

ATTACHMENT 2

13-NC-QD-201, REVISION 2

9202270415 920207
PDR ADOCK 05000528
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REVISION 02

CALCULATION REVISION/TITLE SHEET

Palo Verde Nuclear Generating Station

CALCULATION NO. 13-NC-QD-201		REV. 2	CLASS: Q ☐ QAG ☐ NQR ☒		AFFECTED SHEET NO(S) See below	
CALCULATION TITLE Calculation for Exide Emergency Lighting Unit Availability Study						ISSUED 1/30/92
AFFECTED CHANGES N/A		REFERENCE(S) NRC Inspection Report #IR528/91-30-00 Letter#102-02091-WFC/TRB/DLK, 12/27/91				UNITS AFFECTED ☒ UNIT 1 ☒ UNIT 2 ☒ UNIT 3 ☐ COMMON
REASON FOR CHANGE Partition: RCTS CATS No.: 040847 "Evaluate commitment in letter 102-02091-WFC/TRB/DLK, Attachment 1, Section I.b., Par 7 and provide compliance with CATS action sheets that implement the commitment." Action 01: "In letter 102-02091, APS committed to provide updated information to the NRC on Exide and Holophane inverter availability by 01/31/92."						
DESCRIPTION OF CHANGE <u>Description</u> This revision (2) incorporates updated availability data obtained for the time period of June 1990 through November 1991. This information was prepared in a manner consistent with that specified within the body of the original calculation. <u>Pages Changed</u> Table of Contents, page 1 of 14 6.0 References, page 5 of 14 <u>Pages Added</u> Table 3: Input Data and Calculated Known and Estimated Unavailable Days(1991), Pages 15 - 17 Table 4: Calculation of Unit and Plant Availabilities(1991), Page 18 - 19 Table 5: Availability Comparison (1990 - 1991), Page 20 - 21 Appendix B: Work Order History Graphs (1991), Pages 22 - 28						
J.R. Wadella Tech. Issues 01/06/92	N/A	N/A	N/A	N/A	N/A	S.K. Guy PRA 1/8/92 D.L. Cooper P.P. Engr. 1/16/92 N/A D.C. Fan PRA 1/16/92 N/A
Preparer Date	Dwg. Check Date	Mech. Date	Civil Date	Elec. Date	I & C Date	Technical Review Date Other (Specify Org.) Date Other (Specify Org.) Date RS Date NEM Date

CROSS DISCIPLINE REVIEW

Procedure 81DP-4CC04



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1.0 PURPOSE

This calculation is performed as part of the PVNGS response to NRC Inspection Report 90 -121. Pages five and six of that report provide failure data on Holophane, Exide and Emergi-Lite units. The data is presented on a reliability basis, e.g., 4 of 4 Holophane units (100%) failed in Unit 1 in 1988. The conclusion is drawn that the emergency lighting is not reliable.

While the failure numbers used by the NRC in the report are an accurate reproduction of data provided to the NRC in the June 29, 1990 letter, their method of portraying failures can be misleading. The purpose of this study is to provide a more proper way of portraying the failures of the Exide units.

2.0 SUMMARY

An average unavailability indicator was developed. The unavailability indicator for each component (and group of components) is calculated for a specific time period by dividing the total number of unavailable days by the total number of days in the time period. Thus, a value of zero means a component was always available. A value of one implies a component was never available. This method is basically the method employed by INPO to monitor the readiness of important safety systems to respond to off-normal events or accidents. An availability indicator is obtained by subtracting the unavailability from one.

The resulting average availability indicators for the various units and Exides as a whole, based on a time period from June 29, 1989 to June 30, 1990 are as follows:

Unit 1: 0.93

Unit 2: 0.49

Unit 3: 0.89

Unit Average: 0.77

3.0 CRITERIA AND ASSUMPTIONS

There are no applicable design criteria, design assumptions, codes, standards, or other requirements for this calculation. The basic equation used to calculate the average estimated unavailability for a Exide unit is to divide the total number of unavailable days by the total number of days in the selected time period.

The details involved are described in Section 5.

Two assumptions are made in this calculation. The first assumption deals with estimating the calendar date when the Exide failed. Following an accepted reliability approach the failure is assumed to have occurred mid-point between the last date the component is known to have been operational and the component failure discovery date. The second assumption is that for each Exide unit there are no failures in the time period from the last Exide unit test to 6/30/90. This is the assumption as made for INPO's safety system unavailability monitoring, i.e. if the failure is not observed then it is assumed that there has not been a failure.



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4.0 INPUT DATA

The input data for this calculation is a series of failure data for each Exide unit that identify the failure discovery date, the component repair date, and the last date that component is known to have been operational. This information is used to calculate a known unavailable time and an estimated unavailable time as described in Section 5.1. The failure data is based on a review of Exide work orders performed by an EED Electrical task force related to Emergency Lighting. A series of graphs were prepared which depict the work order history of the Exide units for the time frame June 29, 1989 to June 30, 1990. These graphs serve as a visual aid and help document which work orders contain information relating to failure data. They are provided as Appendix A.

The failures were compared with Exide failure evaluations previously described to the NRC in References 2, 3, and 4. The results of that comparison follow.

- Unit 1: QDN-F01 & QDN-N01 - consistent with previous evaluations.
- Unit 1: QDN-F02 & QDN-N02 - consistent with previous evaluations.
- Unit 2: QDN-F01 & QDN-N01 - consistent with previous evaluations (the 06/03/90 failure reported in Reference 2 is a typo - the actual date is 06/30/90)
- Unit 2: QDN-F02 & QDN-N02 - consistent with previous evaluations.
- Unit 3: QDN-F01 & QDN-N01 - the 06/12/90 failure described in Reference 4 is the 05/13/89 failure in Table 1 of this calculation. The 08/07/89 low electrolyte problem evaluated as incipient in Reference 4 is now classified as a failure with a discovery date of 08/03/89.
- Unit 3: QDN-F02 & QDN-N02 - consistent with previous evaluations.

The failure data is contained in Table 1.

5.0 CALCULATION AND RESULTS

5.1 Method

An unavailability indicator was developed to quantify the readiness of Exide units to respond to situations in which they would be required. The indicator for each component (or any group of components) is calculated for a specific time period by dividing the total number of unavailable days by the total number of days in the time period. Thus, a value of zero for a component means the component was always available. A value of one means a component was never available. This method is basically the method employed by INPO to monitor the readiness of important safety systems to respond to off-normal events or accidents.

The method requires the development of known and estimated unavailable time periods. The known unavailable time periods are the times a component is not available for service when the beginning and ending time of the unavailability due to a failure are known, i.e. failure discovery time and repair time respectively. The estimated time periods are the average times a component was in a failed state prior to failure discovery. This time is estimated as one-half time interval measured from the last time the component is known to be operable to the time it is discovered as failed. Thus, for a component which failed an eight-hour discharge test, the estimated unavailable time would probably be one-half the time since the last successful eight-hour discharge test for that

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component. A more recent preventive maintenance would be used if a determination could be made that the specific failure mode would have been detected by the maintenance. The unavailable times described above are only those stemming from events judged to be component failures.

5.2 Scope

The scope of this evaluation includes all Exide Units in Units 1, 2, and 3. The time period begins on June 29, 1989 (Unit 2 restart). The process of determining failure dates, repair dates, and last known available dates requires extensive review of work orders. These work orders are not intended for this purpose and chronological reconstructions can be difficult and time consuming. The selection of 6/29/89 as a start date for this calculation is based on it being both representative and recent. An end date of 6/30/90 was chosen as the conclusion of the time period for this study. The basis for the selection of this end date is that it allows for an extended history without having to consider open work orders. Although the limited time period is based on time and resource constraints, a one-year period is considered adequate to estimate Exide availability.

5.3 Calculation Process

The calculation process used is straight-forward. For each failure event, three dates are required as input data: the failure discovery date, the component repair date, and the last date the component is known to have been available. The time between the failure discovery date and the component repair date is the known unavailable hours as discussed in Section 5.1. The estimated unavailable time is one-half the time between the last time the component is known to be available and the failure discovery date. An exception to this calculation of the estimated unavailable time is made for cases in which the estimated unavailable time period is prior to the June 29, 1989 start date. In those cases, the estimated unavailable time is taken from the start date to the failure date. The calculated known and estimated unavailable days are shown with the input data in Table 1. Once the known and estimated unavailable days are determined for each component, they are entered into a spreadsheet which: (1) totals the known and estimated unavailable days for each component; and, (2) calculates the component average unavailability indicator by dividing this total by the total time period for the component (366 days). The spreadsheet also sums the unavailable days and the total time periods for all the components in a unit, and then calculates a unit average. This process is repeated for all three units. An Exide overall plant unit average is calculated. The spreadsheet calculations were manually verified. The spreadsheet is duplicated in Table 2.

5.4 Results

The resulting average availability indicators for the various units and Exides as a whole, based on a time period from June 29, 1989 to June 30, 1990 are as follows:

Unit 1: 0.93

Unit 2: 0.49

Unit 3: 0.88

Unit Average: 0.77



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6.0 REFERENCES

1. August 30, 1989 Letter from Terence J. Sullivan of INPO to William F. Conway Enclosure 2
2. August 1, 1990 letter from W. F. Conway to J. B. Martin: 161-03373-WFC/WFQ
3. June 29, 1990 letter from W. F. Conway to J. B. Martin: 161-03305-WFC/RAB
4. June 23, 1990 letter from W. F. Conway to J. B. Martin: 161-03294-WFC/RAB
5. December 27, 1991 letter from W. F. Conway to J. B. Martin: 102-02091-WFC/TRB/DLK

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TABLE 1. Input Data and Calculated Known and Estimated Unavailable Days

Equipment ID	Discovery Date	Repair Date	Last Known Available Date	Unavailable Known Days	Unavailable Estimated Days	Unavailable Total Days
1EQDNN01	28-Feb-90	25-Mar-90	28-Feb-90	25	0	25
1EQDNN02	28-Feb-90	24-Mar-90	28-Feb-90	24	0	24
2EQDNN01	03-Jan-90	05-Apr-90	22-Nov-88	92	*188	280
	05-Apr-90	20-Apr-90	05-Apr-90	15	0	15
	30-Jun-90	01-Jul-90	Jun-30-90	1	0	1
2EQDNN02	04-Dec-89	03-Jan-90	14-Nov-89	30	10	40
	04-Jan-90	27-Jan-90	03-Jan-90	23	0.5	23.5
	21-Mar-90	30-Mar-90	12-Mar-90	9	4.5	13.5
**3EQDNN01	29-Jun-89	01-Aug-89	29-Jun-89	33	0	33
	03-Aug-89	28-Aug-89	01-Aug-89	25	1	26
3EQDNN02	03-Aug-89	18-Aug-89	03-Aug-89	15	0	15
	31-Mar-90	09-Apr-90	26-Mar-90	9	0	9

* Estimated Unavailable Times extends to before start date. 188 days is from 6/29/89 to 1/3/90.

** Failure occurred on 05/13/89 and thus was in effect when time period started.



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TABLE 2. Calculation of Unit and Plant Availabilities

Equipment ID	Known Unavailable Days	Estimated Unavailable Days	Total Unavailable Days	Required Days	Average Availability
1EQDNN01	25	0	25	366	93.2%
1EQDNN02	24	0	24	366	93.4%
Totals	49	0	49	732	
Average Unit Availability					93.3%
2EQDNN01	108	188	296	366	19.1%
2EQDNN02	62	15	77	366	79.0%
Totals	170	15	373	732	
Average Unit Availability					49.0%
3EQDNN01	58	1	59	366	83.9%
3EQDNN02	24	0	24	366	93.4%
Totals	82	1	83	732	
Average Unit Availability					88.7%
Plant Totals	301	204	505	2196	
Average Plant Availability					77.0%



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APPENDIX A

WORK ORDER HISTORY GRAPHS



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REV 1

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June 89 July 89 Aug 89 Sept. 89 Oct 89 Nov 89 Dec 89 Jan 90 Feb 90 Mar 90 Apr 90 May 90 June 90 July 90

Revision 1

DATA START DATE - 6/29/89 (UNIT 2 RESTART)

00359638 (7/6/89 - 7/7/89) MONTHLY UPS INSPECTION / TEST OK

00360534 (7/21/89 - 7/21/89) MONTHLY BATTERY INSPECTION / TEST OK

00360537 (7/26/89 - 7/26/89) MONTHLY UPS INSPECTION / TEST OK

00375707 (8/14/89 - 8/15/89) ANNUAL INSPECTION

00371384 (8/23/89 - 8/23/89) MONTHLY BATTERY INSPECTION / TEST OK

00371356 (9/7/89 - 9/8/89) MONTHLY UPS INSPECTION / TEST OK

00375486 (9/25/89 - 9/25/89) MONTHLY BATTERY INSPECTION / TEST OK

00375443 (9/26/89 - 9/26/89) MONTHLY UPS INSPECTION / TEST OK

00380440 (9/28/89 - 9/28/89) MONTHLY UPS INSPECTION / TEST OK

00380423 (10/17/89 - 10/17/89) MONTHLY BATTERY INSPECTION / TEST OK

00380413 (10/20/89 - 10/20/89) MONTHLY UPS INSPECTION / TEST OK

00384095 (10/31/89 - 10/31/89) QUARTERLY INSPECTION / TEST OK

00385923 (11/13/89 - 11/23/89) MONTHLY BATTERY INSPECTION / TEST OK

00387136 (11/23/89 - 12/19/89) MONTHLY UPS INSPECTION / TEST OK

00392757 (12/11/89 - 12/11/89) MONTHLY BATTERY INSPECTION / TEST OK

00392767 (12/21/89 - 12/21/89) MONTHLY UPS INSPECTION / TEST OK

00409016 (2/27/90 - 2/28/90) 8 - HOUR DISCHARGE TEST OK

00401568 (2/28/90 - 3/7/90) EQUALIZING CHARGE: FAILED 2/28/90 FOR LOW SPECIFIC GRAVITY. W.O. # 413446 ISSUED TO PERFORM AN EQUALIZING CHARGE.

00399745 (3/5/90 - 3/16/90) MONTHLY BATTERY INSPECTION / TEST: FAILED FOR LOW SPECIFIC GRAVITY. W.O. # 413446 PREVIOUSLY ISSUED.

00399747 (3/5/90 - 3/16/90) QUARTERLY INSPECTION / TEST: FAILED FOR LOW SPECIFIC GRAVITY. W.O. # 413446 PREVIOUSLY ISSUED.

00399721 (3/16/90 - 3/26/90) MONTHLY UPS INSPECTION / TEST OK

00401010 (3/16/90 - 3/26/90) MONTHLY UPS INSPECTION / TEST OK

00413946 (3/7/90 - 3/26/90) EQUALIZING CHARGE PERFORMED TO RESTORE LOW SPECIFIC GRAVITIES. IDENTIFIED IN W.O. # 401568. ALSO REPLACED FLOAT/EQUALIZE SWITCH. RESTORED 3/25/90

00404479 (3/26/90 - 3/26/90) MONTHLY BATTERY INSPECTION / TEST OK

00404330 (3/26/90 - 3/26/90) MONTHLY UPS INSPECTION / TEST OK

00404331 (4/5/90 - 4/5/90) MONTHLY UPS INSPECTION / TEST OK

00404480 (4/5/90 - 4/5/90) MONTHLY BATTERY INSPECTION / TEST OK

00418661 (4/6/90 - 4/13/90) ANNUAL EQUALIZING CHARGE OK

00404496 (5/1/90 - 5/1/90) QUARTERLY INSPECTION / TEST OK

00404332 (5/13/90 - 5/13/90) MONTHLY UPS INSPECTION / TEST OK

REQUIRED AVAILABLE DAYS: 366
KNOWN UNAVAILABLE DAYS: 25
ESTIMATED UNAVAILABLE DAYS: 0

EMERGENCY LIGHTING COMPONENT AVAILABILITY
EQUID: IEQDNF01 & IEQDNN01 TYPE: EXIDE

Available
Known unavailable
Estimated unavailable



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June 89 July 89 Aug 89 Sept 89 Oct 89 Nov 89 Dec 89 Jan 90 Feb 90 Mar 90 Apr 90 May 90 June 90 July 90

Revision 1

- DATA START DATE - 6/29/89 (UNIT 2 RESTART)
- # 00359660 (7/6/89 - 7/10/89) MONTHLY UPS INSPECTION / TEST OK
 - # 00360385 (7/21/89) - MONTHLY BATTERY INSPECTION / TEST OK
 - # 00360338 (7/22/89) MONTHLY UPS INSPECTION / TEST OK
 - # 00375708 (8/17/89 - 8/18/89) ANNUAL BATTERY MAINTENANCE
 - # 00371960 (8/17/89 - 8/24/89) ANNUAL EQUALIZING CHARGE
 - # 00360388 (8/17/89 - 8/18/89) QUARTERLY BATTERY INSPECTION / TEST OK
 - # 00371385 (8/23/89) - MONTHLY BATTERY INSPECTION / TEST OK
 - # 00371357 (8/25/89 - 8/26/89) MONTHLY UPS INSPECTION / TEST OK
 - # 00375487 (9/23/89) - MONTHLY BATTERY INSPECTION / TEST OK
 - # 00375444 (9/26/89) - MONTHLY UPS INSPECTION / TEST OK
 - # 00380441 (9/29/89) MONTHLY UPS INSPECTION / TEST OK
 - # 00380080 (10/17/89) - MONTHLY UPS INSPECTION / TEST OK
 - # 00380424 (10/17/89) - MONTHLY BATTERY INSPECTION / TEST OK
 - # 00384096 (10/31/89) - QUARTERLY BATTERY INSPECTION / TEST OK
 - # 00385924 (11/13/89 - 12/19/89) MONTHLY BATTERY INSPECTION / TEST OK
 - # 00385881 (11/13/89) - MONTHLY UPS INSPECTION / TEST OK
 - # 00392764 (12/21/89) - MONTHLY UPS INSPECTION / TEST OK
 - # 00392798 (12/21/89) - MONTHLY BATTERY INSPECTION / TEST OK
 - # 00405016 (2/27/90 - 2/28/90) 8 - HOUR DISCHARGE TEST OK
 - # 00412476 (2/28/90 - 3/23/90) EQUALIZING CHARGE. FAILED 2/28/90 FOR LOW SPECIFIC GRAVITY (S.G.)
 - WO # 414513 ISSUED TO PERFORM AN EQUALIZING CHARGE TO RESTORE SPECIFIC GRAVITY.
 - # 00390746 (3/6/90) - MONTHLY BATTERY INSPECTION / TEST: FAILED LOW S.G. (WO # 414513 PREVIOUSLY ISSUED)
 - # 00390741 (3/6/90) - QUARTERLY BATTERY INSPECTION / TEST: FAILED LOW S.G. (WO # 414513 PREVIOUSLY ISSUED)
 - # 00391393 (3/6/90 - 3/7/90) - MONTHLY BATTERY INSPECTION / TEST: FAILED LOW S.G. (WO # 414513 PREVIOUSLY ISSUED)
 - # 00391377 (3/6/90 - 3/7/90) MONTHLY UPS INSPECTION / TEST OK
 - # 00391377 (3/6/90 - 3/7/90) MONTHLY UPS INSPECTION / TEST OK
 - # 00414513 (3/9/90 - 3/29/90) EQUALIZING CHARGE PERFORMED TO RESTORE LOW SPECIFIC GRAVITIES. IDENTIFIED IN WO # 412476. RESTORED 3/24/90
 - # 00340568 (3/23/90 - 3/20/90) MONTHLY UPS INSPECTION / TEST OK
 - # 00404337 (3/26/90) - MONTHLY UPS INSPECTION / TEST OK
 - # 00404486 (3/29/90) - MONTHLY BATTERY INSPECTION / TEST OK
 - # 00404499 (5/1/90) - QUARTERLY BATTERY INSPECTION / TEST OK
 - # 00404488 (5/9/90) - MONTHLY BATTERY INSPECTION / TEST OK
 - # 00404339 (5/9/90) - MONTHLY UPS INSPECTION / TEST OK
 - # 00359659 (5/23/90) - MONTHLY UPS INSPECTION / TEST OK
 - # 00404340 (6/7/90) - MONTHLY UPS INSPECTION / TEST OK
 - # 00404415 (6/7/90) - MONTHLY BATTERY INSPECTION / TEST OK
 - # 00404341 (7/7/90) - MONTHLY UPS INSPECTION / TEST OK
 - # 00404490 (7/8/90 - 7/10/90) MONTHLY BATTERY INSPECTION / TEST OK

REQUIRED AVAILABLE DAYS: 366
KNOWN UNAVAILABLE DAYS: 24
ESTIMATED UNAVAILABLE DAYS: 0

EMERGENCY LIGHTING COMPONENT AVAILABILITY
EQUID: IEQDNF02 & IEQDNN02
TYPE: EXIDE

Available
Known unavailable
Estimated unavailable



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June 89 July 89 Aug 89 Sept. 89 Oct 89 Nov 89 Dec 89 Jan 90 Feb 90 Mar 90 Apr 90 May 90 June 90 July 90

Revision 1

DATA START DATE - 6/29/89 (UNIT 2 RESTART)

00366079 (7/1/89 - 7/1/89) MONTHLY UPS INSPECTION / TEST OK
00366077 (7/1/89 - 7/1/89) MONTHLY BATTERY INSPECTION / TEST OK

00370232 (8/1/89 - 8/1/89) MONTHLY UPS INSPECTION / TEST OK

00370229 (8/21/89 - 8/21/89) QUARTERLY INSPECTION / TEST OK
00370228 (8/21/89 - 8/21/89) WEEKLY INSPECTION OK

00377608 (9/1/89 - 9/1/89) WEEKLY INSPECTION OK
00377610 (9/1/89 - 9/1/89) WEEKLY INSPECTION OK

00382462 (10/17/89 - 10/17/89) MONTHLY UPS INSPECTION / TEST OK
00382460 (10/17/89 - 10/17/89) WEEKLY INSPECTION OK

00387845 (11/1/89 - 11/1/89) WEEKLY INSPECTION OK
00387850 (11/1/89 - 11/1/89) MONTHLY UPS INSPECTION / TEST OK
00387889 (11/20/89 - 11/20/89) MONTHLY UPS INSPECTION / TEST OK
00387844 (11/28/89 - 11/28/89) WEEKLY INSPECTION OK

00387946 (12/4/89 - 12/4/89) 8 - HOUR DISCHARGE TEST (INCOMPLETE - VOLUNTARILY TERMINATED AFTER 4 - HOURS, ILLUMINATION CRITERIA NOT MET)

00391078 (12/12/89 - 12/12/89) WEEKLY INSPECTION: BATTERY CELLS # 4 AND # 7 HAD LOW SPECIFIC GRAVITY
WO # 401622 INITIATED TO PERFORM AN EQUALIZING CHARGE.
00391082 (12/12/89 - 12/12/89) MONTHLY UPS INSPECTION / TEST OK

00398915 (1/2/90 - 1/2/90) 8 - HOUR DISCHARGE TEST: FAULTED - INVERTER BREAKER TRIPPED AT 7.5 HOURS
WO # 401622 PREVIOUSLY INITIATED TO PERFORM AN EQUALIZING CHARGE.
00401622 (1/8/90 - 1/8/90) EQUALIZING CHARGE FOR WO # 401078: FAILED FOR LOW SPECIFIC GRAVITY.
WO # 404284 INITIATED TO PERFORM AN EQUALIZING CHARGE.

00398924 (1/8/90 - 1/8/90) MONTHLY UPS INSPECTION / TEST OK
00398922 (1/15/90 - 1/15/90) WEEKLY INSPECTION: FAILED FOR LOW SPECIFIC GRAVITY
WO # 401622 PREVIOUSLY INITIATED

00404284 (1/15/90 - 1/15/90) EQUALIZING CHARGE FOR WO # 401622: FAILED FOR LOW SPECIFIC GRAVITY
WO # 405740 INITIATED TO PERFORM AN EQUALIZING CHARGE.

00405740 (1/23/90 - 1/23/90) EQUALIZING CHARGE FOR WO # 404284: FAILED FOR LOW SPECIFIC GRAVITY
WO # 337133 INITIATED TO PERFORM AN EQUALIZING CHARGE.

00401707 (2/3/90 - 2/3/90) MONTHLY UPS INSPECTION / TEST OK
00371135 (2/7/90 - 2/7/90) EQUALIZING CHARGE FOR WO # 405740 OK

00406982 (2/23/90 - 2/23/90) WEEKLY INSPECTION OK
00398932 (2/27/90 - 2/27/90) MONTHLY BATTERY INSPECTION / TEST OK

00406984 (3/5/90 - 3/5/90) MONTHLY UPS INSPECTION / TEST OK

00411656 (4/3/90 - 4/3/90) MONTHLY UPS INSPECTION / TEST OK

00411654 (4/3/90 - 4/3/90) WEEKLY INSPECTION OK
00418337 (4/4/90 - 4/5/90) 8 - HOUR DISCHARGE TEST OK. RETEST FOR WO # 398915 AND 337133.
00418654 (4/5/90 - 4/20/90) EQUALIZING CHARGE: FAILED FOR LOW SPECIFIC GRAVITY. EQUALIZING CHARGE RE-PERFORMED. SPECIFIC GRAVITY RESTORED 4/20/90

WO # 00416649 (4/23/90 - 4/24/90) BATTERY MAINTENANCE, CLEANING

00416815 (5/1/90 - 5/1/90) MONTHLY UPS INSPECTION / TEST OK
00416811 (5/1/90 - 5/1/90) WEEKLY INSPECTION OK
00416812 (5/1/90 - 5/1/90) WEEKLY INSPECTION OK

00354469 (5/19/90 - 5/20/90) QUARTERLY INSPECTION / TEST OK

00421385 (6/1/90 - 6/1/90) WEEKLY INSPECTION OK
00421389 (6/1/90 - 6/1/90) MONTHLY UPS INSPECTION / TEST OK

00430210 (6/18/90 - 6/18/90) INSPECT LAMPS OK

00426060 (6/30/90 - 6/30/90) MONTHLY UPS INSPECTION / TEST (FAILED - INVERTER FUSE BLEW)
00433082 (6/30/90 - 7/1/90) REPLACED INVERTER FUSE - RESTORED 7/1/90

REQUIRED AVAILABLE DAYS: 366
KNOWN UNAVAILABLE DAYS: 108
ESTIMATED UNAVAILABLE DAYS: 188

EMERGENCY LIGHTING COMPONENT AVAILABILITY
EQUID: 2EQDNN01 & 2EQDNN01
TYPE: EXIDE

Available
Known unavailable
Estimated unavailable



ENGINEERING SKETCH PAD

REV 1

BY: Shawn Rodgers	DATE: 7-17-90	SUBJECT: CALCULATION OF EXIDE AVAILABILITY	SHEET NO: Page 12 of 14
CHECKED BY: Yovan Lukic	DATE: 9/24/90		JOB NO: 13-NC-QD-201

June 89 July 89 Aug 89 Sept. 89 Oct 89 Nov 89 Dec 89 Jan 90 Feb 90 Mar 90 Apr 90 May 90 June 90 July 90

Revision 1

DATA START DATE - 6/29/89 (UNIT 2 RESTART)

00366078 (7/7/89) - MONTHLY BATTERY INSPECTION / TEST OK
00366043 (7/18/89) - MONTHLY UPS INSPECTION / TEST OK

00370223 (8/6/89) - MONTHLY UPS INSPECTION / TEST OK
00370231 (8/17/89) - QUARTERLY BATTERY INSPECTION / TEST OK
00370230 (8/17/89) - MONTHLY BATTERY INSPECTION / TEST OK

00377611 (9/18/89 - 9/19/89) MONTHLY UPS INSPECTION / TEST OK
00377609 (9/21/89 - 9/22/89) MONTHLY UPS INSPECTION / TEST OK
00380501 (9/27/89) - REPLACED FLOAT EQUALIZER SWITCH
NO IMPACT ON 8 - HOUR ILLUMINATION

00382463 (10/17/89) - MONTHLY UPS INSPECTION / TEST OK
00382461 (10/17/89) - MONTHLY BATTERY INSPECTION / TEST OK

00387831 (11/14/89) - MONTHLY UPS INSPECTION / TEST OK
00387847 (11/14/89) - QUARTERLY BATTERY INSPECTION / TEST OK
00387890 (11/20/89) - ANNUAL UPS MAINTENANCE OK

00387946 (12/4/89) 8 - HOUR DISCHARGE TEST (INCOMPLETE - VOLUNTARILY TERMINATED
AT 7:00 HOURS, ILLUMINATION CRITERIA NOT MET).
00376937 (12/4/89) - EQUALIZING CHARGE: FAILED FOR LOW SPECIFIC GRAVITY AND IGV (INITIAL READINGS).
EQUALIZING CHARGE PERFORMED TO RESTORE SPECIFIC GRAVITY AND IGV RESTORED 12/9/89
00391013 (12/11/89) MONTHLY UPS INSPECTION / TEST OK
00391079 (12/12/89) - MONTHLY BATTERY INSPECTION / TEST: FAILED LOW SPECIFIC GRAVITY
WO # 401624 INITIATED TO PERFORM AN EQUALIZING CHARGE.

00398915 (1/1/90) 8 - HOUR DISCHARGE TEST OK
00401624 (1/4/90 - 1/6/90) EQUALIZING CHARGE - FAILED 1/4/90 REF. 404283
00395625 (1/9/90 - 1/10/90) MONTHLY UPS INSPECTION / TEST OK
00395623 (1/13/90) - MONTHLY BATTERY INSPECTION / TEST - FAILED
00404283 (1/13/90) EQUALIZING CHARGE PERFORMED (FAILED) REF. 405743
00405743 (1/23/90) EQUALIZING CHARGE PERFORMED - RESTORED 1/27/90

00407736 (2/2/90 - 2/12/90) ANNUAL EQUALIZING CHARGE
00401708 (2/2/90 - 2/5/90) MONTHLY UPS INSPECTION / TEST OK

00403637 (2/25/90 - 2/26/90) ANNUAL BATTERY MAINTENANCE
00406983 (2/25/90 - 2/26/90) MONTHLY BATTERY INSPECTION / TEST OK

00406915 (3/5/90) - MONTHLY UPS INSPECTION / TEST OK

00412339 (3/22/90) - 8 HOUR DISCHARGE TEST OK

00411416 (3/22/90 - 3/31/90) ANNUAL EQUALIZING CHARGE - FAILED 3/21/90 RESTORED 3/30/90

00411655 (4/5/90 - 4/6/90) MONTHLY BATTERY INSPECTION / TEST OK
00411657 (4/5/90 - 4/6/90) MONTHLY UPS INSPECTION / TEST OK

00416816 (4/1/90 - 5/1/90) MONTHLY UPS INSPECTION / TEST OK
00416814 (5/1/90) - QUARTERLY BATTERY INSPECTION / TEST OK

00421316 (6/1/90 - 6/2/90) MONTHLY BATTERY INSPECTION / TEST OK
00421390 (6/1/90 - 6/2/90) MONTHLY UPS INSPECTION / TEST OK

00426059 (6/29/90 - 6/30/90) MONTHLY BATTERY INSPECTION / TEST OK
00426061 (6/30/90 - 7/1/90) MONTHLY UPS INSPECTION / TEST OK

REQUIRED AVAILABLE DAYS: 366
KNOWN UNAVAILABLE DAYS: 62
ESTIMATED UNAVAILABLE DAYS: 15

EMERGENCY LIGHTING COMPONENT AVAILABILITY
EQUIP: 2EQDNN02 & 2EQDNN02 TYPE: EXIDE

Available
Known unavailable
Estimated unavailable



ENGINEERING SKETCH PAD

REV 1

BY Shawn Rodgers	DATE ...	SUBJECT CALCULATION OF EXIDE AVAIL- ABILITY	SHEET NO. Page 13 of 14
CHECKED BY: Yovan Lukic	DATE: 9/24/90		JOB NO. 13-NC-QD-201

June 89 July 89 Aug 89 Sept. 89 Oct 89 Nov 89 Dec 89 Jan 90 Feb 90 Mar 90 Apr 90 May 90 June 90 July 90

WOW 00356239 (5/13/89 - 8/3/89) - 8 HOUR DISCHARGE (FAILED - INVERTER TRIPPED)

DATA START DATE - 6/29/89 (UNIT 2 RESTART)

00366322 (7/5/89 - 7/5/89) MONTHLY BATTERY INSPECTION / TEST OK

00365686 (7/24/89) - RESET LOW VOLTAGE RELAY (TO 105V) TO RESOLVE WO# 00356239 8 HOUR DISCHARGE RETEST PERFORMED UNDER WO# 00366322 - OK, RESTORED 8/1/89

00373798 (8/7/89 - 8/7/89) EQUALIZING CHARGE: FAILED FOR LOW SPECIFIC GRAVITY. PERFORMED EQUALIZING CHARGE AND LEFT ON FLOAT CHARGE. REF WO# 370539

00370539 (8/7/89 - 8/7/89) MONTHLY BATTERY INSPECTION / TEST: FAILED FOR LOW SPECIFIC GRAVITY ON PILOT CELLS. WO# 377926 INITIATED TO PERFORM EQUALIZING CHARGE. HOWEVER, IT WAS VERIFIED AS RESTORED (THROUGH FLOAT CHARGE) BY WO# 414189

00372634 (8/18/89 - 8/18/89) MONTHLY UPS INSPECTION / TEST OK

00374319 (8/28/89 - 8/28/89) QUARTERLY INSPECTION / TEST: RESOLUTION FOR WO# 370539. VERIFIED SPECIFIC GRAVITY WAS OK

00374472 (8/30/89 - 8/30/89) MONTHLY BATTERY INSPECTION / TEST OK

00378200 (9/15/89 - 9/15/89) MONTHLY UPS INSPECTION / TEST OK

00380935 (9/29/89 - 9/29/89) MONTHLY BATTERY INSPECTION / TEST OK

00382332 (10/13/89 - 10/13/89) MONTHLY UPS INSPECTION / TEST OK

00385612 (10/30/89 - 10/30/89) MONTHLY BATTERY INSPECTION / TEST OK
00390015 (11/1/89 - 11/2/89) (CM) ADJUST SETPOINT FOR HOUR ILLUMINATION. NO IMPACT ON 8-HOUR ILLUMINATION.

00389273 (11/2/89 - 11/2/89) MONTHLY UPS INSPECTION / TEST OK

00377926 (11/27/89) INITIATED TO PERFORM EQUALIZING CHARGE FROM WO# 370539. NOT REQUIRED. READINGS WERE OK WITHOUT PERFORMING AN EQUALIZING CHARGE

00391583 (11/28/89 - 11/28/89) QUARTERLY INSPECTION / TEST OK

00391674 (11/28/89 - 11/28/89) MONTHLY BATTERY INSPECTION / TEST OK

00392488 (12/23/89 - 12/23/89) MONTHLY UPS INSPECTION / TEST OK

00395762 (1/9/90 - 1/9/90) MONTHLY BATTERY INSPECTION / TEST OK

00402018 (2/5/90 - 2/5/90) MONTHLY BATTERY INSPECTION / TEST OK

00411954 (2/21/90 - 2/21/90) 8-HOUR DISCHARGE TEST. VOLUNTARILY TERMINATED DUE TO ILLUMINATION LEVELS. WRONG TYPE OF LIGHT METER USED. (REF WO# 412651)

00403889 (2/21/90 - 2/21/90) MONTHLY BATTERY INSPECTION / TEST OK

00403894 (2/21/90 - 2/21/90) QUARTERLY INSPECTION / TEST OK

00412651 (2/21/90 - 3/2/90) 8-HOUR DISCHARGE TEST OK

00412656 (3/2/90 - 3/11/90) ANNUAL EQUALIZING CHARGE

00403886 (3/26/90 - 3/26/90) MONTHLY UPS INSPECTION / TEST OK

00403890 (4/3/90 - 4/3/90) MONTHLY BATTERY INSPECTION / TEST OK

00410419 (4/12/90 - 4/13/90) MONTHLY BATTERY INSPECTION / TEST OK

00410708 (4/12/90 - 4/12/90) ANNUAL INSPECTION

00419705 (4/12/90 - 4/19/90) (CM) RELUG DISCOLORED WIRE. NO IMPACT ON 8-HOUR ILLUMINATION.

00413673 (5/18/90 - 5/19/90) QUARTERLY INSPECTION / TEST OK

00413672 (5/18/90 - 5/19/90) MONTHLY BATTERY INSPECTION / TEST OK

00422801 (6/7/90 - 6/7/90) MONTHLY BATTERY INSPECTION / TEST OK

00422804 (6/21/90 - 6/29/90) QUARTERLY INSPECTION / TEST OK

00422802 (7/4/90 - 7/4/90) MONTHLY BATTERY INSPECTION / TEST OK

REQUIRED AVAILABLE DAYS: 366
KNOWN UNAVAILABLE DAYS: 58
ESTIMATED UNAVAILABLE DAYS: 1

EMERGENCY LIGHTING COMPONENT AVAILABILITY
EQUID: 3EQDNF01 & 3EQDNN01 TYPE: EXIDE

Available
Known unavailable
Estimated unavailable

Revision 1



ENGINEERING SKETCH PAD

REV 1

BY Shawn Rodgers	DATE 1-1-90	SUBJECT CALCULATION OF EXIDE AVAILABILITY	SHEET NO. Page 14 of 14
CHECKED BY Yovan Lukic	DATE 9/24/90		JOB NO. 13-NC-QD-201

June 89 July 89 Aug 89 Sept. 89 Oct 89 Nov 89 Dec 89 Jan 90 Feb 90 Mar 90 Apr 90 May 90 June 90 July 90

Revision 1

DATA START DATE - 6/29/89 (UNIT 2 RESTART)

#00366434 (7/19/89) MONTHLY UPS INSPECTION / TEST OK
#00367719 (7/19/89) MONTHLY BATTERY INSPECTION / TEST OK

#00356239 (8/1/89 - 8/3/89) 1 - HOUR DISCHARGE TEST OK
#00373800 (8/1/89 - 8/3/89) ANNUAL EQUALIZING CHARGE; FAILED LOW SPECIFIC GRAVITY. EQUALIZING CHARGE PERFORMED AND PLACED ON FLOAT CHARGE (REF WO # 372636)

#00372636 (8/18/89 - 8/23/89) MONTHLY BATTERY INSPECTION / TEST OK VERIFIED SPECIFIC GRAVITY FROM WO # 00373800 WAS RESTORED (BY FLOAT CHARGE) ON 8/18/90
#00372635 (8/18/89 - 8/23/89) MONTHLY UPS INSPECTION / TEST OK
#00372637 (8/28/89 - 9/4/89) QUARTERLY BATTERY INSPECTION / TEST OK

#00371204 (9/14/89) MONTHLY BATTERY INSPECTION / TEST OK
#00371203 (9/20/89) MONTHLY UPS INSPECTION / TEST OK

#00382334 (10/13/89) MONTHLY BATTERY INSPECTION / TEST OK
#00382333 (10/14/89) MONTHLY UPS INSPECTION / TEST OK

#039238 (11/13/89 - 11/14/89) MONTHLY UPS INSPECTION / TEST OK
#00391534 (11/19/89) - QUARTERLY BATTERY INSPECTION / TEST OK

#00392541 (12/23/89 - 12/24/89) MONTHLY UPS INSPECTION / TEST OK
#00392542 (12/23/89 - 12/24/89) MONTHLY BATTERY INSPECTION / TEST OK

#00400694 (1/23/90 - 2/5/90) MONTHLY BATTERY INSPECTION / TEST OK
#00400693 (1/29/90 - 1/30/90) MONTHLY UPS INSPECTION / TEST OK

#00403191 (2/28/90) MONTHLY BATTERY INSPECTION / TEST OK
#00403187 (3/4/90 - 3/5/90) MONTHLY UPS INSPECTION / TEST OK

#00403188 (3/26/90 - 3/27/90) MONTHLY UPS INSPECTION / TEST OK
#00403187 (3/26/90 - 3/27/90) MONTHLY BATTERY INSPECTION / TEST OK
#00412652 (3/31/90) 1 - HOUR DISCHARGE TEST OK
#00412655 (3/31/90 - 4/3/90) EQUALIZING CHARGE; FAILED 3/31/90 FOR LOW SPECIFIC GRAVITY AND LOW I.C.V. AN EQUALIZING CHARGE WAS PERFORMED TO RESTORE THE UNIT. RESTORED 4/8/90.
#00417958 (4/1/90) (CM) CORRECTED INDICATING LIGHTS. WOULD HAVE PROVIDED 1 - HOUR ILLUMINATION
#00410487 (4/12/90 - 4/13/90) MONTHLY UPS INSPECTION / TEST OK

#00410488 (5/8/90 - 5/9/90) MONTHLY UPS INSPECTION / TEST OK
#00410491 (5/8/90 - 5/9/90) MONTHLY BATTERY INSPECTION / TEST OK
#00413674 (5/19/90 - 5/21/90) QUARTERLY BATTERY INSPECTION / TEST OK

#00416061 (6/3/90 - 6/11/90) MONTHLY UPS INSPECTION / TEST OK

#00432676 (6/28/90 - 7/8/90) ANNUAL EQUALIZING CHARGE
#00422303 (7/4/90 - 7/5/90) MONTHLY BATTERY INSPECTION / TEST OK
#00422305 (7/5/90) QUARTERLY BATTERY INSPECTION / TEST OK
#00422300 (7/7/90 - 7/9/90) MONTHLY UPS INSPECTION / TEST OK
#00431001 (7/7/90) ANNUAL UPS MAINTENANCE

REQUIRED AVAILABLE DAYS: 366
KNOWN UNAVAILABLE DAYS: 24
ESTIMATED UNAVAILABLE DAYS: 0

EMERGENCY LIGHTING COMPONENT AVAILABILITY
EQUID: 3EQDNF02 & 3EQDNN02 TYPE: EXIDE

Available
Known unavailable
Estimated unavailable



BY John R. Wadella	DATE 06 Jan 92	SUBJECT CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS AVAILABILITY (1991)	SHEET NO Page 15
CHECKED BY. Sandra K. Guy	DATE 08 Jan 92		JOB NO. 13-NC-QD-201

TABLE - 3

INPUT DATA AND CALCULATED KNOWN AND ESTIMATED UNAVAILABLE DAYS (1991)



BY John R. Wadella	DATE 06 Jan 92	SUBJECT CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS AVAILABILITY (1991)	SHEET NO Page 16
CHECKED BY Sandra K. Guy	DATE 08 Jan 92		JOB NO. 13-NC-QD-201

TABLE 3. Input Data and Calculated Known and Estimated Unavailable Days

Equipment ID	Discovery Date	Repair Date	Last Known Available Date	Unavailable Known Days	Unavailable Estimated Days	Unavailable Total Days
--------------	----------------	-------------	---------------------------	------------------------	----------------------------	------------------------

UNIT-1

1EQDNF01	*24-June-90	13-July-90	24-June-90	19	0	19
1EQDNN01	^20-Feb-91	21-Feb-91	20-Feb-91	01	0	01
	#24-April-91	30-April-91	24-April-90	06	0	06
	+01-Aug-91	15-Aug-91	01-Aug-91	14	0	14

* Unavailability due to a failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

^ Unavailability due to a blown F1 fuse

Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

+ Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

1EQDNF02	*25-Feb-91	18-March-91	25-Feb-91	21	0	21
1EQDNN02	#01-Aug-91	15-Aug-91	01-Aug-91	14	0	14

* Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

UNIT-2

2EQDNF01	#25-July-90	23-Aug-90	05-April-90	29	54	83
2EQDNN01	+18-Jan-91	06-Feb-91	18-Jan-91	19	00	19
	^23-Mar-91	25-Mar-91	23-Mar-91	02	00	02
	~29-Aug-91	17-Sept-91	29-Aug-91	19	00	19

Unavailability due to failed 8-hour capacity discharge.

Estimated (T/2) = 54 days is from 06/01/90 to 07/25/90

+ Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

^ Unavailability due to regulating capacitor change out.

~ Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

2EQDNF02	*04-Apr-91	24-Apr-91	04-Apr-91	20	00	20
2EQDNN02	#04-Sept-91	26-Sept-91	04-Sept-91	22	00	22

* Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

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REVISION 02

BY John R. Wadella	DATE 06 Jan 92	SUBJECT CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS AVAILABILITY (1991)	SHEET NO Page 17
CHECKED BY Sandra K. Guy	DATE 08 Jan 92		JOB NO. 13-NC-QD-201

TABLE 3. Input Data and Calculated Known and Estimated Unavailable Days (continued)-

Equipment ID	Discovery Date	Repair Date	Last Known Available Date	Unavailable Known Days	Unavailable Estimated Days	Unavailable Total Days
--------------	----------------	-------------	---------------------------	------------------------	----------------------------	------------------------

UNIT-3

3EQDNF01	*27-Mar-91	11-Apr-91	27-Mar-91	15	00	15
3EQDNN01						

* Unavailability due to a failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

3EQDNF02	*18-Jan-91	07-May-91	31-Mar-90	109	146.5	255.5
3EQDNN02	#22-July-91	19-Aug-91	22-July-91	28	00	28

* Unavailability due to failed 8-hour capacity discharge test.

Estimated (T/2) = 146.5 days is from 08/25/90 to 01/18/91

Unavailability due to failed equalize within 72-hours after the performance of an 8-hour capacity discharge.

BY John R. Wadella <i>JPW</i>	DATE: 06 Jan 92	SUBJECT CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS AVAILABILITY (1991)	SHEET NO Page 18
CHECKED BY: Sandra K. Guy <i>SKG</i>	DATE: 08 Jan 92		JOB NO.: 13-NC-QD-201

TABLE - 4

CALCULATION OF UNIT AND PLANT AVAILABILITIES (1991)



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REVISION 02

By John R. Wadella	DATE 06 Jan 92	CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS AVAILABILITY (1991)	SHEET NO. Page 19
CHECKED BY Sandra K. Guy	DATE 08 Jan 92		JOB NO. 13-NC-QD-201

TABLE 4: Calculation of Unit and Plant Availability

Equipment ID	Known Unavailable Days	Estimated Unavailable Days	Total Unavailable Days	*Required Days	Average Availability
UNIT-1					
1EQDNF01	40	0	40	518	92.3%
1EQDNN01					
1EQDNF02	35	0	35	518	93.2%
1EQDNN02					
Totals:	75	0	75	1036	
Average Unit Availability:					92.8%
UNIT-2					
2EQDNF01	69	54	123	518	76.3%
2EQDNN01					
2EQDNF02	42	0	42	518	91.9%
2EQDNN02					
Totals:	111	54	165	1036	
Average Unit Availability:					84.1%
UNIT-3					
3EQDNF01	15	00	15	518	97.1%
3EQDNN01					
3EQDNF02	137	146.5	283.5	518	45.3%
3EQDNN02					
Totals:	152	146.5	298.5	1036	
Average Unit Availability:					71.2%
PALO VERDE PROJECT					
	338	200.5	538.5	3108	82.7%
* Required days (01 June 1990 through 01 November 1991 - 518 days)					

BY: John R. Wadella <i>W</i>	DATE 06 Jan 92	SUBJECT CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS AVAILABILITY (1991)	SHEET NO Page 20
CHECKED BY: Sandra K. Guy <i>SKG</i>	DATE 08 Jan 92		JOB NO. 13-NC-QD-201

TABLE - 5

AVAILABILITY COMPARISON (1990 - 1991)



BY John R. Wadella	DATE 06 Jan 92	CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS AVAILABILITY (1991)	REVISION Page 21
CHECKED BY Sandra K. Guy	DATE 08 Jan 92		JOB NO 13-NC-QD-201

TABLE 5: Availability Comparison

Equipment ID	Previous Calculation June 1989 - June 1990	Present Calculation June 1990 - November 1991
1EQDNF01 1EQDNN01	93.2%	92.3%
1EQDNF02 1EQDNN02	93.4%	93.2%
UNIT AVERAGE:	93.3%	92.8%
2EQDNF01 2EQDNN01	19.1%	76.3%
2EQDNF02 2EQDNN02	79.0%	91.9%
UNIT AVERAGE:	49.0%	84.1%
3EQDNF01 3EQDNN01	83.9%	97.1%
3EQDNF02 3EQDNN02	93.4%	45.4%
UNIT AVERAGE:	88.7%	71.2%
PVNGS PROJECT AVERAGE:	77.0%	82.7%

REVISION 02

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	Available	Known unavailable	Estimated unavailable
1			
2			
3			
4			
5			
6			

165159 AF0000Y
Unavailable 030191

[illegible][illegible]



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ENGINEERING SKETCH PAD

REVISION 02

BY: John R. Wadella	DATE: 06 Jan 92	SHEET NO.: 27	PAGE: 13-NC-QD-201
	DATE: 1/15/92		
CHECKED BY: Craig A. Cooper	SUBJECT: CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS AVAILABILITY (1991)		

EMERGENCY LIGHTING COMPONENT AVAILABILITY EQUID:3EQDNE01 & 3EQDNN01 TYPE: EXIDE

Required available days : 518
Known unavailable days : 15
Estimated unavailable days : 0

☒ Available
☒ Known unavailable
☒ Estimated unavailable

Unavailable 6/2/2001
Available 6/1/1991

#00422804 (06/07/90) Monthly Battery Inspection, Task #039046
#00416050 (06/09/90) Check LPS, Task #039046
#00422802 (07/08/90) Monthly Battery Inspection, Task #039214
#00422799 (07/07/90) Check LPS, Task #039046
#00427313 (07/11/90) Replace LVR card (1-wk) per 3531-QD-008
#0041052 (07/24/90) Monthly Battery Inspection, Task #039046
#00411093 (08/01/90) Monthly Battery Inspection, Task #039214
#00437103 (08/30/90) Monthly LPS Inspection, Adjust K2 relay reference: EIR #04-D-033
#00444050 (09/11/90) Adjust charger card output to 6 AMP
#00439615 (09/26/90) Monthly LPS Inspection, Task #039046
#00439728 (10/01/90) Monthly Battery Inspection, Task #039214
#00445274 (10/02/90) Quarterly Inspection, Task #039291
#00445270 (10/04/90) Monthly Battery Inspection, Task #039214
#00439726 (10/24/90) Monthly LPS Inspection, Task #039046
#00445271 (11/01/90) Monthly Battery Inspection, Task #039214
#00449733 (11/21/90) Monthly LPS Inspection, Task #039046
#00432641 (11/29/90) Monthly Battery Inspection, Task #039214
#00455345 (12/14/90) Monthly LPS Inspection, Task #039046
#00455349 (12/26/90) Quarterly Inspection, Task #039291, Reference: EIR #91-QD-001
#00455492 (01/25/91) Monthly Battery Inspection, Task #039214
#00454629 (02/21/91) Monthly LPS Inspection, Task #039046
#00454693 (02/22/91) Monthly Battery Inspection, Task #039214
#00465447 (03/10/91) Monthly LPS Inspection, Task #039046
#00454642 (03/11/91) Check LPS, Task #034581, Charger light failed to illuminate
#00471930 (03/13/91) Monthly Battery Inspection, Task #039214
#00471936 (03/21/91) Quarterly Inspection, Task #039291
#00471935 (03/26/91) Implement DCP 3-XLR-QD-026
#00435527 (03/26/91) Replace LVR card per DCP 3-XLR-QD-026
#00459035 (03/27/91) Annual Battery Discharge Test, Task #044207
#00471931 (04/07/91) Monthly Battery Inspection, Task #039214
#00471926 (04/09/91) Monthly LPS Inspection, Task #039046
#00454703 (04/11/91) Rebuilding Charger, Task #039422
#00472531 (04/17/91) Annual Inspection, Task #044444
#00471927 (05/06/91) Monthly LPS Inspection, Task #039046
#00471942 (05/12/91) Quarterly Inspection, Task #039291
#00472579 (05/12/91) Monthly Battery Inspection, Task #039214
#00472573 (05/29/91) Troubleshoot/rework charger light failing to illuminate
#00481249 (06/09/91) Monthly LPS Inspection, Task #039046
#00481244 (06/09/91) Monthly Battery Inspection, Task #039214
#00494546 (07/01/91) Quarterly Inspection, Task #039291
#00495450 (07/02/91) Monthly Battery Inspection, Task #039046
#00495482 (07/02/91) Monthly Battery Inspection, Task #039214
#00502335 (07/27/91) Monthly Battery Inspection, Task #039214
#00501699 (07/31/91) Implement DCP-03-XLR-QD-027
#00502332 (08/03/91) Monthly LPS Inspection, Task #039046
#00504583 (08/30/91) Monthly Battery Inspection, Task #039214
#00504581 (09/01/91) Monthly LPS Inspection, Task #039046
#00502907 (09/13/91) Repeat requirements for DCP 3-XLR-QD-010
#00504814 (09/21/91) Quarterly Inspection, Task #039291
#0050364 (09/27/91) Monthly Battery Inspection, Task #039046
#00510366 (09/27/91) Monthly Battery Inspection, Task #039214
#00501737 (10/04/91) Implementation of DCP 3-XLR-QD-010
#00515533 (10/21/91) Monthly LPS Inspection, Task #039046
#00515535 (10/27/91) Monthly Battery Inspection, Task #039214
#00515536 (11/27/91) Monthly LPS Inspection, Task #039046

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ENGINEERING SKETCH PAD

REVISION 02

BY: John R. Wadella	DATE: 06 Jan 92	SHEET NO.: 28
CHECKED BY: Craig A. Cooper	DATE: 11/15/92	FIG. NO.: 13-NC-QD-201

SUBJECT: CALCULATION OF EXIDE EMERGENCY LIGHTING UNITS
AVAILABILITY (1991)

EMERGENCY LIGHTING COMPONENT AVAILABILITY
EQUID:3EQDNE02 & 3EQDNN02 TYPE: EXIDE

Required available days: 518
Known unavailable days: 137
Estimated unavailable days: 146

Available
Known unavailable
Estimated unavailable



