ARMED SERVICES BOARD OF CONTRACT APPEALS

Appeal of --	)	
	)	
Yardney Technical Products, Inc.	)	ASBCA No. 53866
	)	
Under Contract No. N00104-98-C-LA13	)	

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OPINION BY ADMINISTRATIVE JUDGE JAMES

Yardney Technical Products, Inc. (Yardney) timely appeals from the contracting officer's (CO) April 2002 final decision denying Yardney's November 2001 certified claim for $147,805 allegedly incurred due to respondent's deficient first article test (FAT) procedures that increased the performance standards for MK 89 battery cells under the captioned contract. The Board has jurisdiction of this appeal under the Contract Disputes Act of 1978, 41 U.S.C. § 607. After a five-day hearing in New London, CT, the parties submitted sequential briefs. The Board is to decide entitlement only (tr. 1/6-8).

FINDINGS OF FACT

1. Yardney is an experienced designer and manufacturer of batteries and has produced batteries for satellite, torpedo, drone and other applications for the Department of Defense since 1944. Yardney has designed and manufactured MK 89 silver/zinc cell batteries using state of the art technology, starting with Navy contracts No. N00104-92-C-J120 (contract J120) and No. N00104-93-C-J118 (contract J118) which it began to perform in 1991-92 (tr. 1/23-27, 2/72, 87; ex. G-2 at 1).

2. The MK 89 secondary (rechargeable) silver-oxide/zinc[1] battery cell is a component of the MK 8 Mod 1 Gator Class SEAL Delivery Vehicle (SDV), a

[1] "Silver-oxide/zinc" and "silver/zinc" are equivalent terms.

battery-powered submarine used by Navy Seals. An SDV propulsion battery is comprised of 100 MK 89 cells; its electronics battery is comprised of 20 MK 89 cells. (R4, tab 14 at 1; tr. 2/109-10, 203)

3. On 13 February 1998 the Naval Inventory Control Point, Mechanicsburg, PA, awarded Contract No. N00104-98-C-LA13 (contract LA13) to Yardney to supply 59 battery sets, consisting of 7,552 silver-zinc cells (120 operational plus 8 spare cells per set), for the firm, fixed-price of $2,301,000. Battery sets were to comply with Specification No. 6096-PS-0007 (specification 0007), dated 20 September 1995, and Drawing No. SK7005527. Yardney was required to submit a FAT sample for government destructive testing. (Compl. and answer ¶ 5; R4, tab 1 at 1, 5, 16)

4. The parties stipulated that they substituted Specification No. 6096-PS-0007a (specification 0007a), dated 2 September 1998, as the relevant specification for all FAT tests under contract LA13, although the contract was not so modified (tr. 2/140-41, 5/7). Specification 0007a was predominantly a performance type specification (tr. 1/118-20). Requirements pertinent to the dispute in specifications 0007 and 0007a were substantially identical, except that specification 0007a referenced drawing No. 7005527 (not in evidence) rather than No. SK7005527 (R4, tab 13; exs. A-5, -6).

5. Specification 0007a for the MK 89 battery provided in pertinent part (ex. A-6; R4, tab 1, § C at 4-5 of 10):

> 1.1 This specification describes the requirements for a silver-oxide/zinc battery capable of providing a capacity of 400 ampere-hours [AHr[2]] at a constant current rate of 60 amperes per cycle for two cycles, and capable of providing a capacity of 300 [AHr] at a constant current of 60 amperes per cycle for an additional 48 cycles.… [C]ycle 1 shall be a performance discharge cycle.…
>
> ….
>
> 2.1 …The design and construction of each silver-oxide/zinc cell shall be adequate to provide a minimum 300 [AHr] capacity at a rate of 60 amperes for 50 cycles of service over a 15 month period…. The first two cycles are required to provide a minimum of 400 [AHr].

[2] The specification used "AHr" and "Ahr" to designate ampere-hours. For consistency, we use "AHr."

….

2.3 Cells shall be designed to fit within cell cases and covers per Naval Sea Systems Command [NAVSEA] Drawing number 7005527….

….

2.5 Cells shall be delivered in a dry-charged condition.

….

3.2 Cells shall provide a minimum life of 50 cycles at the capacities defined below:

3.2.1 Cycle 1 is a performance discharge cycle. Cells, strapped as a battery, shall be capable of delivering a minimum of 400 AHr when discharged at a constant 60 ampere rate to a cut-off voltage of 1.20 VDC per cell.

3.2.2 Cycle 2 is a 400 AHr discharge at the 60 ampere rate.

….

3.3 Cells shall be capable of accepting a constant current charge of 10 amperes, so that when the cell voltage has reached 2.03 VDC, the cells shall be fully charged.

….

5.0 First Article Test Requirement.

5.1 First article testing shall consist of the tests in the sequence of Table I. The FAT sample size will be 20 cells.

5.2 Failure of any sample to pass any FAT or inspection shall be cause for rejection of the contract quantity of cells, as determined by the procuring agency.

5.3 All FAT will be performed by Naval Surface Warfare

Center [NSWC], Crane.

Table I: FAT and LAT Sample Distribution
[sets forth a sequence of 15 tests, of which the 9th test was a performance test of cycles 1 and 2, and the 13th test was a vibration test]

….

7.0 First Article and Lot Acceptance Tests [LAT]. All cells subjected to functional testing shall be restrained, such as with wood blocks or metal plates at both ends clamped together with tie rods, straps or fibrous tape, prior to activation and remain in a restrained condition.

….

7.3.4 …The vibration environment shall be in accordance with test method 204, test condition C, of MIL-STD-202. The vibration test of Test Condition C shall be lowered to 1.0g.…

….

7.4 Performance tests of cycles 1 & 2. Cycle the cells as follows:

7.4.1 Cycle 1. Connect all twenty cells in series as a 20 cell battery (All 20 cells have been filled and given a booster charge in accordance with [¶] 7.7.1). Subject the battery to a discharge of 60 amperes to a cell cut off voltage of 1.20 VDC per cell.

7.4.2 Recharge the battery in accordance with [¶] 7.7.2.

7.4.3 Cycle 2. Subject the 20 cells battery to a discharge of 60 amperes for 6 hours and 40 minutes (400 AHr).

7.4.4 Recharge the battery in accordance with [¶] 7.7.2.

7.4.5 On these two cycles each cell shall provide a minimum of 400 AHr.…

….

7.7.1 Booster Charge: Charge the cells…until all cells reach 2.03 VDC. As cells reach 2.03 VDC they shall be removed from the circuit.

7.7.2 Capacity Charge: Charge the cells…until all cells reach 2.03 VDC. As cells reach 2.03 VDC they shall be removed from the circuit.

Since MK 89 battery cells are to be delivered dry-charged, each FAT cycle consists of a discharge and a charge (tr. 1/47, 2/144-45).

6. Drawing No. SK7005527 showed a rectangular cell of 6.75 x 5.80 x 2.75 inches and a vent valve, vent plug and ".65/.55" inch "+" and "-" terminals with ".438-20UNF THD" atop the cell (ex. A-5). Whether drawing SK7005527 differed from 7005527 (not in evidence) cannot be determined.

7. Each cell designed and delivered under contract LA13 included a housing containing alternating, rectangular plates of silver cathode (positive) and zinc anode (negative) electrodes, activated by pouring a potassium hydroxide electrolyte solution into the cell housing where the electrodes absorb the electrolyte. In Yardney's "U-wrap convention" the cell's silver electrodes were wrapped in five layers of cellophane and nylon to separate them from the zinc electrodes. In Yardney's "split-wrap convention," the cell's silver and zinc electrodes were both wrapped, prolonging their cycle life. (Tr. 1/31-38, 41-43, 2/50-51)

8. Contract LA13 included the FAR 52.209-4, FIRST ARTICLE APPROVAL-GOVERNMENT TESTING (SEP 1989) and ALTERNATE I (SEP 1989) clause that required Yardney to deliver a 20-cell FAT sample to NSWC within 120 days from the date of the contract, and did not require prior contractor inspection or testing of the first articles (R4, tab 1 at 11 of 42). Contract LA13 and specification 0007a did not specify or refer to any test plan or test procedure (R4, tab 1; ex. A-6; tr. 5/6-8).

9. In 1998 the Navy decided to transition from the tedious, manual method of charging each MK 89 battery cell individually used by the fleet, to the use of an automatic battery charger. NAVSEA tasked Newport News Shipbuilding (NNS) to develop, build and deliver a new technology, automatic battery charging system for the MK 8 Mod 1 SDV. The new system was to charge silver/zinc batteries delivered under Yardney's contracts J120 and J118. NSWC instructed NNS to use a cut-off voltage of 2.00 volts. (Ex. G-12 at 1-2, 4; tr. 4/148-51)

10. As a result of the development of the new automatic battery charger, NSWC faced two practical problems in connection with FAT for contract LA13: (1) the

disparity between the 2.00 volt cut-off charge for the NNS battery charger and the 2.03 volt cut-off charge specified for MK 89 batteries in contract LA13 and (2) the lengthy internal review and approval process to change the MK 89 battery specification so that there would be no disparities (tr. 2/185). NSWC also desired to increase the MK 89 cell cycle life and to resolve safety concerns of potentially explosive hydrogen and oxygen gas of cells charged over 2.00 volts (tr. 2/148-51, 187-89).

11. Mark Thomas, NSWC's SDV project engineer, decided that the quickest and easiest way to overcome the foregoing problems was to use NSWC's test plan as the vehicle to change the voltage cut-off for MK 89 battery cells under contract LA13 from 2.03 to 2.00 and to obtain Yardney's approval thereof (tr. 4/96, 195-96). Without performing an impact analysis, NSWC initially extrapolated a 7 to 10 AHr loss (and after reviewing more test data, extrapolated a 7 to 13 or 15 AHr loss) of discharge capacity by reducing the cell charge to 2.00 volts (tr. 2/190-92, 4/151-53, 266). This anticipated loss increased, and made more stringent, the performance requirements of the contract since the battery cells were still required to provide a minimum of 400 AHr on the second cycle (finding 5, ¶ 7.4.5).

12. On 13 July 1998 Mr. Thomas sent Sue Russell, Yardney's MK 89 Project Manager, Test Plan No. 6096-TP-319 (TP-319) (ex. G-5). He advised her of the voltage charge change from 2.03 to 2.00 volts, due to NNS' 2.0 volt automated battery charger, but did not advise her of any safety concern about gas explosion or that TP-319 was intended to be a contract modification. (Tr. 3/7-8, 147-50, 4/42-45, 198-206, 208-10)

13. In July 1998 Ms. Russell was unaware that the 2.0 volt charge change would adversely impact second cycle cell performance (tr. 2/212). She knew that TP-319 stated that battery trays were to restrain the cells during testing, but did not know how cells were restrained previously. NSWC did not show an SDV tray to Ms. Russell, or provide the specifics of the SDV tray's restraint capacity to Yardney. She assumed that battery trays meant something that would adequately restrain cells in a good manner similar to what was used in the past. (Tr. 3/10-11, 134-35) We find that her assumption was reasonable.

14. In August-September 1998, NSWC and Yardney made several revisions to TP-319, which CO Charles Splawn signed on 3 September 1998 and Ms. Russell signed on about 28 September 1998. TP-319 did not change the price of contract LA13. (Exs. G-6 to G-11; R4, tab 14 at 1; tr. 3/128, 131) The only specifically identified Yardney request to change TP-319 was in the parties' 24 September 1998 letters. Mr. Thomas stated: "It appears, from the drawing, that the terminal height is to be .55" to .65" (or .60 ± .05") and the cell height with out [sic] the terminal is to be 6.75 ± 0.03". That would give a measurement and tolerance stack of 7.35 ± .08". Agree?" Ms. Russell answered:

I AGREE THE TOTAL CELL HEIGHT INCLUDING THE TERMINAL IS 7.35 ± .08.…

PLEASE CORRECT THE TERMINAL THREAD CALL OUT: IS ".438-14" SHOULD BE "438-20"

(Exs. G-10, -11; tr. 4/210)

15. TP-319 cited as references: (a) specification 0007a of 2 September 1998, (b) NAVSEA Drawing No. 7005527, (c) contract LA13 and (d) NSWC Test Procedure No. 6096-TP-0321 (not in evidence) (R4, tab 14 at 1; tr. 5/14). TP-319 set forth the following provisions relevant to this dispute (R4, tab 14, italics added):

2.1.6. Cell Restraint. Except where specified or when physically impractical, the cell(s) shall be restrained during and after filling [with electrolyte]. The cells shall be restrained in groups of five by placing them in the battery tray with the wedge securely lowered into the end of the tray marked with a "T", and match the slanted side of the wedge to the tray – away from the end cell. If trays are not available, use ¾ inch plywood plates on the leading and trailing faces of the pack and clamp with the special clamping devices provided in the lab (an alternative would be to tightly secure the cells with three wraps of fiberglass tape including the plywood ends).…

2.2. FIRST ARTICLE TESTS – OUTLINE

2.2.1. …20 First Article samples shall be manufactured using the methods and procedures proposed for production. The samples shall be subjected to the test requirements *in the sequence shown in Table I.*

2.2.2. **TABLE I – First Article Test Requirements (FAT)** [prescribed a sequence of 16 tests, in which the 10th test was Cycle Life, Cycles 1 & 2 and 12th test was Vibration]

….

2.4.2.3. **CELL RESTRAINT**. The cells shall be restrained from this point on [*i.e.*, after the second test]. The cells shall be restrained in groups of five, preferably by placing them in the MK 8 Mod 1 battery trays.

….

2.4.10. VIBRATION (FAT ONLY)

NOTE: Vibration testing is conducted on cells after the cycle 2 charge and before the cycle 3 discharge.

2.4.10.1. The specified cells (Fxxx – Jxxx), will be vibration tested…. The cells shall remain restrained during the vibration test.

2.4.10.2. The vibration environment shall be in accordance with MIL-STD-202F, Method 204, test condition C except that high frequency acceleration amplitudes shall be limited to 1.0 g.…

….

2.4.13.4. CYCLE LIFE.

2.4.13.4.1. The Cycle Life charge/discharge (Axxx – Oxxx) cycles will proceed until either a battery (or cell) failure occurs or a total of 50 cycles have been applied.

….

2.4.13.4.6. **Cycle Life Test Procedures**

CYCLE NO.	BATTERY PERFORMANCE REQUIRED	GENERAL TEST REQUIREMENT
1	Each cell must deliver at least 300 [AHr] Each cell must reach a minimum of 2.00 V	Discharge: 60A rate to 1.2V/cell Capacity charge: 10A rate, until <u>all</u> cells = 2.00 V
2	End of discharge each cell voltage ≥ 1.2 V Each cell must reach a minimum of 2.00 V	Discharge: 60A rate for 6 hours 40 minutes Capacity charge: 10A rate until all cells = 2.00 V

….

2.4.13.6. CHARGE AND DISCHARGE PROCEDURES.

2.4.13.6.1. **CAPACITY CHARGE** (10A UNTIL <u>ALL</u> CELLS = 2.00 VOLTS).

NOTE: This procedure will apply a constant current 10A charge…until <u>ALL</u> cells reach a voltage of 2.00 volts.…

….

2.4.13.6.1.2. Verify that the test parameters (and tolerances) are correct: 10.0 ± 0.2 amperes charge rate until **<u>all</u>** cells reach a voltage or [sic] 2.00 (+0.02, -0.03) volts.…

….

5. **Evaluation Criteria**.

5.1. Each FAT…data will be compared to one another and measured by the minimum specification requirements outlined in reference (a) [procurement specification 6096-PS-0007a].

16. On 22 September 1998 NSWC completed its evaluation of the NNS prototype, automated battery charger using 60 cells produced under contracts J120, lot 21, and J118, lot 8, charged to about 1.98 volts and restrained in SDV trays (ex. G-12 at 3-10, 16-39; tr. 4/261). Approximately 15 cells delivered 400 AHr and 45 cells delivered 375-395 AHR on the second cycle discharge (ex. G-12 at 12).

17. On 7 October 1998 Yardney delivered to NSWC for FAT 20 silver-zinc cells, Yardney part number LR360DC-5, embodying the split-wrap design (R4, tab 15 at 1-2).

18. On 17 November 1998 NSWC notified Yardney that its sample had failed FAT (FAT-1) because cells G634 and J637 failed the cycle 3 discharge requirements during vibration testing (ex. A-15; R4, tab 15 at 5, 8). At the 30 November 1998 teardown inspection of the failed FAT-1 cells, NSWC verbally informed Yardney of cycle 2 discharge failures (tr. 2/63).

19. NSWC Crane's undated,[3] unsigned letter forwarding FAT report No. EDD 98-117 to Yardney stated two grounds for rejecting Yardney's FAT-1 sample.

(a) Of Yardney's five sample cells submitted to vibration testing, cells F633, G634 and J637 failed to deliver the minimum 300 AHr on cycle 3 discharge. Tear-down analyses revealed yielding of tabs near the terminal and of the negative plate around the tab/anode welds. (R4, tab 15 at i, 5)

(b) Of Yardney's 15 sample cells submitted to cycle life testing, 4 failed the 400 AHr cycle 2 discharge requirement. Those cells delivered the following AHr:

Cell No.	A628	J637	M640	T647
AHr output	397.5	398.5	393.5	376

[3] On the cover letter appears an unexplained, handwritten "1/5/99."

NSWC's report explained the failures as follows (R4, tab 15 at i, 4-5):

> [A] poor charge acceptance on the cycle 1 charge resulted in four failures on the 400 [AHr] discharge of the second cycle. This phenomenon is known as second cycle syndrome[1]. What may have contributed to the poor charge is the change in cut off voltage in the latest revision of the specification [0007a]. The cut off voltage for charge has been 2.03 VDC from antiquity. However, the test plan for this contract...changed the cut off voltage to 2.00 VDC – largely due to the soon-to-be-on-line [NNS] automated charger. This change…could have resulted in as much as 10 [AHr] or possibly 15 [AHr] difference in the first few cycles. The four cells that failed to deliver the specification minimum of 400 [AHr] during cycle 2 discharge were 1.5 (J637), 2.5 (A628), 6.5 (M640) and 24.0 (T647) [AHr] short.…
>
> ---
>
> 1 A phenomenon known to dry charged silver-oxide/zinc batteries whereby the first full charge following the first full discharge averages 80 percent recharge and the subsequent charge completes the "lost" 20 percent. [Note in original]

20. For several decades before the award of contract LA13, both parties were aware of the "second cycle syndrome" -- the unpredictable inability of a silver-zinc cell, whether of the "U-wrap" or "split-wrap" design, to accept an efficient charge following its first discharge resulting in a reduced capacity discharge in the second cycle (tr. 1/48-51, 2/49, 116-17, 146, 163, 3/17, 156; ex. A-22 at 4-25).

21. The parties' test data show that gas bubbles accumulated on the zinc electrode during cell charging decrease the electrode surface area available for charging, increase internal cell pressure and cause a temporary voltage increase. Gas is purged during such charge by a vacuum process and by including lead oxide-cadmium oxide depolarizers in the zinc electrode. To relieve internal gas pressure, a cell's vent valve opens, the cell "burps" as the gas escapes, causes a temporary voltage drop, frees the electrode area available for further charging, increases the cell's discharge capacity and off-sets the second cycle syndrome. (Ex. A-22 at 33-38; tr. 1/40-42, 64, 3/84-88) Inadequate cell restraint during FAT can prevent cell burping by increasing the cell volume, reduce a cell's internal pressure which activates the vent valve and permit more gas bubbles to decrease the electrode surface area and can contribute to or exacerbate second cycle discharge failures (tr. 3/95-96, 169-71, 4/168-72).

22. The 26 January 1999 letter to NSWC from Maria Bela de Castro, Yardney's contract administrator who signed all bilateral modifications of contract LA13 (R4, tabs 3, 5-9, 12), notified NSWC, with respect to the vibration induced failures, of an inconsistency between the vibration test requirements in specification 0007a, ¶ 7.3.4 ("The vibration test of Test Condition C [of MIL-STD 202] shall be lowered to 1.0 g,") (finding 4), and in TP-319, ¶ 2.4.10.2 ("The vibration environment shall be in accordance with MIL-STD-202F…test condition C except that *high frequency acceleration amplitudes* shall be limited to 1.0g,") (finding 15, emphasis added) (R4, tab 17 at 11; tr. 2/60, 173-74). CO Splawn stated that no one caught that error; Mr. Thomas admitted the mistake (ex. G-13 at 2; tr. 2/174). We find that cell failures due to NSWC's erroneous low frequency vibration testing at levels in excess of 1.0 g were not a valid basis to reject Yardney's FAT-1 samples.

23. With respect to the second cycle discharge failures, Yardney's 26 January 1999 letter stated that TP-319's—

> [C]hange to 2.00 volts was due to an equipment/procedure change…. Although the test plan was approved by YTP [Yardney] for this change[,] after analysis of [FAT-1 test] data this change has proven to be detrimental in meeting the requirements of the specification.…
>
> YTP's data review has shown that the delta capacity [loss] from 2.00 volts to 2.03 volts is ~20 AH[r].…

(R4, tab 17 at 6)

24. On 26-27 April 1999 the parties discussed Yardney's new split-wrap and U-wrap cell designs, which varied the silver-zinc ratio and whose recharge difference at 2.00 and 2.03 volts was about 16-17 AHr. Yardney selected the "normal" U-wrap design (LR360DC-6) and agreed to submit five cells for NSWC testing on the NNS battery charger with a revised recharge voltage of 2.03 volts. (Ex. G-15; tr. 2/195-97, 3/105)

25. In May-June 1999 NSWC tested five "series 4" (LR360DC-4) and five "series 6" (LR360DC-6) cells on the modified NNS battery charger in accordance with NSWC's test plan 6095-TPL-402 and test procedure 6096-TP-279a. NSWC restrained those cells in "fleet cell trays" and charged them to 2.03 VDC. Two series 6 cells failed the 400 AHr cycle 2 discharge requirement, delivering approximately 290 and 340 AHr, respectively. (Ex. G-16 at 1, 6-8, 30)

26. On 8 July 1999 Yardney resubmitted to NSWC for FAT 20 cells, part No. LR360DC-6, using the U-wrap design (FAT-2) (R4, tab 22 at i, 3, 6; tr. 3/49). In

FAT-2 testing, NSWC charged the cells to 2.03 volts and restrained them in SDV trays (R4, tab 22 at 9-10; tr. 1/166-68).

27. On or about 26 August 1999 NSWC notified Yardney that its FAT-2 samples had failed because cell No. J041 delivered 360.19 AHr, 39.81 AHr less than the 400 AHr required for cycle 2 discharge by specification 0007a (R4, tab 22 at i). NSWC's 26 August 1999 report, No. EDD 99-083, stated (R4, tab 22 at 6):

> c. All 20 cells met the specification requirements of performance discharge on the first cycle. However, a poor charge acceptance on the cycle 1 charge resulted in one failure [of sample cell J041]...on the 400 [AHr] discharge of the second cycle discharge. This phenomenon is known as second cycle syndrome.… The cut off voltage for charge has been changed back to 2.03 VDC.…

28. On 7 December 1999 Ms. Russell visited NSWC, learned that NSWC used SDV trays for cell restraint in FAT-1 and FAT-2 testing, observed four trays and felt (but did not measure) a bulge on the thinner end tray wall opposite the thicker wedged wall on more than one SDV tray, and so advised NSWC (tr. 3/55-57, 66-67, 137-40, 4/31-36; R4, tab 23).

29. Ms. Russell prepared the relevant part of the cell location diagram in exhibit A-40 at Crane on 7 December 1999 while she was looking at what Mr. Thomas showed her were the locations of the 20 cells, designated A through T, with five cells in each of the four SDV trays that NSWC used in FAT-2. No one told her that her diagram was not correct. (Tr. 2/194-95, 3/58-64, 4/37-42, 55) Mr. Thomas did not deny her statements, but testified (tr. 4/121):

> Q Did you ever tell Ms. Russell that's how the cells were positioned within the trays?
>
> A Well, you don't have to because they're written in letters that big, with an indelible ink pen, right on the top, though.… And to answer your question, I don't remember pointing them out. I don't remember having to point them out.

30. NSWC's 29 December 1999 memorandum of the 7 December meeting stated: "The failed cell location with the 5-cell packs seemed to be of particular interest. Failures were alleged to nearly always occur on the end cell." "There is a coincidental high occurrence of cell failures in the end cells of the pack (A, F, J, P, and T)." The

parties agreed to conduct an experiment to determine the effect of cell restraints on cycle 2 discharge failures. (R4, tab 23 at 2, 4, 7; tr. 4/136)

31. The parties agree about the location of the J and T cells at the non-wedge end of the SDV tray and of the M cell, but disagree about the location of the A cell (exs. A-40, G-30 at 9; tr. 4/245-46).

32. We accept Yardney's view of the cell arrangement in the SDV trays because it was a contemporaneous diagram as to FAT-2, and there is no reason to believe that such arrangement was different in FAT-1. Indeed, Mr. Thomas testified that NSWC used the same arrangement of cells A through T in SDV trays for all FAT tests (tr. 2/125-28, 195, 4/127). We find that the occurrence of four of the five cycle 2 discharge failures in FAT-1 and FAT-2 in cells adjacent to the SDV tray end wall and the evidence of a bulge in such wall show that to some degree the SDV tray may have provided cell restraint which allowed expansion of cell component material by electrolyte wetting (tr. 1/57, 174, 3/77, 5/76).

33. In January 2000 NSWC tested 20 Yardney "series 4" cells (LR360DC-4) with a 2.03 recharge voltage, of which 10 cells were restrained in SDV trays and 10 were restrained with plywood end plates, clamps and fibrous tape, and concluded that all 20 cells provided 400 AHr on cycle 2 discharge, with SDV trays if anything slightly superior (ex. G-18 at 1-7, 10; tr. 4/136-43). Yardney's 15 February 2000 letter to CO Splawn regarding NSWC's "Restraint and Vacuum test program," stated "that the program reflects inconclusive results" and did not dispute NSWC's cycle 2 discharge conclusion (R4, tab 26 at 1).

34. Effective 17 April 2000 bilateral contract Modification No. P00005, with no release of claims or reservation of rights by either party and no adjustment of the contract price, changed the FAT procedures as follows (R4, tab 6):

> ITEMS 1, 2, AND 3 BELOW, ARE CITED IN THE SPECIFICATION AS ALTERNATIVES, HOWEVER, [NSWC] CRANE WILL UTILIZE THESE, BECAUSE THEY ARE…PREFERRED BY YARDNEY…. ITEMS FOUR AND FIVE ARE A CHANGE TO THE SPECIFICATION THAT YAR[D]NEY HAS REQUESTED AND WILL BE USED FOR THE [FAT] IN LIEU OF WHAT THE SPECIFICATION CITES.
>
> 1) Vacuum fill will be performed on all FAT cells.
>
> 2) Battery 5-cell packs will be rigidly restrained by clamps and plywood.

3) The vacuum test of specification [¶] 7.2.3 will be conducted.

4) Cycle 1 charge will be performed as follows:

a) Charge #1 begins with all cells charging at the 10.0 ampere rate until 420 ampere-hours are replaced OR until the FIRST CELL reaches 2.03 VDC.

b) A three-hour rest period will follow the 10.0 ampere charge.

c) A top off charge at the 8 ampere rate will follow the three-hour rest period until each cell reaches cut-off of 2.03 VDC; however, the top off charge will terminate if a total time of 48 hours – beginning with the initiation of the 10 ampere charge – is reached.

5) Top-off charge prior to cycle 1 discharge will not be performed.

The foregoing statement, "Items four and five are a change to the specification that Yar[d]ney has requested and will be used for the [FAT] in lieu of what the specification cites" is inaccurate to the extent that specification 0007a, ¶¶ 3.3, 7.7.1 and 7.7.2, required a cut-off charge of 2.03 VDC (finding 5).

35. On 15 March 2000,Yardney submitted, and on 17 April 2000 NSWC received, 20 cells embodying the LR360DC-6 U-wrap design for FAT (FAT-3) (compl. and answer ¶ 18; R4, tab 28 at 3).

36. NSWC's 3 October 2000 report No. EDD 00-046 on Yardney's FAT-3 resubmission stated that, in accordance with the FAT procedures revised in Modification No. P00005, of "the 20 LR360DC-6 FAT cells tested, none failed to deliver the minimum 400 [AHr] on the cycle #1 and cycle #2 discharge" and the FAT-3 samples had successfully completed all other tests except the wet life performance, which would continue until August 2001 (R4, tab 28 at i, 2, 3; tr. 1/189-90).

37. Effective 5 November 2000, bilateral contract Modification No. P00006 gave Yardney partial first article approval and authorized the start of production, subject to completion of the 15-month wet life test (R4, tab 7).

38. Yardney's 27 November 2001 letter to the CO submitted a certified claim for $147,805[4] for the FAT-2 and FAT-3 resubmissions, alleging that inconsistencies between contract specification 0007a and respondent's test plan TP-319, *viz*., failure to use the 1.0 g vibration test, the 2.00 volt recharge and inadequate SDV cell restraint, effectively increased the standards of performance and did not fairly demonstrate whether the cell samples NSWC tested met specified requirements (R4, tab 30). The CO's 30 April 2002 final decision denied Yardney's claim in its entirety (R4, tab 31). This timely appeal followed.

39. (a) With respect to the second cycle discharge failures in FAT-1, the parties introduced evidence of linear, quadratic and cubic polynomial "regression analyses" to attempt to show whether the four cells which failed FAT-1 would have passed if they had been charged to 2.03 instead of 2.00 volts (exs. A-46, -51, G-31). Although the parties' witnesses, Mr. Tuan A. Duong, Yardney's Director of Operations, and Mr. Mark Thomas, are experienced and have technical training, neither was offered or accepted as an expert.

(b) Mr. Duong, using linear regression, calculated the "amp-hour capacity" input for the four FAT-1 cells that failed to achieve the 400 AHr cycle 2 discharge output if such cells were charged to 2.03 volts, as follows (ex. A-46; tr. 4/59, 66-67):

Cell No.	A628	J637	M640	T647
AHr input	439.5	428	428	441

Mr. Duong also used polynomial regression to predict the "amp-hour capacity" for the four FAT-1 cells that failed to achieve the 400 AHr cycle 2 discharge output. He asserted that four polynomial regression charts each had missing second pages that showed the same AHr inputs for the four cells as he calculated by linear regression. (Ex. A-51; tr. 5/103-10). The 2.00 volt input charges on which Mr. Duong based his regression analysis corresponded to the input charges for cells A628, J637, M640 and T647 in cycle 1 (ex. A-46 at 1; R4, tab 15 at 21, 30, 33, 40; ex. A-22 at 16-17). Mr. Duong did not explain how to calculate cycle 2 outputs (discharges) from his predicted cycle 1 input (charges) at 2.03 volts (tr. 4/65-86, 5/103-16).

(c) Mr. Thomas sought to predict the cycle 2 discharge output in AHr for cells A628, J637, M640 and T647 that failed FAT-1, if their cycle 1 charge had been 2.03 VDC, rather than 2.00 VDC (finding 19(b)), by linear, quadratic and cubic polynomial

[4] While the claim narrative sought $147,805, the sum of the detailed cost breakdown is $146,961 (R4, tab 30 at 6, 7).

regression techniques. By regression technique and cell number, Mr. Thomas predicted the following AHr inputs at 2.03 volt charge for cycle 1:

Cell No.→	A628	J637	M640	T647
Linear AHr	440	435	430	470
Quadratic AHr	420	420	416	430
Cubic AHr	413	414	414	396

For each such cell Mr. Thomas opined that the cubic technique was the "Best Model" and that Mr. Duong's "[p]redictions…are wildly exaggerated." Mr. Thomas stated that, when charged to 2.00 volts, the "cycle 2 discharge is less than the cycle 1 charge by about 2" AHr, but that "historical data do not support this prediction [of 2 AHr] as the average difference is 7 AHr." Respondent did not offer historical data to substantiate Mr. Thomas' foregoing statement. Mr. Thomas opined that the cycle 2 output AHr for the four cells, using the "best model" regression technique and the 7 AHr average difference at the 2.00 volt charge, were:

Cell No.	A628	J637	M640	T647
AHr output	404	405	400	384

(Ex. G-31 at 1-2, 7-8)

(d) Based on the foregoing, we find that the parties' regression analyses show that at least three of the four cells that failed the FAT-1 cycle 2 400 AHr discharge requirement would have satisfied such requirement had they been charged to 2.03 volts, but yielded inconclusive results about whether cell T647 would have satisfied such requirement if so charged.

40. With respect to the degree of SDV tray deformation caused by Yardney cells, the parties introduced "finite element" and von Mises stress analyses. (a) Yardney calculated a potential 1.13327 inch deformation of the SDV tray back wall (the unwedged wall) due to (i) gas or pneumatic pressure and (ii) the swelling reaction of the cellophane separator material to the electrolyte (ex. A-22 at 53-54; tr. 1/136-40, 3/110-11, 5/75-82, 88-92). (b) Respondent's von Mises stress analysis, performed by NSWC Panama City, was based on Mr. Thomas' advice of 5-7 pounds pressure to release a cell's vent valve and double that pressure on the SDV tray walls (tr. 4/109-12, 230-31). NSWC did not record the actual pressure exerted on, and deflection of, the SDV tray back wall with operating MK 89 cells in the tray. According to Yardney, Mr. Thomas failed to consider the swelling reaction of the cellophane separator material (tr. 5/75-76). Respondent's photos of SDV trays alongside plywood restraints sought to show that the latter deflected more than the former; but Mr. Thomas stated that the plywood "bow is extremely minor" (tr. 4/239). (c) We find that though the SDV trays in some degree provided cell restraint

which allowed expansion of cell material (finding 32), respondent's January 2000 testing showed that the difference in restraint provided by SDV trays and plywood end plates and fibrous tape was inconclusive and Yardney cells restrained by both methods provided 400 AHr on cycle 2 discharge (finding 33). Thus, we are persuaded that cell J041, which failed the cycle 2 discharge requirement by 39.81 AHr on FAT-2 (finding 27), would still have failed such requirement even if it had been restrained by clamps and plywood.

DECISION

We summarized the rules of burden of proof in government inspection and rejection cases in *Propellex Corp*., ASBCA No. 50203, 02-1 BCA ¶ 31,721 at 156,728-29, *aff'd*, 342 F.3d 1335 (Fed. Cir. 2003):

> As stated by the Court of Claims in *Southwest Welding & Mfg. Co. v. United States*, 413 F.2d 1167, 1176 n.7, 188 Ct. Cl. 925, 940 n.7 (1969)… "When the Government rejects work as being not in compliance with its specifications, the…burden is upon the Government to demonstrate that fact," citing *Hardeman-Monier-Hutcherson*, ASBCA No. 11785, 67-1 BCA ¶ 6210 (at 28,748-49) and other decisions. This Board has further explained the rules of burden of proof in such cases:
>
> > When the Government opted to make that showing [of noncompliance of the rejected product] with [laboratory test] reports…a presumption arose that the tests had been properly conducted and that the results were accurate. [The contractor] was then required to rebut that presumption with evidence either that the Government's test results were invalid or that testing conducted by [the contractor] showed the products to be in conformity with the specification. Upon the production of such proof, the Government would be entitled to prevail as to the rejection only if a preponderance of the entire evidence showed nonconformity of the product to the specifications.
>
> *Tempo, Inc.*, ASBCA No. 37589, 95-2 BCA ¶ 27,618 at 137,661-62.

To justify rejection of the contractor's product, the government must show that the inspection or test used did not impose a higher or more stringent requirement, or standard

of performance, than the contract required. *See Astro Dynamics, Inc.*, ASBCA No. 28381, 88-3 BCA ¶ 20,832 at 105,364 (government's more stringent test constituted a constructive change). The same rules apply when a contractor claims its costs for investigating failures and performing punch list corrective work at government direction. *See Mitchell Enterprises, Inc.*, ASBCA No. 53202 *et al*., 06-1 BCA ¶ 33,277 at 164,962.

Yardney does not dispute the accuracy of NSWC's FAT-1 or FAT-2 test reports, or the proper functionality or calibration of its FAT equipment, but argues that NSWC's FAT plans and reports show that the performance criteria applied to FAT samples were invalid because the 2.00 volt charge and SDV tray cell restraints used in FAT-1 and FAT-2 so increased the difficulty to achieve the specified 400 AHr second cycle discharge as to make it commercially impracticable or impossible to achieve (app. br. at 40-56).

The TP-319 vibration test exceeding 1.0 g employed in FAT-1, and the 2.00 voltage charge and the SDV tray restraint applied to Yardney's FAT-1 and FAT-2 cells, did not comply with the requirements of specification 0007a (finding 5). Respondent argues, and we agree, that its non-compliant FAT-1 vibration test is immaterial to second cycle discharge failures that occurred before that vibration test (gov't br. at 48-49).

Respondent first argues that appellant assumed the risk of meeting the changed performance requirements contained in TP-319 because it was an enforceable "contract modification" (gov't br. at 31-36). Yardney argues that there was no consideration for a modification (app. br. at 47-49).

RESTATEMENT (SECOND) OF CONTRACTS § 73, Performance of Legal Duty (1981), provides:

> Performance of a legal duty owed to a promisor which is neither doubtful nor the subject of honest dispute is not consideration; but a similar performance is consideration if it differs from what was required by the duty in a way which reflects more than a pretense of bargain.

In *Aviation Contractor Employees, Inc. v. United States*, 945 F.2d 1568, 1574 (Fed. Cir. 1991) ("*ACE*"), the court held that settlement of an honest dispute of the costs to be used to calculate the definitive price in a contract modification constituted consideration, remanded to the ASBCA to find whether a pre-existing legal duty met the conditions of Restatement § 73 and stated:

> One treatise discusses the problem of lack of consideration in government contracts as follows:

> In Government contracts, [lack of consideration] most often occurs when the Government modifies a contract to benefit the contractor but receives no additional or different promise or performance in return. Under Restatement, Second, Contracts § 73, such modifications are without consideration since they involve performance of a pre-existing duty *which is neither doubtful nor the subject of honest dispute*. [Our emphasis.]
>
> J. Cibinic & R. Nash, *Formation of Government Contracts* 189 (2d ed. 1986).

See also Gardiner, Kamya & Associates, P.C. v. Jackson, 369 F.3d 1318, 1322-23 (Fed. Cir. 2004) (contractor's promise to perform tasks when it was not previously so obligated, was sufficient consideration for agency's promise to price Task Orders retroactively and prospectively); *Allen v. United States*, 100 F.3d 133, 134 (Fed. Cir. 1996) (since plaintiff had the legal duty to pay restitution, plaintiff provided no consideration for probation officer's alleged promise to do something in exchange for restitution payment).

The rule that performance of a pre-existing duty does not constitute consideration has been applied frequently when the tribunal declines to enforce a purported contract or modification to pay the contractor an additional amount for work already specified or required under the contract. *See, e.g., Allen*, 100 F.3d at 134; *ACE*, 945 F.2d at 1573. The Boards have not hesitated to apply that same rule to nullify a deductive modification for work in compliance with contract or specification requirements, as shown in the following cases: The government omitted a liquidated damages clause in a construction contract, but soon after discovering such omission issued unilateral Mod. 1 with a $23 per day liquidated damages provision. The CO thereafter assessed $11,707 in liquidated damages. We held that there was no consideration to support Mod. 1. *See Jacqueline Howell, Ltd.*, ASBCA No. 27026, 82-2 BCA ¶ 16,086 at 74,787-88. Change Order No. 3 deducted $38.40 for fence posts that did not comply with the minimum eight inch fence post diameter required by Work Order F. Since the original contract was silent on such diameter, there was no consideration for the deduction. *See Airco Engineers*, AGBCA No. 245, 72-1 BCA ¶ 9215 at 42,749. When a contractor's proposed "equal" cement complied with the contract requirements for color, tone and other physical characteristics similar to the prescribed brand name cements, the government was already obligated to approve such equal cement. Thus, the government could not enforce the parties' agreement to a $700 credit to the government in return for such approval. *See Hunt Building Marts*, DOT CAB No. 69-6, 69-2 BCA ¶ 8042 at 37,343.

Yardney received no monetary consideration for accepting revised TP-319 (finding 14). That revision was done chiefly to resolve the government's self-inflicted inconsistency between contract LA13's 2.03 volts charge requirement and the NNS automated battery charger's charging requirement of 2.00 volts ordered by NSWC (findings 9-12). Yardney incurred the more stringent performance criteria that increased the difficulty of achieving the specified FAT cycle 2 400 AHr discharge requirement and resulted in a constructive change. *Astro Dynamics,* 88-3 BCA at 105,364. We hold that TP-319 lacked consideration to constitute a binding contract modification.

Respondent's argument that its acceptance of other changes to TP-319 that Yardney requested was a benefit to Yardney (gov't reply br. at 31-32) is untenable. The only proven change Yardney requested to TP-319 was to correct the terminal thread call out from .438-14 to .438-20 (finding 14) so as to conform that requirement to the requirement in Drawing No. SK7005527 (finding 6). Such change was of no benefit to Yardney or any detriment to respondent, since Yardney was entitled to perform, and respondent was obliged to test, to the .438-20 requirement in drawing SK7005527. Based on the foregoing analyses, we hold that there was no consideration moving to Yardney to support TP-319 as a contract modification.

We reject respondent's other major argument—that Yardney's split-wrap cell design was the more likely cause of its cycle 2 discharge failures in FAT-1 than the change in test requirements (gov't br. at 37-39, 41-44). With respect to FAT-1, the parties agree that three of the four cells that failed would not have failed if the cells had been charged to 2.03 volts, and the proof is inconclusive with respect to the fourth failed cell (finding 39(d)). Such evidence is more persuasive than respondent's attempt to correlate cell design with FAT failures. Respondent has not persuaded us that Yardney's cycle 2 failures in FAT-1 were not the result of the noncompliant charge of 2.00 volts. We so hold.

With respect to FAT-2, though the SDV trays in some degree provided cell restraint which allowed expansion of cell material (finding 32), respondent's January 2000 testing showed that the difference in restraint provided by SDV trays and plywood end plates and fibrous tape was inconclusive and Yardney cells restrained by both methods provided 400 AHr on cycle 2 discharge (finding 33). Thus, we are persuaded that cell J041, which failed the cycle 2 discharge requirement by 39.81 AHr on FAT-2 (finding 27), would still have failed such requirement even if it had been restrained by clamps and plywood (finding 40(c)). We hold that Yardney's cycle 2 discharge failure in FAT-2 was not due to the SDV tray restraints.

Accordingly, we sustain the appeal with respect to FAT-1, deny the balance of the appeal and remand it to the parties to resolve quantum.

Dated: 1 October 2009

DAVID W. JAMES, JR.
Administrative Judge
Armed Services Board
of Contract Appeals

I concur

RICHARD SHACKLFORD
Administrative Judge
Armed Services Board
of Contract Appeals

I concur

I concur

MARK N. STEMPLER
Administrative Judge
Acting Chairman
Armed Services Board
of Contract Appeals

EUNICE W. THOMAS
Administrative Judge
Vice Chairman
Armed Services Board
of Contract Appeals

I certify that the foregoing is a true copy of the Opinion and Decision of the Armed Services Board of Contract Appeals in ASBCA No. 53866, Appeal of Yardney Technical Products, Inc., rendered in conformance with the Board's Charter.

Dated:

CATHERINE A. STANTON
Recorder, Armed Services
Board of Contract Appeals