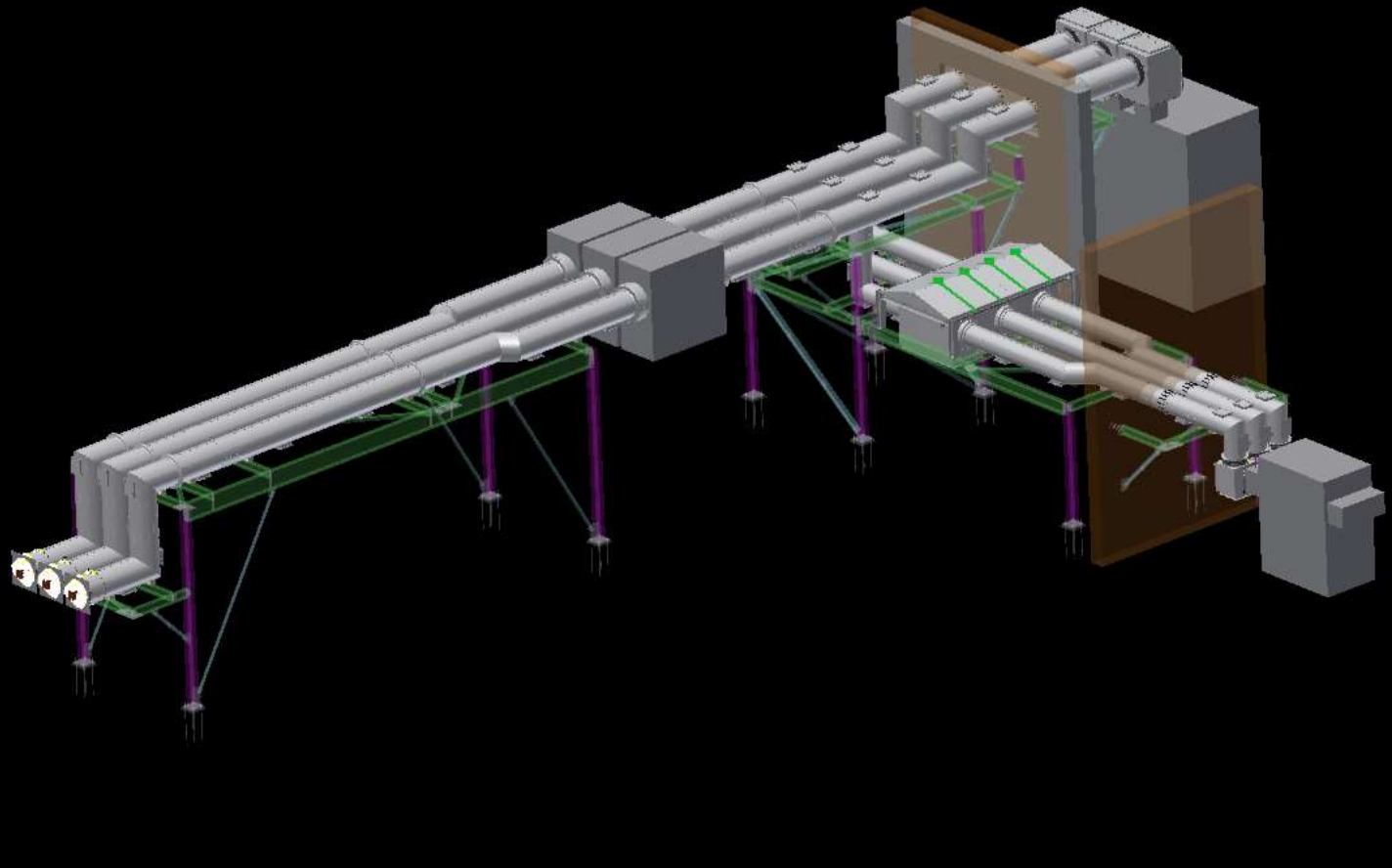
Y
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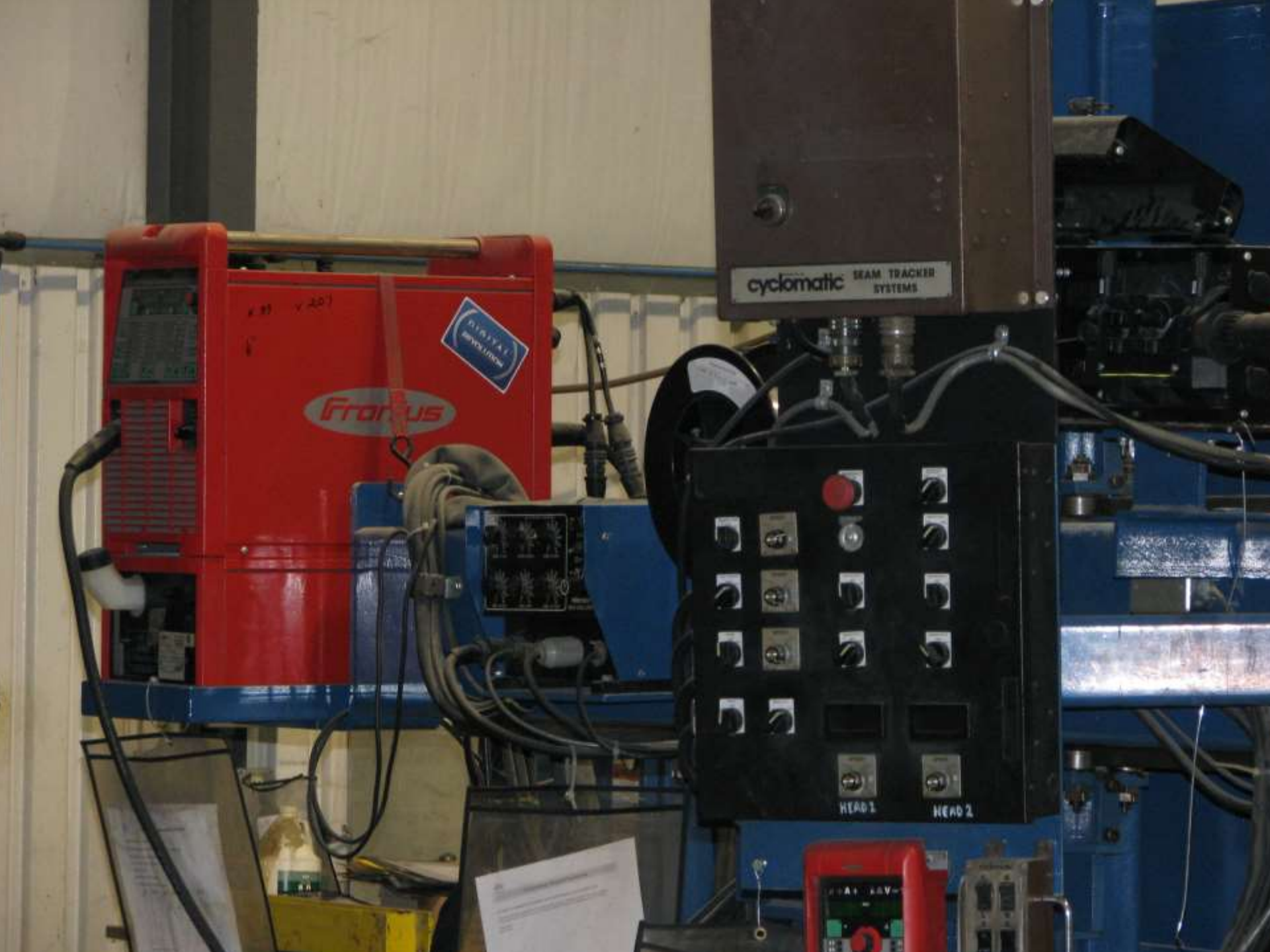
X

Computerized **welding**


PANDJIRIS


PANDJIRIS
Fronius


cyclomatic
SEAM TRACKER
SYSTEMS
Fronius
HEAD 1
HEAD 2


cyclomatic
SEAM TRACKER SYSTEMS
Fronius
PANDJIRIS
ST. LOUIS MO.
HEAD 1
HEAD 2

Crown Electric's computerized welds are all capable of being certified

And **Crown Electric's** most senior design engineer(s) are **CWI's**

Crown manufactures all manners of custom cabinetry, medium voltage switchgear & outdoor houses


AMERA 5400 LB / 2450 KG WLL

MASSACHUSETTS DATA PLATE ADDENDUM

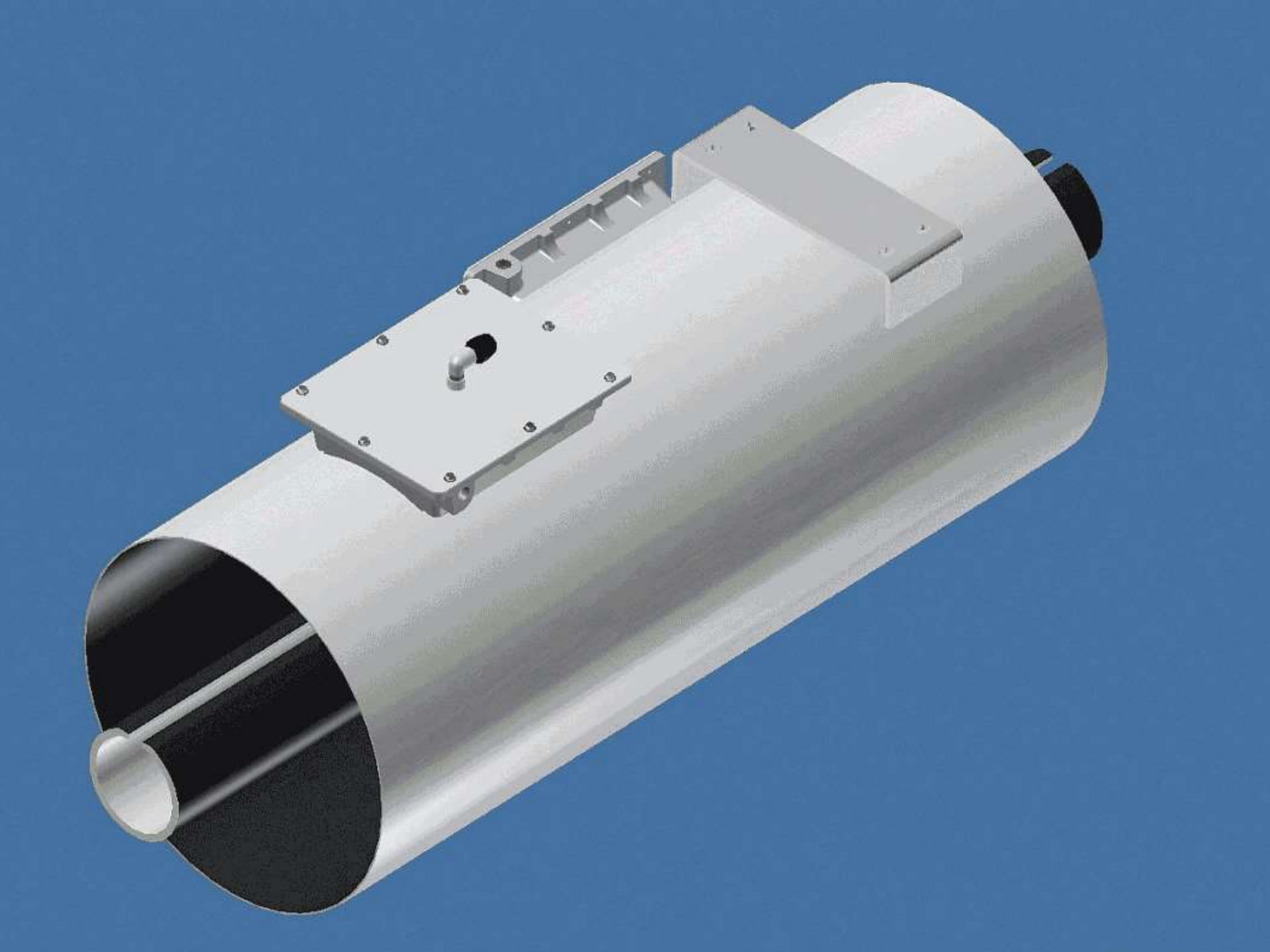
Water Connection Directions	N/A
Drain Connection Directions	N/A
Floor Loads: Live	50 psf/100psf S.G. Area Dead: 10 psf
Electrical Instructions:	Dwg. 080012-E001 thru E012 & C001 – C007
Electrical Warning	**DANGER HIGH VOLTAGE**
Methods of Assembly or Joining Multiple Units	N/A
Height & Story Limitations	1 story
Floor Area	14' x 25'
Min. Side Yard Required for Fire Rating	10ft.

Crown Electric designs, fabricates & installs **IPB replacement and uprated coolers** – to nuclear plant size

Crown Electric does more **GSU change-outs** than anyone. And we do them **turn-key**

IPB
Specification Considerations

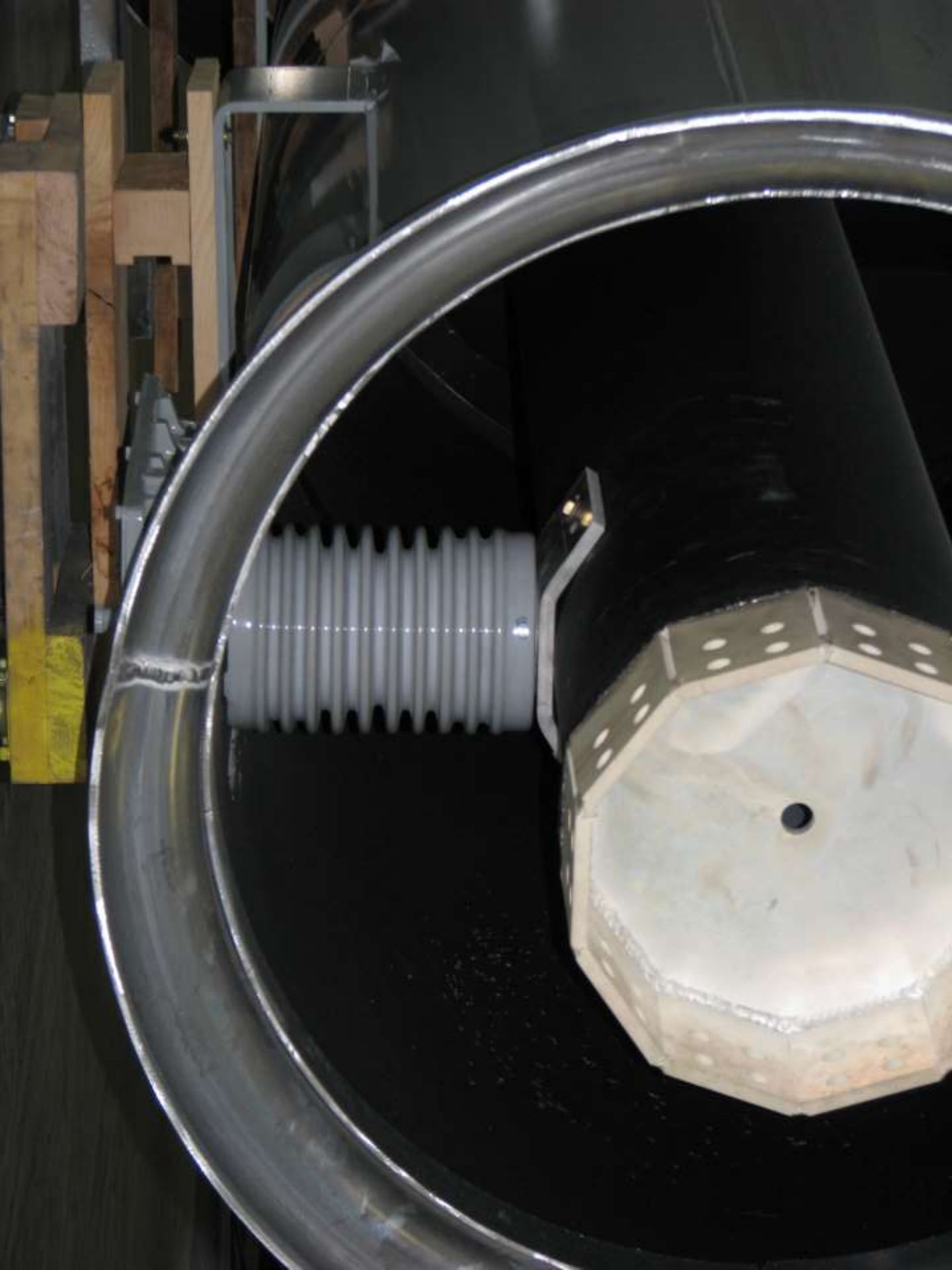
Crown's insulator support windows are a thoughtfully designed system.



There is great value in having **IPB insulator support windows** that allow for visual inspection and cleaning.


Dayton

Crown Electric requires only one (1) insulator per support point.



Lets get to know ANSI/IEEE C29

Iso Phase Bus insulators should be **Dew Point** rated

NEMA Standards Publication

ANSI

ANSI/NEMA C29.1-1988 (R2002, R2012)

American National Standard for Test Methods for Electrical Power Insulators

National Electrical Manufacturers Association

NEMA Standards Publication

ANSI

ANSI/NEMA C29.10-1989 (R2002, R2012)

American National Standard for Wet Process Porcelain Insulators - Indoor Apparatus Type

National Electrical Manufacturers Association

Lets look at
C29.1
section **4.6**

4.5.2 Precipitation. The precipitation shall be applied in accordance with subsection 1.3.3.2 and Table 1.2 (Practice in USA) of ANSI/IEEE 4-1978.

4.5.3 Preparation of Test Specimen. The preparation of the test specimen shall be in accordance with' subsection 1.3.3.2 of ANSI/IEEE 4-1978.

4.5.4 Voltage Application. 75% of the rated wet withstand voltage may be applied in one step and gradually raised to the required value in not less than 5 nor more than 30 seconds.

4.5.5 Test Voltage and Time. The test voltage, which is the rated wet withstand voltage, with appro-priate atmospheric corrections applied, shall be held on the test specimen for 10 seconds.

4.5.6 Corrections. Corrections shall be in accordance with 4.2.4, except that no correction shall be made for humidity. The test voltage applicable to existing atmospheric conditions is obtained from the rated withstand voltage, as given for standard atmospheric conditions, by use of the following equation:

$V = V_s \times s$

where;
V = test voltage, in kilovolts, applied to test specimen
V_s = rated withstand voltage, in kilovolts
s = relative air density

4.6 Low-Frequency Dew Withstand Voltage Tests

4.6.1 Preparation of Test Specimen. The test specimen shall be placed in a chamber having a temperature of from -10°C to -150C.(14°F to 5°F) until the specimen is thoroughly cooled. (Cooling may take 10 to 12 hours.)

4.6.2 Mounting Arrangement. The test specimen shall be mounted in accordance with Section 3 in a test chamber having a temperature of approximately 77°F (25°C). The relative humidity in the test chamber shall be approximately 100%. This may be obtained by passing live steam at atmospheric pressure into the chamber.

4.6.3 Voltage Application. The voltage shall be raised rapidly to dew withstand test voltage,-while the test specimen is completely covered with dew. The time to raise the voltage shall be not more than 20 seconds.

4.6.4 Test Voltage and Time. The test voltage, which is the rated dew withstand voltage with appropriate atmospheric corrections applied, shall be held on the test specimen for 10 seconds.

4.6.5 Corrections. Corrections shall be made in accordance with 4.5.6.

4.7 Impulse Flashover Voltage Tests

4.7.1 General. Impulse flashover voltage tests are made under dry conditions only.

4.7.2 Mounting Arrangement. The test-specimen mounting for impulse flashover voltage tests shall be in accordance with Section 3.

4.7.3 Impulse Voltage Wave. All tests shall be made with a 1.2 X 50-microsecond wave, in accordance with ANSI/IEEE 4-1978.

4.7.4 Critical Impulse Flashover Voltage Value. The critical impulse flashover voltage shall be determined in accordance with ANSI/IEEE 4-1978.

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4.6.5 Corrections. Corrections shall be made in accordance with 4.5.6.

Lets look at

C29.1 0

Table **2**

Table 1			
Metric Equivalents			
Inches	Millimeters	Inches	Millimeters
1/32	0.8	4-1/2	114
1/2	13	5	127
9/16	14	6	152
5/8	16	6-1/4	159
3/4	19	7	178
7/8	22	7-1/2	191
1	25.4	8	203
1-1/8	29	8-1/2	217
2	51	9	229
2-1/2	64	10-1/2	267
3	76	12	305
3-1/2	89	15	381
3-3/4	95	16-1/2	419
4-1/4	108		

Table 2			
Electrical Characteristics			
	Withstand Test Voltage (kV)		
Nominal Voltage Rating (kV)	Impulse	Low-Frequency Dry, One Minute	Dew, 10 Seconds
2.4	45	15	10
4.8	60	19	15
7.2	75	26	24
13.2	95	36	26
14.4	110	50	30
23.0	125	60	40
23.0	150	60	40
34.5*	150	80	--
34.5*	200	80	--

*The 34.5-kV insulator units are for bus supports and front-connected devices only.

Table 3				
Mechanical Characteristics of Strength Class A-10				
Nominal Voltage Rating (kV)	Cantilever* (Pounds)	Torsional (Inch-Pounds)	Tensile (Pounds)	Compression (Pounds)
2.4	750	1500	11500	10000
4.8	750	1500	1500	10000
7.2	750	1500	1500	10000

*Cantilever strength ratings are given 2-1/2 inches above the cap.

Table 2

Electrical Characteristics

Nominal Voltage Rating (kV)	Withstand Test Voltage (kV)		
	Impulse	Low-Frequency Dry, One Minute	Dew, 10 Seconds
2.4	45	15	10
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13.2	95	36	26
14.4	110	50	30
23.0	125	60	40
23.0	150	60	40
34.5*	150	80	--
34.5*	200	80	--

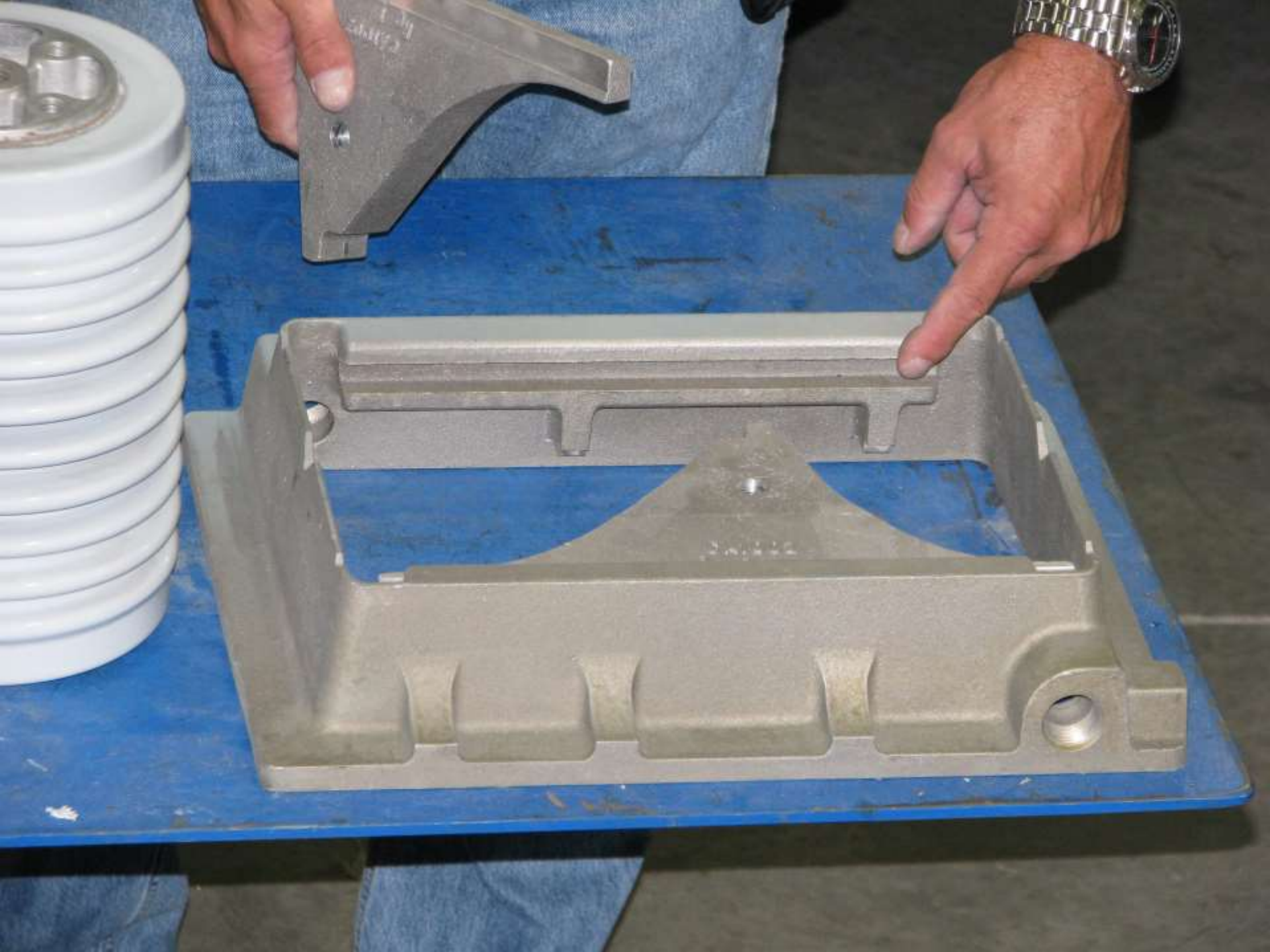
*The 34.5-kV insulator units are for bus supports and front-connected devices only.

Dew Point rated insulators mean you never need pressurization and it is totally passive.

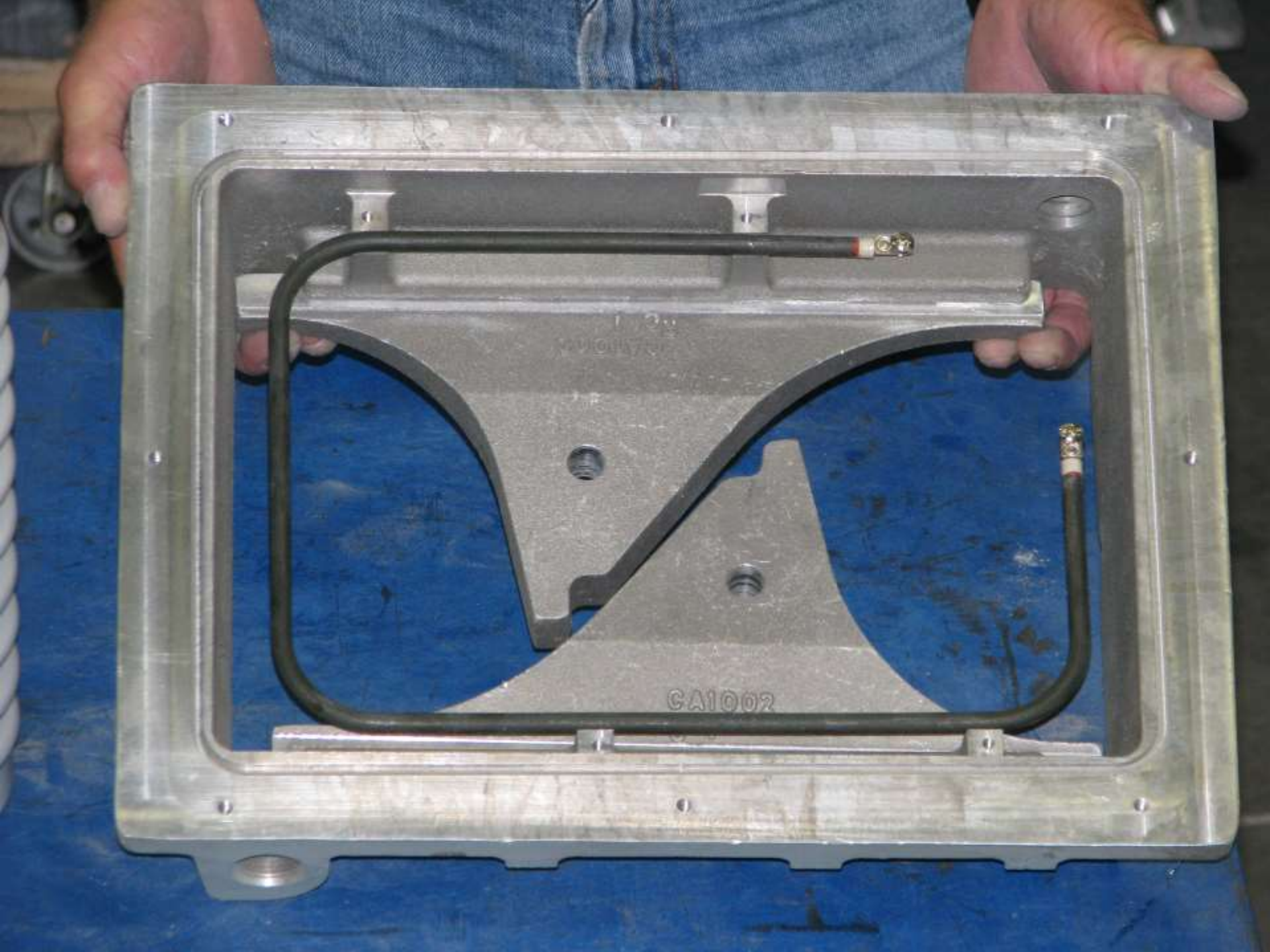
No leaks.
No pressurization systems to maintain.
No loss of BIL.
No down time

Never accept pressurization without applying an evaluation penalty.

The **Westinghouse slider mounting design** allows insulators to harmonize with thermal expansion and better dissipate short circuit forces.



Windows hold space heaters and can be field upgraded well after initial install.


CA1002

Windows accept electric conduit connections on either side.

Windows use
“O” rings
not gaskets.

Windows
hold drain plugs and breathers

Now
lets discuss the

IPB's Enclosure

I have two questions for you that we can discuss in more depth at some later time off-line.

1 – Did you know that IPB enclosure current is more or less equal to the conductor current ?

For all practical purposes – IPB is a transformer with a 1:1 turns ratio.

Your specs could well improve the IPB product you get if they clearly state that enclosure max. temperature of 80 degree C shall be calculated at 100 % of the same maximum current value as the IPB conductor

2 – If you evaluate and charge for losses in transformers – why don’t you do the same evaluation for IPB ?

It’s the same electrons and the same heat (energy) lost from the production process.

Something to notice on

Enclosures for connecting IPB to capital equipment.

Notice the **Covers**

See how they **mount?**

Those raised welded mounting frames takes:

Engineering
Drafting
Fabrication
Welding
Finishing

Those raised welded mounting frames…

$ Cost money $

If you want them.
You need to specify them.

BTW

Shipping sections

#’s of shipping sections

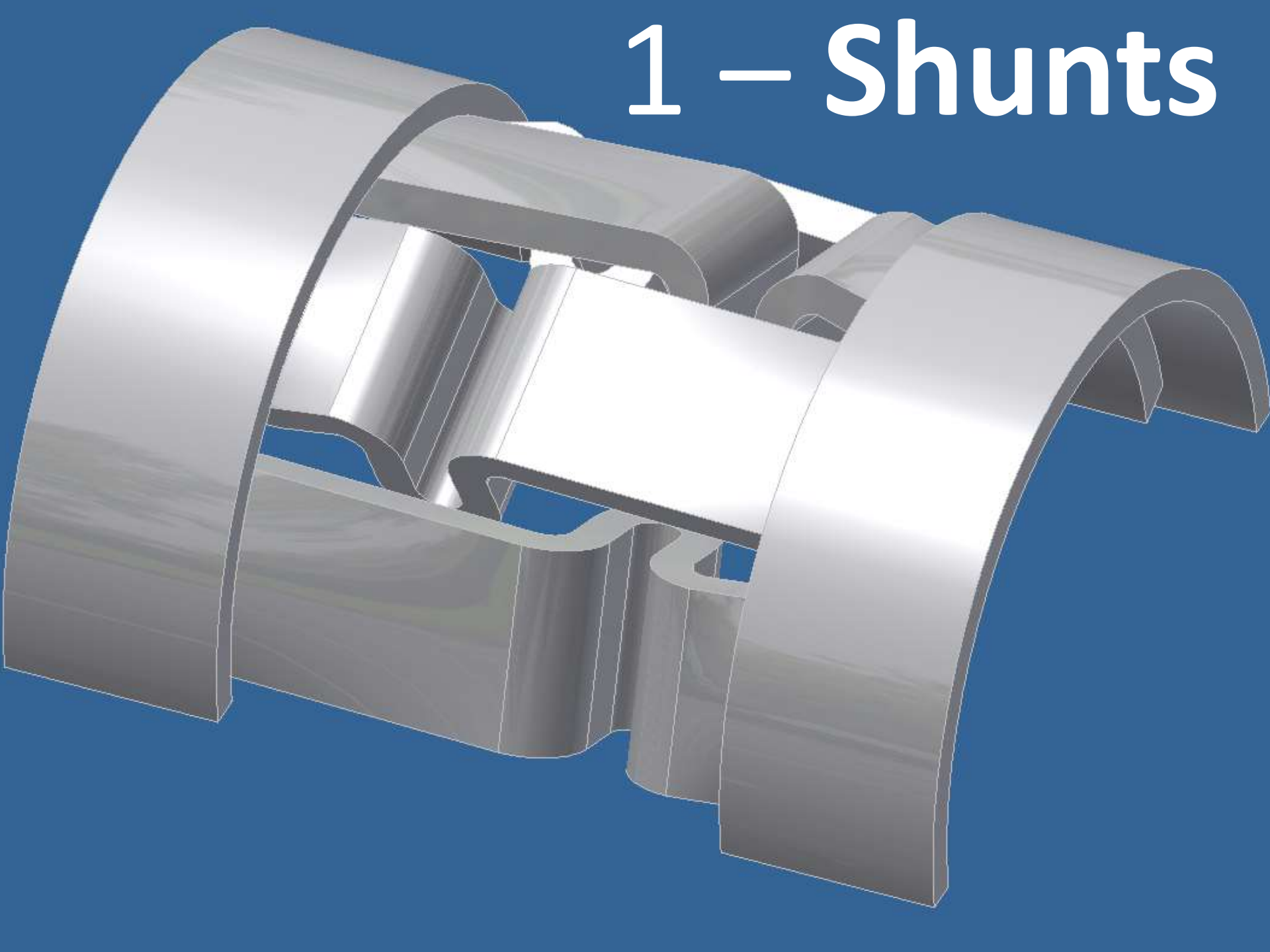
Points of break in shipping sections

All cost installation $$’s

Consider discussing this issue with your bidders during the evaluation process

As we wind down- allow me to point out **two more things worth knowing about**...

1 – Shunts



Shunts are made of bundles of very thin laminates of aluminum. And they move (often).

The shunt bundles should be **welded on the inside – not the outside**. A broken laminate can bend outward toward the ground plane !

2 – know your connection points. They should be quality **silver plated**. The silver plating should be per a certified procedure.

Spec 3-5 mils.
And vendor should provide certification with their bid.

NEVER accept wipe-on silver plating.

Silver Plating
A Special Process at Crown Electric

When Crown Electric began using the Electrodeposited silver plating machines, the instructions with the machines were vague in what was needed to meet the standards of our industry.

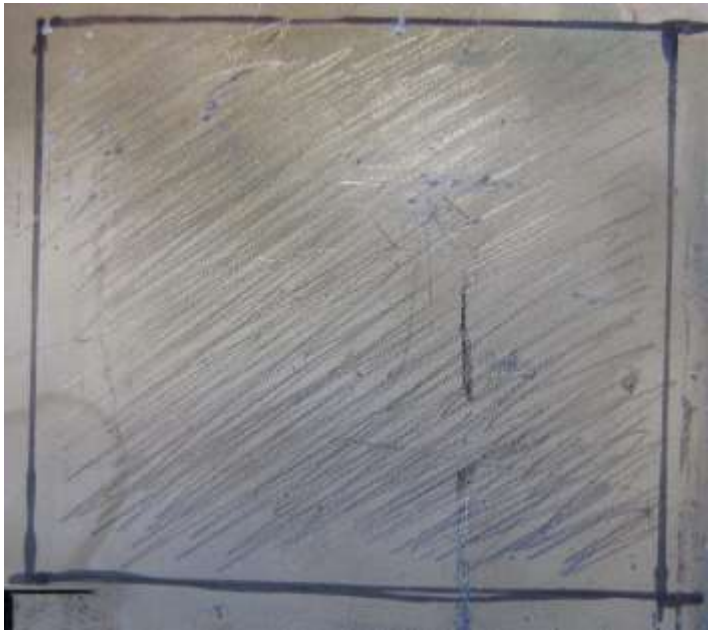
The instructions showed how to plate, but lacked the information on how much or how long to deposit the silver to achieve the desired results.

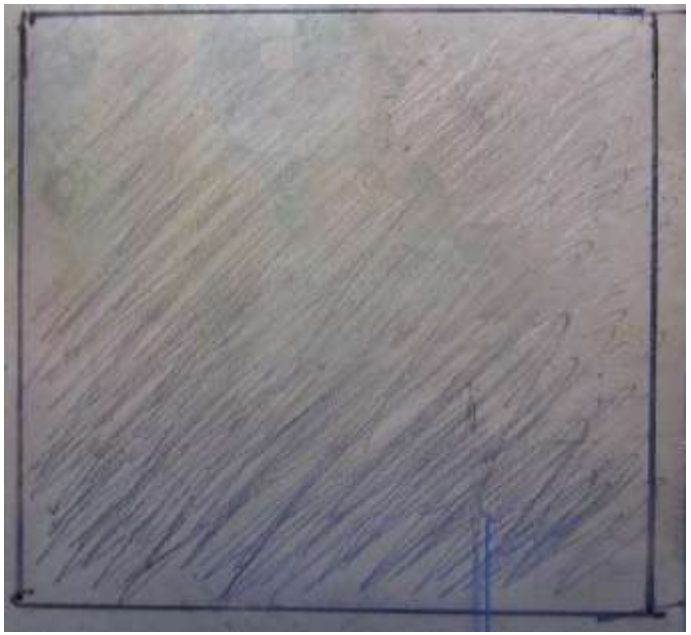
We researched and purchased the standards that apply to the process. The first standard is for adhesion ASTM B571-97; we needed to know that the silver stayed in place. The second is the standard for thickness ASTM B700-08.

According to the standard ASTM B700-08 the thickness for electrical contact connectors of limited wear is 2.5 micrometers. At Crown we wanted a margin greater than 2.5μm to ensure supply of a consistent and superior product. So we embarked on the task of preparing coupons and plating at incremental times, then sending them out to a second party laboratory for testing and documented results.

Because the testing process results in destruction of the samples, we needed to validate our process and document a procedure to set in place for our quality standards as well as to meet our ISO program requirements.

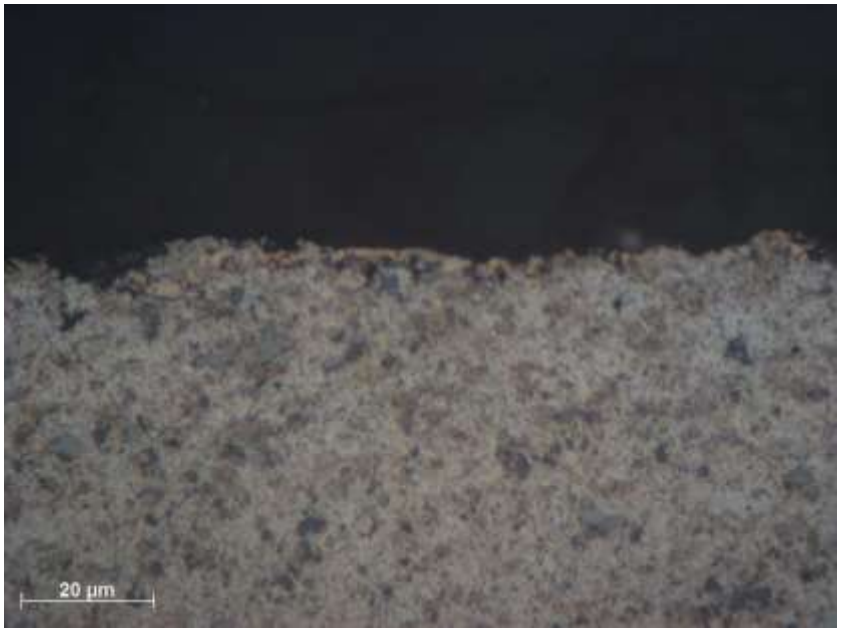
The process began by making the coupons out of the material we use for our product. We prepared them for plating as standard process and recorded the rub time per coupon, then sent the coupons to the lab.
Our first couple of coupons passed the adhesion tests.



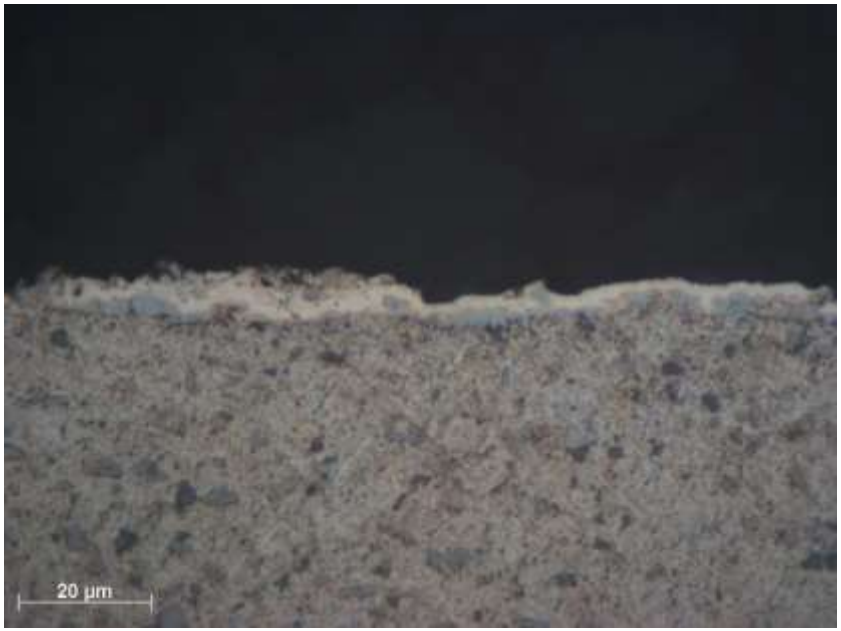


After burnishing test neither specimen developed blisters, lifting or peeling. This satisfies the requirement in paragraph 4.1 of ASTM B571.

However one fell short on thickness and the other was predominantly at the standard thickness with some valleys that showed under the microscope to be less than desirable.



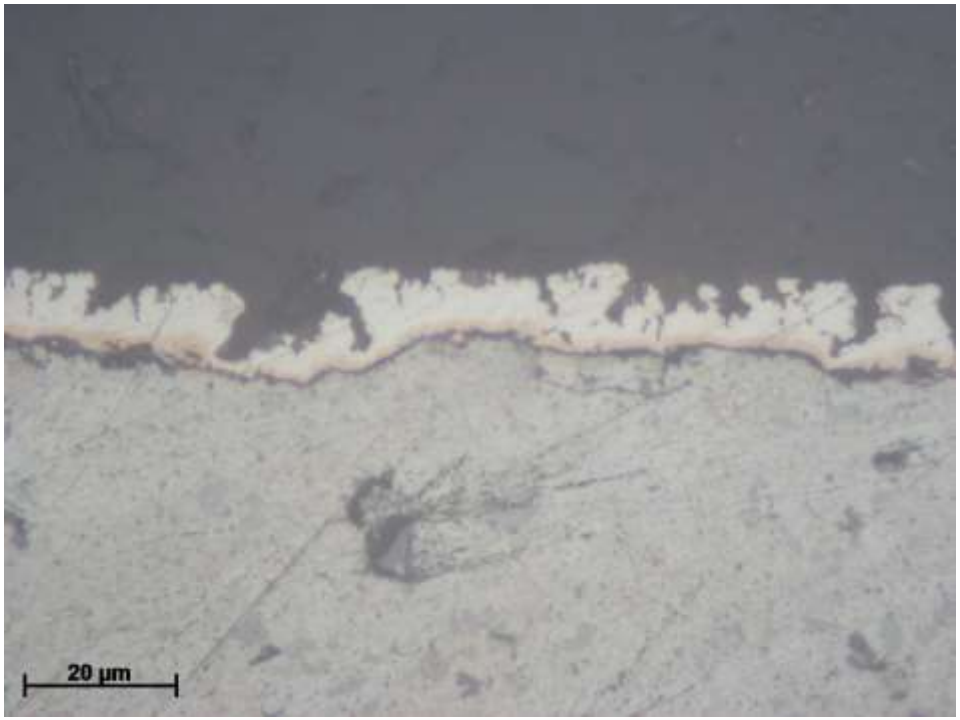
Silver coating is discontinous and measured thickness is less than the 2.5 µm minimum thickness specified in ASTM B700. (Average ~ 1 µm)



Silver coating is continous and measured thickness is between 1.5 - 5 µm, with a predominant thickness of ~ 2.5 µm.

Then we prepared and plate additional coupons with a longer rub time. They were sent to the lab for evaluation.

We were pleased with our test results; again the adhesion test satisfied the standard and the thickness tests came out far exceeding the standards hallmark.



Silver coating is continuous and predominant thickness is between 10 and 20 µm.

The information from the testing has been written into a Crown Electric ISO Silver Plating Procedure for use in-house, as well as on customer sites should the need arise.

We now have second party laboratory results which show that Crown's silver plating exceeds the standards and complements the Crown Electric products high standards.

ACCUTEK
TESTING LABORATORY

3701 Port Union Rd. Fairfield, OH 45014
P: (513) 984-4112 F: (513) 984-8258
testing@accutektesting.com
www.accutektesting.com

REPORT NO.:	DATE:	CUSTOMER:	P.O.#:	AUTHORIZED BY:
K12066433-1	6/19/2012	Crown Electric	S12-0089	David DeWitt

SAMPLES RECEIVED AS:
SAMPLED & TESTED BY:
R. Frischmuth

(2) Aluminum samples with silver coating
Accutek ID#6433-1: Labeled 1 of 2 by client
Accutek ID#6433-2: Labeled 2 of 2 by client

MICROSCOPIC EVALUATION

EVALUATE PER:	[X] ASTM B700
PROCEDURE:	[X] MET-PRP-5410
	[X] MET-EXM-5400
MAGNIFICATION:	[X] 1000X
EQUIPMENT:	[X] ZEISS AXIOVERT 40MAT SN 254

RESULTS

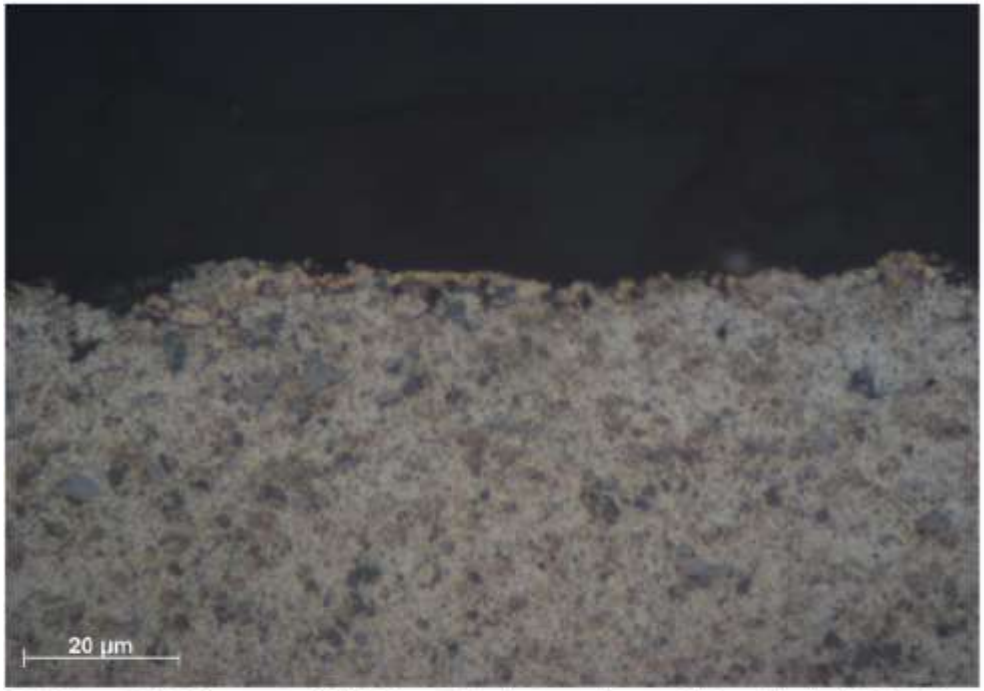


Photo 1 shows typical field of cross section of 6433-1. Silver coating is discontinous and measured thickness is less than the 2.5 µm minimum thickness specified in ASTM B700. (Average ~ 1 µm)

ACCUTEK
TESTING LABORATORY

3701 Port Union Rd. Fairfield, OH 45014
P: (513) 984-4112 F: (513) 984-8258
testing@accutektesting.com
www.accutektesting.com

REPORT NO.:	DATE:	CUSTOMER:	P.O.#:	AUTHORIZED BY:
K12066433-1	6/19/2012	Crown Electric	S12-0089	David DeWitt

SAMPLES RECEIVED AS:
SAMPLED & TESTED BY:
R. Frischmuth

(2) Aluminum samples with silver coating
Accutek ID#6433-1: Labeled 1 of 2 by client
Accutek ID#6433-2: Labeled 2 of 2 by client

MICROSCOPIC EVALUATION

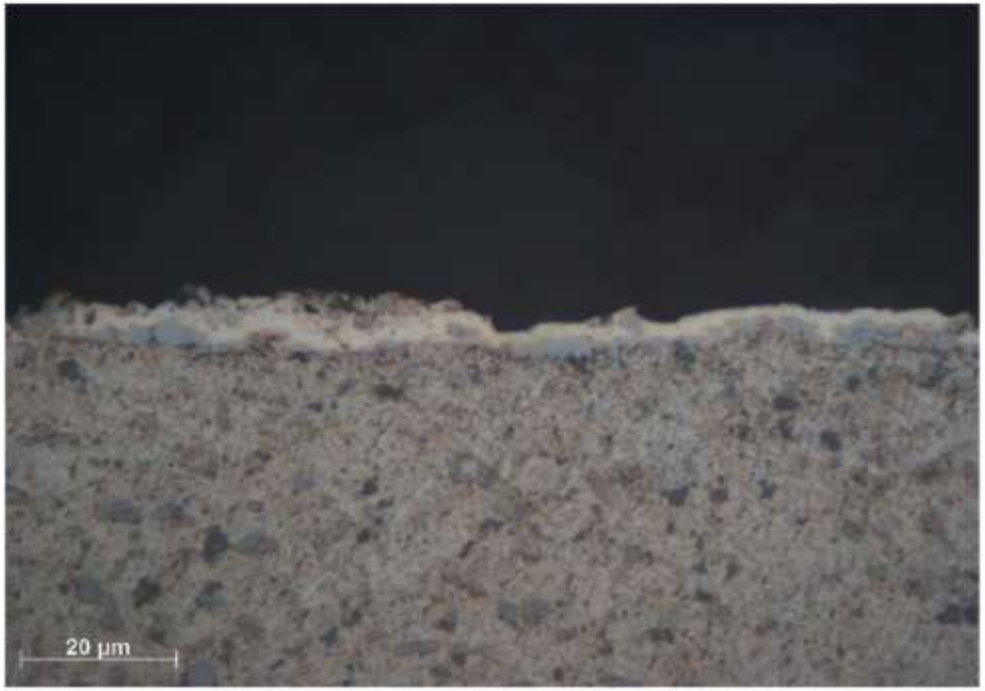


Photo 2 shows typical field of cross section of 6433-2. Silver coating is continous and measured thickness is between 1.5 - 5 µm, with a predominant thickness of ~ 2.5 µm.

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REPORT NO.:	DATE:	CUSTOMER:	P.O.#:	AUTHORIZED BY:
K12066433-1	6/19/2012	Crown Electric	S12-0089	David DeWitt
SAMPLES RECEIVED AS:				SAMPLED & TESTED BY:
(2) Aluminum samples with silver coating				R. Frischmuth
Accutek ID#6433-1: Labeled 1 of 2 by client				
Accutek ID#6433-2: Labeled 2 of 2 by client				

MICROSCOPIC EVALUATION

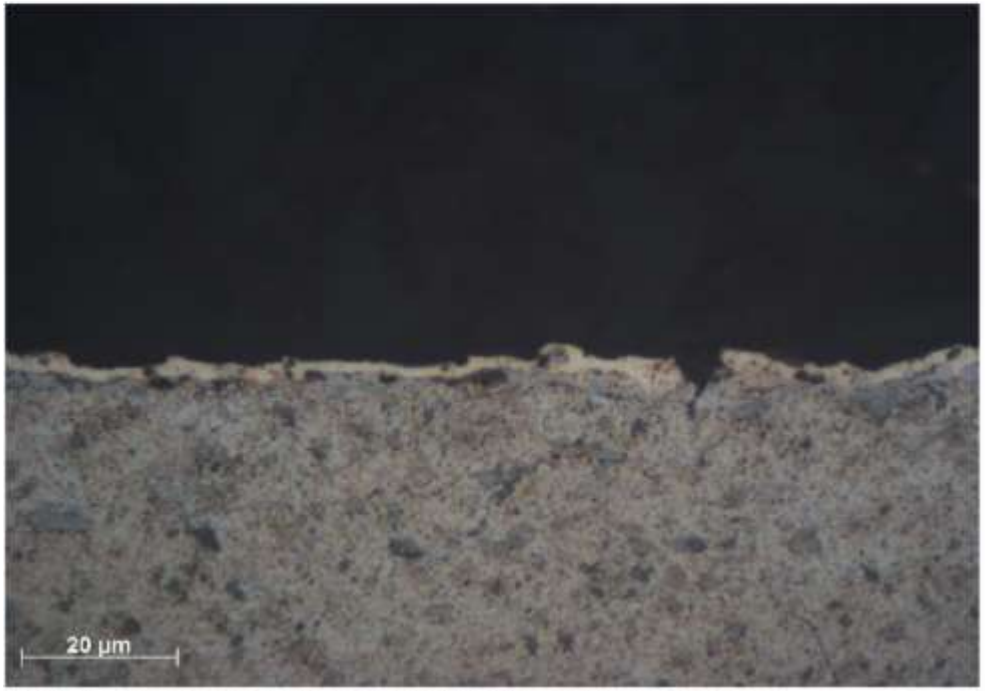

Photo 3 shows worst case field of cross section of 6433-2. Minimum meausred silver coating thickness is ~1.5 µm.

WE HEREBY CERTIFY THE RESULTS ABOVE TO BE THE TRUE RESULTS OBTAINED ON THE SAMPLES TESTED.

CALIBRATION SYSTEM IS MAINTAINED IN ACCORDANCE WITH ISO 17025:2005.

EVALUATED BY:

John P. McCloy, PE, CWI
President-Accutek Testing Laboratory

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TESTING LABORATORY

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REPORT NO.:	DATE:	CUSTOMER:	P.O.#:	AUTHORIZED BY:
K12066433-2	6/19/2012	Crown Electric	S12-0089	David DeWitt

SAMPLES RECEIVED AS:
(2) Aluminum samples with silver coating
Accutek ID#6433-1: Labeled 1 of 2 by client
Accutek ID#6433-2: Labeled 2 of 2 by client

SAMPLED & TESTED BY:
R. Frischmuth

BURNISHING TEST

EVALUATE PER: [X] ASTM B571
PROCEDURE: [X] ASTM B571. RUBBED TOOL OVER AREA FOR APPROXIMATELY 15 SECONDS.
TOOL: [X] 1/4" STEEL ROD WITH HEMISPHERICAL END

RESULTS

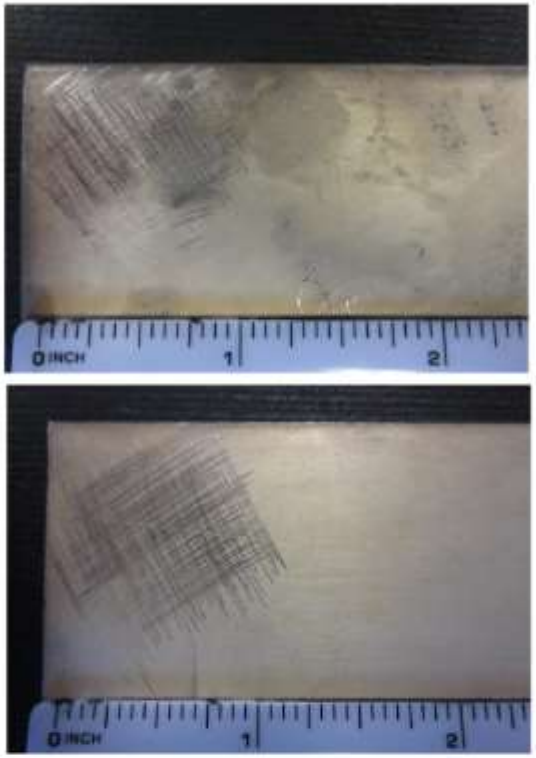

Photo 1 (top) shows 6433-1 and photo 2 (bottom) shows 6433-2 after burnishing test. Neither specimen developed blisters, lifting or peeling. This satisfies the requirement in paragraph 4.1 of ASTM B571.

WE HEREBY CERTIFY THE RESULTS ABOVE TO BE THE TRUE RESULTS OBTAINED ON THE SAMPLES TESTED.

CALIBRATION SYSTEM IS MAINTAINED IN ACCORDANCE WITH ISO 17025:2005.

EVALUATED BY:

John P. McCloy, PE, CWI
President-Accutek Testing Laboratory

I guess the point I'm trying to make is –

Iso Phase Bus
may be boring

But there are **engineering differences** to be cognizant of

- Dew point rated stand off supports

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- Forced pressurization should be penalized

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- Insulator in-situ visibility and accessibility should be positively evaluated

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- Enclosure's amperage should be specified

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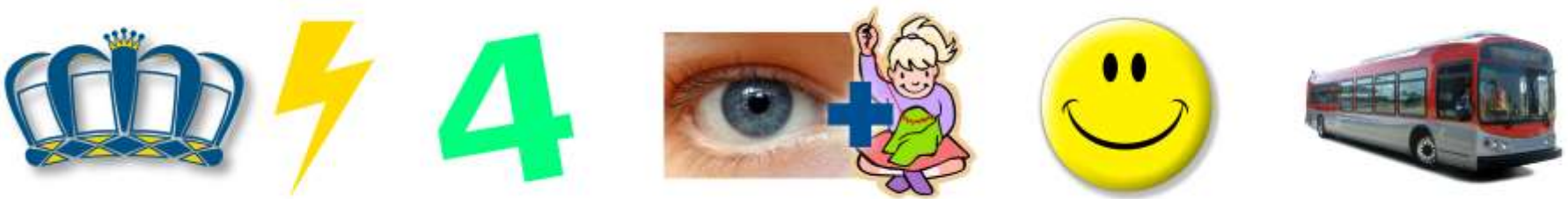
- Insulator in-situ visibility and accessibility should be positively evaluated
- Welding should be able to be certified
- Enclosures should have welded raised frames for covers
- Enclosures amperage should be specified
- IPB losses should be evaluated

Always remember



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