



Target Rock
1966 E. Broadhollow Road
E. Farmingdale, NY 11735
Phone: 631.293.3800
Fax: 631.293.6144

January 11, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Cc: Chief, Electrical Vendor Branch,
Division of Construction Inspection and Operational Programs,
Office of New Reactors

Subject: Reply to NRC Inspection Report 99900060/2012-201 Notice of
Nonconformance – Request for Additional Information.

The Curtiss-Wright Flow Control Company, Target Rock Division Reply to the subject
Request for Additional Information is as follows:

Item no. 1. TR has revised PR 071 to clarify that for the previously received terminal blocks the stated electrical performance requirements are not technically required to be considered critical however, TR will verify these characteristics for all future orders. As stated in CAR 12-063A, there are no current orders in place for this part. The supplier has been disapproved in the TR ASL with a special condition for a CG survey at time of next order. Additionally, for clarification, the updates of the CCAV sheets and the TR ASL as stated in CAR 12-063A are adequate to control the dedication process. The TR dedication program/procedures require use of the CCAV sheets and the ASL and do not require revision.

Item no. 2. For clarification, TR assured adequate controls for all components by reviewing all CCAV sheets for all CG items for proper Method 2 assignments and found no other similar improper assignment noncompliance as stated in CAR 12-063C. Therefore, CG surveys were conducted as required for all other products. Additionally, TR has revised PR 073 to clarify how TR concludes all pressure switches meet TR dedication requirements based on verifications of the attributes and to clarify no design or materials of construction have been modified.

Please contact me if you have any questions or require any additional information.

Sincerely,

A handwritten signature in black ink that reads "John DeBonis".

John DeBonis

TR Quality Assurance Manager

jdebonis@curtisswright.com

631 396-4429

Enclosures:

TR Problem Report 071 rev. 1

TR Problem Report 073 rev. 1

TE09
URO

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-071, Rev. 1

DATE: 9/12/12

REPORTED BY: Target Rock

FIELD PROBLEM: _____

INTERNAL PROBLEM: X

- I. **PROBLEM DESCRIPTION:** (Include source, item identify, customer, project number and a detailed description of the condition/s)

In accordance with Target Rock Commercial Grade Dedication Program, critical characteristics for commercial grade items and the method of attribute verification are designated on Target Rock's CCAV (Critical Characteristics Attribute Verification) Sheet. The critical characteristics of the component are determined by Target Rock Engineering based on the component's safety function. During audit surveillance activities at Target Rock, receipt inspection of terminal board, TR Part No. 205674-2, was performed on September 11, 2012. Per the applicable CCAV Sheet (CCAV Sheet No. 205674, 205675 and 205676), several component characteristics require verification. One such characteristic requiring verification is sample testing of the terminal screws and terminal plate brass material. The material verification analysis of the brass screws and plates was requested during the audit surveillance. Target Rock was unable to provide material test analysis for these components. Target Rock had not performed the material analysis required by the CCAV sheet. Review of previous inspection results determined Target Rock had not performed this material analysis on earlier orders. Additionally, neither TR nor the supplier had previously performed verification of the critical performance characteristics.

NOTE: Decision basis for reporting problems, See QMP 1014.

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-071, Rev. 1

II. EVALUATION OF PROBLEM:

Quality Engineering/Engineering Review

Correctable within specification requirements.

Not correctable within specification requirements (Nonconformance)

Problem Solution or Evaluation of Nonconformance Status
(Provide Details)

The terminal board (TR Part No. 205674-2, vendor part no. 37TB02F-72098) is a purchased item from an approved Target Rock supplier. The terminal board is certified, by the supplier, to meet the requirements of MIL-T-55164/1 and Target Rock Drawing, 205674, requirements.

The terminal board consists of two brass components, the screws and the mounting plate. Both the screws and plate are nickel plated, providing additional protection against corrosion. The primary function of the screws is to provide secured fastening of the wiring connections lugs to the terminal board's plate. The brass plate provides the necessary current path/flow between the terminal board connections. This current flow path is necessary to connect plant wiring to the valve solenoid.

This terminal board's electrical rating is 300 volts and current rating is 15 amps. This high powered terminal board was selected by Target Rock due to its high performance, greatly exceeding Target Rock's maximum voltage requirement of 140 volts and maximum amperage requirement of 3.9 amps. The voltage capability of the terminal board is more than double the required voltage for solenoid operation. The current carrying capability is nearly four times greater than the required amperage needed for the largest (worst case) solenoid that TR manufactures.

The terminal board was originally qualified under TR part no. 102995-1. This part no. identifies an 8-terminal block made of Diallyl Phthalate material with a closed back and brass terminal plates and screws. The terminal block was part of Equipment Qualification Type Testing for a 1" solenoid valve. TRP 3996 is the type test report generated for the qualification. TR Part no. 204674-2 is made from identical materials but is a 2-terminal block. TR evaluated the changes as part of Technical Evaluation of Replacement Item (TERI)-010.

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

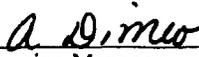
PROBLEM REPORT PR-071, Rev. 1

Target Rock has performed an analysis "Effect of Alternate Conductor Material to the Required Electrical Performance Characteristics for Terminal Block, 205674-2" (see Attachment 1) to determine the effect material has on the solenoid coil operation. The materials considered for the analysis is brass, silver, and stainless steel. Stainless steel is considered to be the worst case material and bounds all commercially available materials. The attached analysis considers the solenoid valve's "pull-in" and "drop-out" voltage. The "pull-in" voltage is the minimum voltage required for the solenoid to lift the pilot disc. The "drop-out" voltage is the maximum voltage required for the solenoid to shut the pilot disc. Target Rock requires "pull-in" and "drop-out" tests is included on valve assembly travelers and is performed on every valve assembly. Typical "pull-in" voltage for a Target Rock solenoid operated valve is 50 to 60 volts. Once the pilot disc has lifted, system process fluid aids in the main disc lift, continuing to bring the valve to the full open position. The "pull-in" voltage is considerably lower than the minimum voltage (90 volts) provided by the plant. Target Rock requires the end user to provide a minimum of 90 volts to the solenoid. Therefore, assuming the higher limit of pull in voltage (60 volts) and the supplied minimum voltage (90 volts), a 50% margin exists. The attached analysis details the effect resistivity of different materials has on the voltage drop across the terminal plate. Excessive voltage drop (below the required minimum for "pull-in") across the plate is not desired. The analysis has determined the worst case scenario, 300 series stainless terminal plate with a 36 ohm coil operating at 140 volts, can experience a decrease of 0.04 volts. Thus, the 50% margin, or additional 30 volts supplied by the end user is more than adequate to support the needed voltage for pilot lift. The Attachment 1 analysis confirms any of the three materials considered more than adequately performs the required function. Therefore the actual terminal plate and terminal screw material does not need to be considered a critical characteristic for TR valve applications and all related electrical voltage and current rating performance requirements are considered satisfied.

A review of Target Rock inventory determined two lots of the 20567-2 terminal boards from previous orders were still in Target Rock stock. Target Rock has pulled one terminal board from each order (Target Rock Cert No.'s 00-1818 and 11-2258) and has performed the material verification on the screws and plates. See Attachment 2 for revised certs based on material verification performed. Material for both items were identified, via Alloy I.D., and found to be in conformance with the CCAV Sheet requirement. Both components were verified to be made of brass. These two separate batches of terminal boards span over a length of approximately eleven (11) years. In addition to these two batches (from inventory), Target Rock has performed the required material verification analysis on the most current batch of terminal boards. This batch of terminal boards was receipt inspected by Target Rock on September 11, 2012. The material verification testing was performed in accordance with the CCAV sheet requirements and both the screw and plate material was verified to be made of brass. See Attachment 2, Cert no. 12-2280, for inspection and test results.

Lastly, as previously stated, TR requires the terminal blocks to be in accordance with the requirements of MIL-T-55164/1. In accordance with MIL-T-55164, the supplier (Marathon Special Products) is required to maintain material control and to perform material analysis of the terminal plates and screws. Attachment 3 demonstrates compliance with these requirements (both terminal plates and screws are manufactured from brass). While TR cannot explicitly use the supplier's tests and inspections for the verification of terminal plate and screw material, this provides reasonable assurance that the terminal plate and screw material is correct per TR drawing requirements.


Quality Assurance Manager 11/11/13
Date


Engineering Manager 11/11/13
Date

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-071, Rev. 1

III. DETERMINATION OF NONCONFORMANCE STATUS

- 1. Product Nonconformance _____ Issue NCR
- 2. System Deficiency X Issue CAR

CAR 12-063A and CAR 12-063B issued

 J. DeBour 1/11/13
Quality Assurance Manager Date

 A. Dimas 1/11/13
Engineering Manager Date

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-071, Rev. 1

IV. EVALUATION OF POTENTIAL 10 CFR PART 21 REPORTABILITY

(Refer to QMP 1014)

Potentially Reportable

Not Reportable (Include Reason)

By analysis, Target Rock has shown the brass material specified for the terminal screws and plate is not critical for any Target Rock valve to operate. Target Rock valves operate with a minimum voltage, well below the voltage supplied by the end user. In addition, the voltage drop across the terminal block regardless of terminal plate material is insignificant. Therefore all previously received terminal blocks are also considered to have met all required electrical performance characteristics even though not verified by a CG survey. Given this margin, a change in material has no impact on valve operation.

TR will continue to require Method 1 verification of brass material for the terminal plate and screw material on its CCAV sheet. TR will also require Method 2 verification of voltage and current rating electrical performance characteristics.

J. DeBour 1/11/13
Quality Assurance Manager Date

A. DiMio 1/11/13
Engineering Manager Date

**Effect of Alternate Conductor Material to the Required Electrical
Performance Characteristics used for Terminal Block
PN 205674-x (Vendor PN 37TB0-x)**

Overview:

The TR CCAV sheet, "TERMINAL BLOCK" includes TR PN 205674-x. The specification drawing for PN 205674-x defines the screw material as "Brass per QQ-W-321, Nickel plated per QQ-N-290" and the Terminal Plate as "Brass per QQ-N-613, Nickel plated per QQ-N-290".

The CCAV sheet requires that both the Terminal Screws and the Terminal Plates be tested on a sampling basis for materials analysis to verify Brass material for both screws and terminal plate.

By calculation Target Rock has determined that the use of a non-brass metallic material for either would not affect valve operation due to the very low material resistivity of a wide range of metals.

Analysis:

The major impact a non-brass material would have on terminal board performance would be to increase resistance of the terminal plate resulting in a higher voltage loss across the terminal block effectively reducing the voltage to the TR solenoid coil. The major function of the brass screws is to secure the connecting wires to the terminal plate which is then the primary conductor of current across the Terminal Block connection.

If the voltage to the coil was reduced below the TR Pull-IN and Drop-OUT voltage of the coil then terminal block material could have an effect on TR SOV operation. TR solenoid coils are specified to work with plant voltages between 90 – 140VDC. The solenoid coils are conservatively designed such that PULL IN and DROP OUT voltages of any given TR SOV are 40-50% less than the 90VDC minimum coil voltage requirement.

If it can be shown that the voltage drop across the terminal block for metallic materials other than brass are much less than 40-50% derating for 90V operation the terminal plate material will not affect TR SOV operation.

For any given material, resistance (R) is a function of the resistivity of the material (ρ), the length of the material (L), and it's cross sectional area (CSA) and is defined as:

$$R = \frac{\rho L}{CSA}$$

Where:

R	=	Resistance (Ohms)
ρ	=	Resistivity of the material (Ohms*m)
L	=	Length of material (m)
CSA	=	Cross-sectional area of material (m ²) or (width x height of material)

A range of resistivity values for metal conductors ranging from Silver to Stainless Steel 316 is given in Table 1. Given the solenoid coil current and the resistance of the terminal block, the voltage drop across the terminal block can be calculated.

The following table computes coil current at 90VDC and 140VDC for the range of TR solenoid coil resistances (220ohms to 36ohms) and multiplies that DC current times the computed values of terminal plate resistance for a range of metallic materials from silver to SS316. It is shown from calculations below that the worst case voltage drop for the worst case coil (36ohms) and the worst case metallic material (SS316) is only 4 millivolts (.004V). Therefore, material resistivity values 2.5 times given in Table 1 would only have a voltage drop of 0.01V – well below any voltage drop that would affect valve function.

Table 1

Terminal Plate Dimensions			Solenoid Coil Current (A)			
	Inch	Meters	Resistance (ohms)	Voltage (VDC)		
Plate Length =	0.317	0.00805	220	90	140	
Plate Height =	0.030	0.00076	155	0.41	0.64	
Plate Width =	0.290	0.00737	36	0.58	0.90	
				2.50	3.89	
Metal Resistivity/Resistance			Voltage Drop across Terminal Plate			
Metal	ρ (ohms/meter)	Terminal Plate Resistance (ohms)	220 ohm		36 ohm	
			Min	Max	Min	Max
Silver	0.000000160	0.0000229523	0.0000094	0.0000146	0.0000133	0.0000207
Brass	0.0000006300	0.0009037469	0.0003697	0.0005751	0.0005248	0.0008163
SS 316	0.0000007200	0.0010328537	0.0004225	0.0006573	0.0005997	0.0009329
					0.0025821	0.0040167

The length, height and width of the 37TB0 terminal plate are taken from the CCAV sheet.

Resistivity values are obtained from Electronics Engineers Handbook, 2nd Edition

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-073, Rev. 1

DATE: 11/1/12

REPORTED BY: Target Rock

FIELD PROBLEM: _____

INTERNAL PROBLEM:

- I. **PROBLEM DESCRIPTION:** (Include source, item identify, customer, project number and a detailed description of the condition/s)

Reference PR-071 for terminal board

In accordance with Target Rock Commercial Grade Dedication Program, critical characteristics for commercial grade items and the method of attribute verification are designated on Target Rock's CCAV (Critical Characteristics Attribute Verification) Sheet. The critical characteristics of the component are determined by Target Rock Engineering based on the component's safety function. During audit surveillance activities at Target Rock, receipt inspection of pressure switch, TR Part No. 200372-1, was performed on September 11, 2012. Per the applicable CCAV Sheet Addendum (Method 2 dedication), several performance characteristics require verification. One such characteristic requiring verification is sample testing of the lead wire material between the potted switch and pins. However, the CCAV Sheet Addendum listed the applicable dedication method as Method 1 only. It was therefore assumed that the requirements of the CCAV Sheet Addendum was not being performed. In addition, TR could not provide any evidence of a supplier survey. The material verification analysis of the lead wire was requested during the audit surveillance. Target Rock was unable to provide material test analysis for these components during the audit.

NOTE: Decision basis for reporting problems, See QMP 1014.

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-073, Rev. 1

II. EVALUATION OF PROBLEM:

Quality Engineering/Engineering Review

Correctable within specification requirements.

Not correctable within specification requirements (Nonconformance)

Problem Solution or Evaluation of Nonconformance Status
(Provide Details)

The pressure switch (TR Part No. 200372-1, supplier part number and model number 608GC851) is purchased from a single approved Target Rock supplier (Custom Control Sensors, Inc). The pressure switch has been obtained from the same supplier since the inception of the drawing (1972). In addition, the supplier part number is unique to the TR part number.

The pressure switch consists of a standard switch element, single throw double pole (STDP) manufactured by Honeywell (11SX22-T). The switch element is wired to external pins and potted inside a stainless steel case. The pressure side of the switch is connected to external threads and the electrical side of the switch has a standard connector to mate to the three pins. The primary function of the pressure switch is to satisfy the ASME Code requirement that "means shall be provided to reveal failure of the pressure sensing element, such as a bellows". The TR 3-stage safety relief valve employs a machined bellows as the primary sensing element and thus this pressure switch is installed in the sealed chamber surrounding the bellows to detect leakage past the bellows.

The pressure switch had been procured for many years to the TR drawing, without Commercial Grade Dedication. However, with the commencement of Commercial Grade Dedication, TR generated the CCAV Sheet (Method 1 Receipt Inspection) and the CCAV Sheet Addendum (Method 2, Commercial Grade Survey), in accordance with the Commercial Grade Dedication Program. This supplemented the drawing with critical characteristics that were required to be verified. For reasons that cannot be verified, the CCAV Sheet Addenda for this part states the dedication method to be in accordance with Method 1 only. Therefore there has never been a Commercial Grade Survey (Method 2) performed at the supplier's facility.

While the supplier is not subject to 10CFR50 or 10CFR21, the supplier is certified to AS9100 and ISO9001 and is frequently audited to confirm compliance with AS9100 and ISO9001. In addition, the supplier has confirmed that the design, materials of construction and assembly and test process for this pressure switch has not changed since 1975. TR had performed a qualification test for GE in 1975 with this revision of the pressure switch. Therefore this pressure switch has been qualified to the GE requirements and has remained unchanged since that test. TR has obtained a representative traveler from the supplier. The traveler provides objective evidence that each pressure switch undergoes a proof pressure test, functional testing and a dielectric test. Although not witnessed as part of a TR survey, TR considers the supplier tests performed in accordance with the quality programs referenced above to meet TR dedication requirements. A copy of the supplier traveler is given in Attachment 1.

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-073, Rev. 1

All of the critical characteristics that are listed on both the CCAV sheet and CCAV Sheet Addendum were verified on 6 pressure switches that TR had in Finished Goods Inventory. All 6 pressure switches met all requirements. The 6 switches were from four different lots. In addition, S/N 435 was destructively tested for complete material analysis.

S/N	TR Cert Number	Additional Tests Performed @ TR
421	None Assigned	Burn test, Functional test, Dielectric test
429	04-0424	Burn test, Functional test, Dielectric test
432	05-2452	Burn test, Functional test, Dielectric test
435	05-2452	Burn test, Functional test, Dielectric test, Materials analysis
438	05-2452	Burn test, Functional test, Dielectric test
445	05-3108	Burn test, Functional test, Dielectric test

The burn test is a destructive test, i.e. one switch from the lot is disassembled to verify the lead wire material and the internal configuration. The functional test was performed to confirm the pressure set point on all switches of the lot since it is not a destructive test. The functional test was also performed at the voltage and current rating of the switch to demonstrate its capability. The dielectric test was also performed on all switches of the lot since it is not a destructive test. The supplier marking, supplier part number verification, and dimensional inspection had been previously performed by TR inspection. The hydro test had been performed at TR, however in the future TR will require the supplier to perform this test as part of the Method 2 CG survey.

TR has only one other lot (95-0001) on record since commercial grade dedication became a requirement. This lot quantity was 4 and there is evidence that a material analysis (burn test) was performed at TR as well as performance characteristics (dielectric test and functional test) was verified. Additional historic receipt inspection data has been found which verifies that the pressure switches had been subject to additional tests and inspections @ TR - not just dimensional and confirmation of part number.

Based on the evidence obtained, the quality programs implemented by the supplier and the confirmation testing performed by TR, TR considers reasonable assurance has been provided that pressure switch, part number 200372-1, has been sourced correctly from a single supplier. The CCAV Sheet and the CCAV Sheet Addendum have errors which propagated the misunderstanding of the dedication method. However, TR dedication requirements are satisfied for all current and previously supplied pressure switches.

J. DeBour 11/1/13
Quality Assurance Manager Date

A. D. Moore 11/1/13
Engineering Manager Date

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-073, Rev. 1

III. **DETERMINATION OF NONCONFORMANCE STATUS**

- 1. Product Nonconformance _____ Issue NCR
- 2. System Deficiency X Issue CAR

CAR 12-063C issued to address the inconsistencies found in the CCAV Sheet and the CCAV Sheet Addendum for this part.

 gdcBom 1/11/13
Quality Assurance Manager Date

 a.d.mus 1/11/13
Engineering Manager Date

CURTISS WRIGHT FLOW CONTROL TARGET ROCK DIVISION

PROBLEM REPORT PR-073, Rev. 1

IV. EVALUATION OF POTENTIAL 10 CFR PART 21 REPORTABILITY

(Refer to QMP 1014)

Potentially Reportable

Not Reportable (Include Reason)

By reviewing historical inspection records, performing all required inspections and tests on 4 out of 5 material lots, and destructively testing one piece, Target Rock has demonstrated that all critical characteristics applicable to the pressure switch have been identified and verified. Given this reasonable assurance, TR has validated that previous pressure switches were properly dedicated via Method 1.

J. DeBora 1/11/13
Quality Assurance Manager Date

A. D. New 1/11/13
Engineering Manager Date