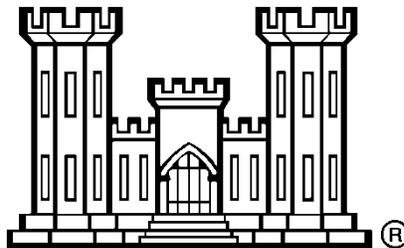


**SUPPLEMENT TO STANDARD
OPERATION AND MAINTENANCE
MANUAL**

SACRAMENTO RIVER
FLOOD CONTROL PROJECT
UNIT NO. 118 – PART NO. 1

EAST LEVEE OF SACRAMENTO RIVER FROM
AMERICAN RIVER TO TOWER BRIDGE
AND

SOUTH LEVEE OF AMERICAN RIVER 0.8 MILES ABOVE
MAYHEW DRAIN DOWNSTREAM TO SACRAMENTO RIVER



SACRAMENTO DISTRICT
CORPS OF ENGINEERS
U.S. ARMY
SACRAMENTO, CALIFORNIA

CORPS OF ENGINEERS
U.S. ARMY

SUPPLEMENT TO STANDARD
OPERATION AND MAINTENANCE MANUAL
SACRAMENTO RIVER FLOOD CONTROL PROJECT

UNIT NO. 118 – PART NO. 1
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MAYHEW DRAIN DOWNSTREAM TO SACRAMENTO RIVER

Sacramento District
Corps of Engineers
U.S. Army
August 1955

**SUPPLEMENT TO STANDARD
OPERATION AND MAINTENANCE MANUAL
SACRAMENTO RIVER FLOOD CONTROL PROJECT**

UNIT NO. 118.1

EAST LEVEE OF SACRAMENTO RIVER FROM
AMERICAN RIVER TO TOWER BRIDGE
AND
SOUTH LEVEE OF AMERICAN RIVER 0.8 MILES ABOVE MAYHEW DRAIN
DOWNSTREAM TO SACRAMENTO RIVER

| LOCATION | ADDITION OR REVISION | DATE |
|-------------------|--|-------------|
| 1-04 e. | Add contract no. 62-63 | Jul 1966 |
| Exhibit B | Add drawing no. 50-4-3702 | Jul 1966 |
| Exhibit F | Add letter of acceptance dated 29 Jun 1962 | Jul 1966 |
| 1-04 e. | Add contract no. 66-28 | Jul 1966 |
| Exhibit B | Add drawing no. 50-4-4118 | Jul 1966 |
| Exhibit F | Add copy of letter of acceptance dated 11 Jan 1966 | Jul 1966 |
| 1-04 g. | Add contract no. DACW05-69-C-0076 | Dec 1970 |
| Exhibit B | Add drawing no. 50-4-4283 | Dec 1970 |
| Exhibit F | Add drawing no. 19 Aug 1969 | Dec 1970 |
| 1-04 | Add subparagraph h. | Sep 1981 |
| 2-05 | Add environment protection | Sep 1981 |
| Exhibit B | Add drawing no. 50-4-5130 | Sep 1981 |
| Exhibit F | Add copy of letter of acceptance dated 17 Aug 1978 | Sep 1981 |
| Exhibit F | Add copy of letter of transfer dated 10 Dec 1948 | 21 Dec 2010 |
| Exhibit F | Add copy of letter of acceptance dated 22 Dec 1948 | 21 Dec 2010 |
| Exhibit F | Add copy of letter of transfer dated 15 Mar 1951 | 21 Dec 2010 |
| Exhibit F | Add copy of letter of transfer dated 10 Sep 1951 | 21 Dec 2010 |
| Exhibit F | Add copy of letter of transfer dated 8 Dec 1951 | 21 Dec 2010 |
| Exhibit F | Add copy of letter of transfer dated 13 Dec 1951 | 21 Dec 2010 |
| Exhibit F | Add copy of letter of transfer dated 4 Dec 1952 | 21 Dec 2010 |
| Exhibit F | Add copy of letter of transfer dated 19 Jun 1962 | 21 Dec 2010 |
| Exhibit F | Add copy of letter of transfer dated 29 Nov 1965 | 2 Feb 2011 |
| Exhibit F | Add copy of letter of transfer dated 7 Aug 1969 | 2 Feb 2011 |
| 1-04 | Changed second subparagraph e to f | 7 Mar 2011 |
| Exhibit F | Add copy of letter of transfer dated 12 Jul 1978 | 7 Mar 2011 |
| Table of Contents | Updated Table of Contents | 7 Mar 2011 |
| Table of Contents | Updated Table of Contents | 30 Mar 2011 |
| 1-04 | Add subparagraph i | 30 Mar 2011 |
| 2-04 | Add subparagraph c | 30 Mar 2011 |
| Exhibit B | Add Mayhew Drain Closure Structure As-Built File | 30 Mar 2011 |
| Exhibit J | Add Mayhew Drain Closure Structure Manuals | 30 Mar 2011 |

| LOCATION | ADDITION OR REVISION | DATE |
|-------------------|--|-------------|
| Exhibit F | Add copy of letter of transfer dated 19 Apr 2011 | 23 May 2011 |
| 1-02 | Authorization paragraph. Add Flood Control Act 1960 | Jan 2012 |
| 1-04 | Add subparagraph j | Jan 2012 |
| Exhibit B | Add drawing no. 50-04-6280 | Jan 2012 |
| Exhibit H | Create Exhibit H: Local Cooperation Agreement | Jan 2012 |
| Table of Contents | Update Table of Contents | Jan 2012 |
| 2-05 | Add subparagraph b, c, d, e, & f | Jan 2012 |
| Exhibit F | Letter of Transfer | |
| Exhibit I | Create Exhibit I: Biological Opinion | Jan 2012 |
| Exhibit I | Add B.O. excerpt USFWS #81420-2008-F-0805-1 | Jan 2012 |
| 1-01 to 1-03 | Revised to include Mayhew Reach and Updated Hydraulic Data | 05 Nov 2012 |
| 1-04.k. | Site L8 Added | 05 Nov 2012 |
| 1-04.l. | Site L12 Added | 05 Nov 2012 |
| 1-04.m. | Mayhew Levee Raise Added | 05 Nov 2012 |
| 2-01.c. | Slurry Wall Facilities Added | 05 Nov 2012 |
| 2-01.c.(1) | Sites L8, L12 and Mayhew Levee Raise Added | 05 Nov 2012 |
| 2-02 | Revised to include L8, L12 and Mayhew Reach Structures and Vertical Datum Notes | 05 Nov 2012 |
| 2-04.a(2)(e) | Pumping Station Drainage Structures Added | 05 Nov 2012 |
| 2-04.d | Mayhew Levee Raise Added | 05 Nov 2012 |
| 2-04.d.(1) | Mayhew Levee Raise French Drain Added | 05 Nov 2012 |
| 2-04.d.(2) | Mayhew Levee Raise Temporary Earthen Closure Structure Added | 05 Nov 2012 |
| 2-04.d.(3) | Mayhew Levee Raise Landside Chimney Drain Added | 05 Nov 2012 |
| 3-01 | Revised to include Mayhew Reach | 05 Nov 2012 |
| 3-03 | Emergency Action Plan Requirements Added | 05 Nov 2012 |
| EXHIBIT B | Drawing No. 1-04-0556 (Site L8) Added | 05 Nov 2012 |
| EXHIBIT B | Drawing No. 1-04-0547 (Site L12) Added | 05 Nov 2012 |
| EXHIBIT B | Drawing No. 1-04-509 (Mayhew Levee Raise) Added | 05 Nov 2012 |
| EXHIBIT A-1 | Mayhew Levee Reach Added | 05 Nov 2012 |
| EXHIBIT F | Copy of L8, L12, Mayhew Levee Raise Transfer Letter dated 05 Nov 2012 Added | 05 Nov 2012 |
| 1-02 | Revised to remove language describing Unit 118 Part 2 supplement | 17 Jul 2013 |
| 1-03 | Revised to include "of freeboard" to the sentence describing the design flow for the American River | 17 Jul 2013 |
| 1-04. | Add subparagraphs n-q. | 17 Jul 2013 |
| 2-01.c.(1) | Revised list of sites and how to handle future levee penetrations in the location of the slurry walls. | 17 Jul 2013 |
| 3-01 | Revised language for flood fighting | 17 Jul 2013 |
| 3-02 | Revised to include proper reference to the Standard O&M Manual. | 17 Jul 2013 |
| Exhibit A | Add: Re-formatted Exhibit A | 17 Jul 2013 |

| LOCATION | ADDITION OR REVISION | DATE |
|-----------|---|-------------|
| | Delete: Original Exhibit A | |
| Exhibit B | Added heading for "Record" Drawings (NOT As-Constructed) | 17 Jul 2013 |
| Exhibit B | Add Record Drawings: Left (South) Bank Levee Strengthening Contract 1, Left (South) Bank Levee Strengthening Contract 2, Jet Grout Sections Contract 1 and Jet Grout Sections Mod Contract 1, Levee Strengthening Alternative Methods Contract A | 17 Jul 2013 |
| Exhibit F | Add Copy of Left (South) Bank Levee Strengthening Contract 1, Left (South) Bank Levee Strengthening Contract 2, Jet Grout Sections Contract 1 and Jet Grout Sections Mod Contract 1, Levee Strengthening Alternative Methods Contract A Transfer Letter dated 17 Jul 2013 | 17 Jul 2013 |

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EXHIBITS

| <u>Exhibit</u> | <u>Description</u> | |
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| A | Flood Control Regulations | Unattached |
| | (Contained in Standard Manual) | |
| A-1 | Location Map | Unattached |
| B | “As Constructed” Drawings | Unattached |
| C | Plates of Suggested Flood Fighting Methods | Unattached |
| | (Contained in Standard Manual) | |
| D | Check List No. 1 – Levee Inspection Report | Unattached |
| E | Check List – Levees, Channels and Structures | Sheets 1 thru 8 |
| F | Letter of Acceptance by State Reclamation Board | Sheets 1 thru 6 |
| G | Semi-Annual Report Form | Sheets 1 and 2 |
| H | Local Cooperation Agreement | Attached |
| I | Biological Opinion | Attached |
| J | Mayhew Closure Structure Manuals | Attached |

SUPPLEMENT TO STANDARD
OPERATION AND MAINTENANCE MANUAL
SACRAMENTO RIVER FLOOD CONTROL PROJECT

UNIT NO. 118 – PART NO. 1
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SECTION I

INTRODUCTION

1-01. Location. The improvement covered by this manual is Unit No. 118 – Part No. 1 of the Sacramento River Flood Control Project. Levees and channels of this unit lie north of the City of Sacramento and extend along the south bank of the American River above the Mayhew Drain downstream to the Tower Bridge on the east bank of the Sacramento River. The area is located in the American Flood Control District and the City of Sacramento, California, as shown on the Location Map, Exhibit A-1.

1-02. Project Works. The flood control works included in this manual was authorized by the Flood Control Act of 1917 as modified by the Acts of 1928, 1937, and 1941. Bank protection work was provided under the authority of the Flood Control Act of 1960. Levee improvements were also performed under the authority of the Water Resources Development Act of 1996 (WRDA 96) and WRDA 99. The project consists of the south levee and channel of the American River from about 0.8 miles above the Mayhew Drain downstream about 11.5 miles to the Sacramento River, also the east levee and channel of the Sacramento River from its junction with the American River downstream about 1.10 miles to the Tower Bridge. Part No. 1 of Unit No. 118 consists of only the southerly portion of Unit No. 118.

1-03. Protection Provided. Levees of the Sacramento River and American River as described in this unit provide direct protection to the City of Sacramento and adjacent agricultural lands against flood water of the Sacramento and American Rivers. Along the east levee of the Sacramento River within this unit the grade of the adopted floodplain profile varies from elevation 34.70 at its junction with the south levee of the American River to elevation 34.3 at the Tower Bridge. Along the south levee of the American River the design water surface profile varies from elevation 55.6 (NGVD 1929) above the Mayhew Drain to about elevation 32.0 (NGVD 1929) at its junction with the east levee of the Sacramento River. In the Sacramento River the design flood is 110,000 cubic feet per second and the levee grade within this unit provides for a freeboard of at least 3 feet above the adopted floodplain profile in the Sacramento River. For the American River the design flood is 160,000 cubic feet per second from the Folsom Dam downstream to the Sacramento River including a minimum of 2 to 4 feet of freeboard depending upon the location.

1-04. Construction Data and Contractor Information. The east levee of the Sacramento River from the American River to the Tower Bridge was built by local interests at various times and in various parts but no records of such construction are available. Construction contracts required to bring locally built levees along the south bank of the American River to project standards were as follows:

- a. Enlargement of the south levee of the American River from 16th Street Bridge to Mayhews was accomplished under Contract No. W-04-167-eng-1413 by H. Earl Parker and completed on 3 November 1948.
- b. Bank protection work at two places along the south levee of the American River downstream from the 16th Street Bridge and downstream from the "H" Street Bridge, as shown on Drawing No. 1-4-374 of Exhibit B, was accomplished under Contract No. DA-04-167-eng-397 by J. R. Reeves and completed on 18 January 1951. Spec. 1483.
- c. Emergency bank protection work along the left bank of the American River upstream from the W.P.R.R. Bridge was accomplished under Contract No. DA-04-167-eng-572 by J. R. Reeves and completed on 30 July 1951 (see Drawing No. 1-4-378 of Exhibit B for location). Spec. 1539.
- d. Surfacing of levee crown for patrol road purposes from station 19+00 to 102+55 along the south levee of the American River, as shown on Drawing No. 50-4-2897, sheets 1 and 7, of Exhibit B was accomplished under Contract No. DA-04-167-eng-828, by Browne and Krull and completed on 2 December 1952. Spec. 1636.
- e. Bank protection on the left bank of the American River was accomplished under Contract No. DA-04-167-CIVENG-66-28 by A. Teichert & Son, Inc., during the period from 19 August 1965 to December 1965, Specification No. 3283, Drawing No. 50-4-4118 (Unit No. 14).
- f. Levee rehabilitation on the left bank of the American and Sacramento Rivers (Item 56f and Item 56i) was accomplished under Contract No. DA-04-167-CIVENG-62-63 by Bernardo & Bernardo Construction Company during the period from 26 April 1962 to 15 June 1962, Specification No. 2817, Drawing No. 50-4-3702.
- g. Stone protection on the left bank of the American River at Site Mile 4.8 (a portion of Unit No. 15, Sacramento River Bank Protection Project) was accomplished under Contract No. DACW05-69-C-0076 by Eugene Luhr and Company during the period from 14 June 1969 to 7 August 1969. Specification No. 3349, Drawing No. 50-4-4283.
- h. Bank sloping, stone protection and selective clearing on the left bank of the Sacramento River at Site Mile 60.1 (of Unit 30) was accomplished under Contract No. DACW05-76-C-0107 by James Ferry & Son. Construction was completed on 6 July 1979. Specification No. 5081, Drawing No. 50-4-5130.
- i. Construction of the Mayhew Drain closure structure was accomplished under Contract No. W91238-07-C-0016 by Flatiron Construction Corporation. The closure structure construction was completed in April 2010. Specification No. 1555, Drawing No. AM-04-514.
- j. Embankment construction, stone protection, selective clearing, and erosion control re-vegetation along the left bank of the lower American River at River Miles 0.3L and 2.8L. Approximately 530' was repaired at site 0.3L and approximately 480' at site 2.8L. The work was completed by Hard Rock Construction in January 2012 under Contract No. W91238-08-C-0011 Specification No. 1644, Drawing No. 50-04-6280.
- k. Site L8: Site L8 is located near RM 07 at the left (south) end abutment of Guy West Bridge, California State University Campus. Project improvements include 302 feet of concrete bentonite (CB) cutoff wall, 3-feet wide and 50-feet deep and impervious fill. The cutoff wall envelops 6 steel storm

drains ranging between 14 and 24 inches diameter and are owned by the City of Sacramento Department of Utilities. Construction was completed in August 2010. The construction was completed in accordance with American River Common Features WRDA 1996 Levee Improvements Phase 2, Contract 1, Site Number L8, Contract Number W91238-10-R-0027, Specification Number 1722, Design File Number 1-04-0556.

l. Site L12 is located between RM 08 and RM 09 on the left (south) bank of the American River near Glenbrook River Access Park between Howe Avenue and Watt Avenue. The site is adjacent to the Florin-Perkins Pump Station. Project improvements include approximately 214 feet of cutoff wall, controlled low strength material (CLSM) and impervious fill. The cutoff wall is 3-feet wide and 52-feet deep. The cutoff wall provides closure around three 36-in welded steel stormwater force mains owned by the City of Sacramento. A portion of an abandoned concrete-filled, 54-inch corrugated metal pipe gravity drain, owned by the City of Sacramento, Department of Utilities, was removed where the cutoff wall was installed. Construction was completed in November 2010. The construction was completed in accordance with American River Common Features Remaining Sites – WRDA 1996 Project Phase 1 Contract B, Contract Number W91238-10-C-0034, Specification Number 1710, Design File Number 1-04-0547.

m. Mayhew Levee Raise: Levee improvements include raising, widening, and adding slurry wall to the left (south) bank levee of the American River from Mayhew Drain (RM 10.7±) 4,400 feet upstream to the east end turnaround near RM 11.5±. Additional project improvements also include a French drain and a landside chimney drain. The project was accomplished under American River Watershed Project, Common Features, Left Bank Lower American River, Raise Existing Levee Near Mayhew Drain, Contract No. W91238-07-C-0016 by Flatiron Construction Corporation. Levee improvement construction was completed in October 2008. Specification No. 1501, Drawing No. 1-04-0509. An interim earthen closure structure was installed near the east end turnaround by the American River Flood Control District in January 2010.

n. Left (South) Bank Levee Strengthening Contract 1: Slurry cutoff wall construction contract. Contract Number DACW05-00-C-0022, Specification Number 9824A, Design File Number 1-04-466. Construction was performed by Geo Con in 2000-2002.

o. Left (South) Bank Levee Strengthening Contract 2: Slurry cutoff wall construction contract. Contract Number DACW05-00-C-0023, Specification Number 1140, Design File Number 1-04-477. Construction was performed by Geo Con in 2000-2002.

p. Jet Grout Sections Contract 1 and Jet Grout Sections Mod Contract 1: Slurry cutoff wall construction contract Contract Number DACW05-02-C-0004, Specification Number 1034, Design File Number 1-04-474. Construction was performed by Pacchiosi Drill USA in 2001-2002.

q. Levee Strengthening Alternative Methods Contract A: Slurry cutoff wall construction contract Contract Number DACW05-03-C-0005, Specification Number 1294, Design File Number 1-04-488. Construction was performed by DDM/Nov JV in 2003.

1-05. Flood Flows. For purposes of this manual, the term “flood” or “high water period” for the Sacramento River portion of this unit shall refer to flows when the water surface in the river reaches or exceeds the reading of 26.0 feet on the U.S. Weather Bureau gage located at the foot of “I” Street in the city of Sacramento. Such term for the American River portion of this unit shall refer to flows when the water surface in the American River reaches or exceeds a reading of 40.0 feet on the U.S. Geological Survey and State Division of Water Resources gage located on the “H” Street Bridge over the American River. Zero of the staff gage and recorder at “I” Street Bridge is set at elevation 3.10 feet U.S. Corps of Engineers datum

and 0.03 feet U.S. Geological Survey datum. Zero of the "H" Street gage is set on 0.00 U.S. Corps of Engineers datum and minus 3.07 feet U.S. Geological Survey datum.

1-06. Assurances Provided by Local Interests. Assurance of cooperation by local interests is provided by State Legislation as contained in Chapter 3, Part 2, Division 5 of the State Water Code (see paragraph 2-02a of the Standard Manual).

**See Water Code Section 12648.1

1-07. Acceptance by State Reclamation Board. Responsibility for operating and maintaining the completed works was officially accepted by the Reclamation Board of the State of California on 19 September, 18 December 1951, 2 January 1952 and 16 December as shown on the attached letters of acceptance, Exhibit F.

1-08. Superintendent. The name and address of the Superintendent appointed by local interest to be responsible for the continuous inspection, operation, and maintenance of the project works shall be furnished the District Engineer, and in case of any change of Superintendent, the District Engineer shall be so notified.

SECTION II

FEATURES OF THE PROJECT SUBJECT TO FLOOD CONTROL REGULATIONS

2-01. Levees.

a. Description. The levees of this unit are located as described in paragraph 1-02 of this manual. Said levees were originally built by local interests and the south levee of the American River has been rebuilt by the Corps of Engineers to project grade and section. For more complete detail of items of reconstruction of above mentioned American River levee, refer to the "As Constructed" drawings of Exhibit B and paragraph 1-04 of this manual.

b. For pertinent Requirements of the Code of Federal Regulations and other requirements, see the following:

- (1) Maintenance – paragraph 4-02 of the Standard Manual.
- (2) Check lists – Exhibit E of this Supplement Manual.
- (3) Operation – paragraph 4-04 of the Standard Manual.
- (4) Special Instructions – paragraph 4-05 of the Standard Manual.

c. Slurry Wall Facilities

- (1) Left (South) Bank Levee Strengthening Contract 1, Left (South) Bank Levee Strengthening Contract 2, Jet Grout Sections Contract 1 and Jet Grout Sections Mod Contract 1, Levee Strengthening Alternative Methods Contract A , Site L8, Site L12, Mayhew Levee Raise: Penetrations into the slurry wall are not allowed. Any future through-the-levee encroachments, including pipes and conduits, shall be installed above the slurry wall top elevation. Modification or repair work in the vicinity of the slurry cutoff wall location should include provisions to avoid damaging the cutoff wall. Any modifications or repairs that starts at the cutoff wall and extends to the levee slope shall be restored to the original layer thickness, using the same soil material type.

2-02. Drainage and Irrigation Structures.

a. Description. Drainage and irrigation structures which extend through the levee are listed as follows:

| River Mileage | Size and Kind of Pipe | Other Structure Description | Elev. of Invert at Pipe |
|--|--------------------------|-----------------------------|----------------------------|
| <u>East Levee of Sacramento River (See Drwg. No. 6-13-1100 of Exhibit B)</u> | | | |
| 60.04 | 36" C.M.P. | | 28.0 |
| 59.90 | 4" Steel | P.G.&E. Co. Steam Plant | 23.0 |
| " | 7" " | " " | 23.0 |
| " | 8" " | " " | 26.0 |

| | | | | | |
|---|-------|---|---|---|------|
| “ | 8” | “ | “ | “ | 21.0 |
| “ | 8” | “ | “ | “ | 24.5 |
| “ | 8” | “ | “ | “ | 21.5 |
| “ | 60” | “ | “ | “ | 24.5 |
| “ | 2-42” | “ | “ | “ | 21.5 |

South Levee of American River (See Drwg. No. 1-4-362, 50-10-2792, 1-04-0556 (L8), 1-04-0547 (L12) & 1-04-0509 (Mayhew Levee Raise) of Exhibit B

| <u>Station</u> | | | | |
|----------------|-------|----------|--|------------|
| 10+00 | 42" | C.M.P. | Flapgate R.S. | 26.5 |
| 31+25 | 6" | Steel | | 41.0 |
| 69+50 | 2-10" | Steel | | 35.0 |
| 89+28 | 18" | Steel | | 48.0 |
| 89+28 | 8" | Steel | | 48.0 |
| 154+94 | 24" | C.M.P. | No. 100 Gate | 31.6 |
| 156+75 | 8" | Steel | | 42.0 |
| 189+20 | 14" | Steel | | 42.0 |
| 202+80 | 30" | Concrete | Sewer Crossing | |
| 228+89 | 7" | Steel | Pumphouse L.S. | 42.7 |
| 264+08 | 24" | | Flapgate R.S. | 22.0 |
| 265+07 | 18" | Steel | Flapgate R. S. | 30.5 |
| 334+75 | 36" | C.M.P. | Flapgate R.S. | 31.7 |
| 341+00 | 14" | Steel | Gas Main at "H" Str. Bridge | 48.8 |
| 366+50 (L8) | 14" | Steel | Storm Drain | 44.9 |
| | 2-20" | Steel | Storm Drains | 44.7 |
| | 3-24" | Steel | Storm Drains | 44.0 |
| 367+40 | 3-18" | C.M.P. | Flapgate R.S. | 35.9 |
| 409+02 | 12" | Steel | Pumphouse R.S. | 48.2 |
| 457+60(L12) | 3-36" | Steel | Storm Drains | (+/- 43.5) |
| 457+90(L12) | 54" | CMP | Storm Drain (abandoned) | (+/- 9) |
| 480+30 | 8" | Steel | | 49.5 |
| 512+10 | 8" | Steel | | 37.9 |
| 522+80 | 10" | Steel | Pumphouse R.S. | 46.9 |
| 535+29 | 8" | Steel | | 54.4 |
| 552+40 | 12" | Steel | | 46.2 |
| 552+82 | 8" | Steel | | 54.5 |
| 566+54 | 3-30" | Steel | Mayhew Pump Drain Pipes w/Flapgates | 45.5 |
| 566+95 | - | Concrete | Mayhew Siphon Breaker Box, L.S. | 59.5 |
| 567+60 | - | Concrete | Mayhew Pump House L.S., Gravity Drain and Riser | 27.83 |
| 601+92 | 3-48" | RC.P. | Mayhew Sanitary Sewer Piper F.M. | (+/-) 41.0 |
| 603+50 | 36" | | Mayhew Storm Drain | (+/-) 48.5 |

Notes on vertical datum, gate model numbers and abbreviations:

Vertical Datum: L8, L12 and Mayhew Levee Raise Project Sta. 566+54 to 603+50 NGVD 1929

Gates. Gate Model No. 100 is a Calco automatic drainage gate on outlet end of pipe. It closes against face pressure and opens automatically to permit outflow when pressure is released.

Abbreviations are as follows:

C.M.P. = Corrugated Metal Pipe
R.C.P. = Reinforced Concrete Pipe
L.S. = Landside
R.S. = Riverside

b. For pertinent requirements of the Code of Federal Regulations and other requirements see the following:

- (1) Maintenance – paragraph 5-02 of the Standard Manual.
- (2) Check Lists – Exhibit E of this Supplement Manual.
- (3) Operation – paragraph 5-04 of the Standard Manual.
- (4) Additional Requirements – paragraph 5-05 of the Standard Manual.
- (5) Safety Requirements – paragraph 5-06 of the Standard Manual.

2-03. Channel.

a. Description. The main channels of the Sacramento and American Rivers for this unit lie adjacent to levees as described in paragraph 1-02. The project design capacities of said channels are as listed in paragraph 1-03 of this manual.

The maintenance and operation of the channels of the Sacramento and American Rivers within this unit, shall be limited to flood control and requirements which follow shall be observed only to that extent.

b. For pertinent Requirements of the Code of Federal Regulations and other requirements, see the following:

- (1) Maintenance – paragraph 6-02 of the Standard Manual.
- (2) Check Lists – Exhibit E of this Supplement Manual.
- (3) Operation – paragraph 6-04 of the Standard Manual.
- (4) Safety Requirements – paragraph 6-05 of the Standard Manual.

It shall be the duty of the Superintendent to maintain a patrol of the project works during all periods of flood-flow in excess of a reading of 26.0 on the gage located at the “I” Street and a reading of 40.0 on the gate located on “H” Street, as indicated in paragraph 1-05 of this manual. The Superintendent shall dispatch a message by the most suitable means to the District Engineer whenever the water surface in the Sacramento River or American River or the American River reaches the gage readings indicated above. The Superintendent shall cause readings to be taken at said gages at intervals of two to four hours during the period when the water surface is above flood-flow stage and record the time of observations. One copy of the readings shall be forwarded to the District Engineer immediately following the flood, and a second copy transmitted as an enclosure to the semi-annual report in compliance with paragraph 3-06 of the Standard Manual.

2-04. Miscellaneous Facilities.

a. Description. Miscellaneous structures or facilities which were constructed as a part of, or in conjunction with, the protective works, and which might affect their functioning, include the following:

(1) Bridges.

- (a) Tower Bridge across the Sacramento River at Capitol Avenue, a railroad and highway bridge.
- (b) "I" Street Bridge across the Sacramento River, a railroad and highway bridge.
- (c) Highway bridge across the American River near the Mouth of the American River.
- (d) Highway bridge crossing the American River at 16th Street (approximate station 118+00).
- (e) Sacramento Northern Railroad Bridge crossing the American River at Station 130+50.
- (f) Western Pacific Railroad Bridge crossing the American River at approximate station 137+00.
- (g) Southern Pacific Railroad bridge crossing the American River at approximate station 215+00.
- (h) New highway bridge crossing the American River at approximate station 227+00.
- (i) "H" Street highway bridge crossing the American River at approximate station 340+00.
- (j) A concrete bridge used as a low water crossing over the American River at the foot of Watt Avenue.

(2) Water front structures.

- (a) Southern Pacific Co. wharf that lies between the "I" Street Bridge and the Tower Bridge along the left bank of the Sacramento River.
- (b) A wharf that lies just upstream from the "I" Street Bridge along the left bank of the Sacramento River (Pioneer Mills Warehouse and Wharf).
- (c) P.G.&E. Company wharf along the left bank of the Sacramento River at about Mile 59.90.
- (d) Intake for City of Sacramento water supply along the left bank of the Sacramento River at about Mile 59.95.
- (e) Pump Drain System and Gravity Drain located on left bank of American River around River Mile (RM) 10.7

(3) Utility Relocation. Because of the nature of the construction of structures by local interests, no records of any utility relocation are available.

(4) Hydrological Facilities. Continuous water stage recorders and staff gages to be maintained by the following Government agencies

- (a) U.S. Weather Bureau gage on the Sacramento River located at the foot of "I" Street.
- (b) U.S. Geological Survey and State Division of Water Resources gage located on the "H" Street Bridge on the American River.

b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:

- (1) Maintenance - paragraph 7-02 of the Standard Manual.
- (2) Check Lists – paragraph 7-03 of the Standard Manual.
- (3) Operation – paragraph 7-04 of the Standard Manual.

c. Mayhew Drain Closure Structure. The Mayhew Drain Closure is designed to prevent the American River from backing up the Mayhew Drain during a significant flood event on the American River. The closure structure is a box culvert consisting of four cells. A gate riser ties into each one of these cells. To regulate flow, the closure structure is equipped with four flap gates and four sluice gates. Operation of the sluice gates are triggered by sensors that are placed near the structure to detect a rising water surface elevation on the American River.

The sensors are on both the upstream and downstream ends on the culvert, located on the transition walls, 1.5 feet above the culvert soffit elevation. The bubbler tubes are located just downstream of the flap gates, and just upstream of the sluice gates, at an elevation six inches above the culvert invert. The bubbler system is located in the electrical building and is connected to Sacramento County's SCADA system, which remotely monitors all of the storm drainage pump stations in their system.

The SCADA system should detect the water surface elevation on either side of the culvert, and will close the sluice gates when the water surface elevation on the river side (American River) is a minimum of 4 feet higher than the water surface elevation on the drain side. The gates shall be opened when the system detects a water surface elevation on the drain side that is 1 foot higher than the water surface elevation on the river side. If there is outage, the water levels in both the American River and the Mayhew Drain shall be monitored. In the event of a power outage, the sluice gate operator will either need to use the gas-powered actuator, see paragraph (4) below. It should be noted that hand operation of the sluice gate screw drives is arduous, and takes approximately one-half hour per gate.

The sluice gates only need to be closed when the American River water surface elevation exceeds the bubbler sensor elevation, and is greater than 4 feet higher than the Mayhew Drain water surface elevation. The sluice gates shall remain open at all other time, unless otherwise directed.

(1) Flap Gates. No maintenance other than periodic cleaning and operation of the flap gates is required. Gates should be operated every 3 months with one operation to be scheduled prior to flood season. A wrench and cable hook is needed to raise the flap gate in order to perform maintenance. A wrench and cable hook has been provided for this purpose. Prior to operation, check the following:

- (a) Check guide frame for proper alignment.
- (b) Clean the gate slide, guides, seals and invert of all foreign material.
- (c) If P-seals are used, clean contact area and adjust seal.
- (d) If gate does not operate smoothly or shows excess leakage, see FLAP GATE

TROUBLE SHOOTING SECTION of manufacturer Operation, Maintenance, and Installation Manual which is included as a separate attachment in Exhibit H. The maintaining agency may choose to winch one or more gates open throughout the non-flood season (15 April through 31 October), if there is excessive debris build-up as a result of the flap gates not allowing enough flow through during the low flow season. However, the flap gates must be able to close during the entire flood season.

(2) Sluice Gates. At least twice a year, grease fittings on manual operation should be lubricated with a small amount of heavy duty grease (see lubrication chart in the manufacturer Operation, Maintenance, and Installation Manual which is included as a separate attachment in Exhibit H). Prior operation, check the following:

- (a) Make sure all foreign material is removed from seating surfaces of the sluice gate.
- (b) Check to make sure that stem guides and brackets are securely fastened.
- (c) The sluice gate should be operated to the fully opened and fully closed position slowly to check for any misalignment or problems in operation.
- (d) If operation becomes difficult, check SLUICE GATE TROUBLE SHOOTING SECTION of the manufacturer Operation, Maintenance, and Installation Manual which is included as a separate attachment in Exhibit H. EXCESSIVE FORCE SHOULD NOT BE APPLIED to crank or hand wheel.

(3) Operating Stem. To ensure proper operation and life of operating stems and lift nuts, it is very IMPORTANT THAT OPERATING STEMS ARE CLEANED AND GREASED EVERY SIX MONTHS. To help keep stem and lift nuts clean, the use of stem covers are recommended (for recommended grease see lubrication chart in manufacturer Operation, Maintenance, and Installation Manual which is included as a separate attachment in Exhibit H).

(4) Gasoline Powered Portable Valve Actuator.

INSTRUCTIONS FOR OPERATION AND MAINTENANCE OF THE MODEL GH-100 GAS POWERED OPERATOR

(a) Operation.

1. The gasoline powered portable operator is designed to rotate the stem shaft of the sluice gates.
 2. The portable operator is capable of rotating the stem clockwise or counter clockwise. This is accomplished by utilizing the proper operator output.
 3. The operator will include a spline to 2" sq drive adapter or a spline to 3/4" sq coupler and an extension shaft with a 2' sq nut driver.
 4. The adapters may be used at either operator drive location.
- (b) Warning. Do not carry the operator while the engine is running.

1. Use the butterfly handles only for carrying the operator.
2. Use the Tri-pod stand or peg-leg will reduce the risk of manpower fatigue.
3. Continual clutch slippage will cause over heating of the clutch shoes and reduce its ability to transfer torque.
4. Store the operator in a cool dry place when not in use. The transfer of the operator from a warm location to a cold location can form harmful condensation.

(c) Maintenance.

1. Read the engine operating manual and follow the instructions for type of fuel, starting technique and general operation.
2. The engine should be operated for two hours or more before it is "broken in" for the best results. All units are tested at the factor but are not operated for the full break-in period.

3. Clutch slippage may occur during its break-in. The clutch unit should be kept free of oil or other moisture for efficient operation.
4. The output shaft and coupler should not rotate when the engine is idling. The coupler or shaft should begin to rotate when the engine RPM is brought up.
5. The red gear case has 4 oz. of grease inserted at the factory. Check twice yearly and add only when needed. DO NOT overfill.

(5) Electrical Details.

- (a) Inspect all exterior electrical devices a minimum of 1 time per year, plus after maintenance on such devices, to ensure weatherproof covers are properly installed.
- (b) Inspect all light fixtures a minimum of 1 time per year to ensure they function, are aimed properly and provide overall adequate lighting.
- (c) Provide a test of all electrical sluice gate “local mode” OPEN and CLOSE controls a minimum of 1 time per year to ensure they function as required.
- (d) Provide a test of all SCADA points and operations a minimum of 1 time per year to ensure that all remotely monitored sensors and other devices and associated controls are reporting back and/or being controlled properly by the County of Sacramento.
- (e) Provide a test of the intrusion detection (security) system 1 time per month to ensure it is working properly. This is a balanced magnetic switch on the electrical building door that reports back through the SCADA system to the County of Sacramento.
- (f) Clean out underground pull boxes a minimum of 1 time per year including pumping out water if necessary. This process may need to be repeated after heavy rains.
- (g) There is a junction box for generator hook-up and associated manual transfer switch inside the electrical building. A portable generator may be brought in and connected here to provide emergency back-up power in the event of a power outage. Power transfer is manual so the utility and generator power sources are safely separated. Switch manual transfer switch back to utility mode when utility power is fully restored. A portable sized 25 kva should be adequate to carry the full electrical load of the closure structure. Sheet E-101 shows the facility load calculations – a smaller generator can be used if staging of the opening and closing of the gates is permitted. A 10 kva generator, for example, would work if 1 gate is opened or closed at a time.
- (h) Use proper arc-flash protective gear (Personal Protective Equipment – PPE: clothing, gloves, shoes, face shield, etc.) when working on all exposed live electrical equipment energized above 50 volts to ground, in accordance with OSHA, NFPA 70 and NFPA 70E requirements. In addition, such equipment shall be labeled in accordance with OSHA, NFPA 70 and NFPA 70E with the required “PPE” level, so maintenance personnel know what protective equipment they must wear when working on the equipment’s live exposed parts when energized. Annual electrical equipment inspection shall ensure required arc flash warning signs stating that required PPE levels are in place and legible.

(6) Concrete Structure Maintenance. The maintenance and repair of the concrete structure shall be in accordance with the following references:

- (a) EM1110-2-2002 Evaluation and Repair of Concrete Structures
 - (b) ACI Committee – 546 Repair of Concrete Structures
 - (c) ICRI (international Concrete Repair Institute)
- d. Mayhew Levee Raise
- (1) French Drain.

- (a) Location: Mayhew Levee Raise Station 586+08± LS, near Kansas Way Access.

(b) Description: An approximately 200-foot long by 2-foot wide by 3-foot deep stone-filled trench, including inlets and a perforated collection pipe providing drainage relief to backyards paralleling the levee.

(c) Inspection: Inspect at least once a year during (minimum 2 hours subsequent to rainfall commencement but within first 8 hours preferably, 18 hours maximum) and 36 to 96 hours subsequent to, a significant rainfall event. During the storm event, visually verify that runoff is freely collected by the stone trench and inlets. If no standing water is visible in the inlets during the post-rainfall event inspection (or if the water level has dropped by at least 50%), the drain system may be regarded as functioning adequately. Inspect the drainage area immediately tributary to the French drain system. A 15-foot wide minimum strip of grass centered about drain (or 7.5 feet from center in all directions) is required around the drain to act as a sediment filter.

(d) Maintenance: Stabilize disturbed or denuded drainage area tributary to the drain w/ seed/straw and tackifier to horizontal limits described in c. above, as required (private property excepted). Remove sediment and debris from the inlet grate and inlet riser.

(e) Repair: Replace failed French drains in-kind with lightly tamped stone (course, washed, uniformly graded 1" to 2" stone, 40% voids), lightweight (3.5-oz) non-woven filter fabric, perforated pipe and inlets as required to insure adequate French drain system function as described above. Prior to reinstalling fabric and stone, lightly rake sides of trench to encourage runoff infiltration. Do not compact or operate equipment on trench subgrade (bottom of trench). Dispose of replaced materials offsite in a safe and legal manner.

(f) Protection: Do not drive over inlet frames, risers and the gravel bed.

(2). Temporary Earthen Closure Structure.

(a) Location: Mayhew Levee Raise Station 603+00± landside, near the levee upstream (east end) turnaround.

(b) Description: An approximately 1.5-foot-high earthen closure structure intended to prevent floodwaters from outflanking the levee at upstream end of the project.

(c) Inspection: Inspect at least once every year to make sure the closure structure has not been lowered, breached or otherwise damaged.

(d) Maintenance: Maintain a healthy stand of grass and a closure structure top elevation vertically even with the grade at the fence line, approximate elevation 58.4 (NGVD 1929).

(e) Repair: Maintain the closure structure crest top elevation even with the grade at the fence line, approximate elevation 58.4 (NGVD 1929). If necessary, repair damaged closure structure by installing soil [CL, CL-ML, ML, SC, or SM] in compacted 6-inch lifts (before compaction). The first lift shall be installed on a scarified soil surface. Plant and restore a thick, healthy stand of grass. Insitu soils may be used if approved by the Superintendent.

(f) Protection: Do not drive over the closure structure. Do not allow the closure structure to be lowered or removed for any reason, unless approved by the Superintendent.

(3). Landside Chimney Drain.

(a) Location: Mayhew Levee Raise Station 601+90, approximately 250 feet upstream of the Gristmill entrance

(b) Description: The chimney drain is an internal drainage system constructed within the landside slope of the levee where three sanitary sewer lines cross the levee within the foundation. The drain consists of a 5-foot tall, 1.5-foot thick inclined drain rock layer parallel to and 2 feet below the levee slope. The inclined drain rock layer connects with a 10-foot long, 1.5-foot thick horizontal drain rock layer along the base of the levee section. The drainage layer is underlain by a 0.5-foot thick layer of fine filter sand and is overlain by a filter geotextile to prevent movement of the embankment fill material into the drain. The exit of the drain at the base of the levee slope is protected by a triangular wedge of gravel toe protection.

(c) Inspection: Inspect at least once a year and at any time the French drain is inspected. Look for: any depressions, bulges, erosion, or sloughing of the landside levee slope above the chimney drain; displacement of the gravel toe protection; and migration of drain rock and/or filter sand and/or embankment fill material out of the levee prism into the gravel toe protection in all inspections.

(d) Maintenance: Maintain the design levee slope and a healthy stand of grass cover over the chimney drain. Maintain the gravel toe protection to the design triangular shape covering the lower levee slope and 5 (horizontal) feet of the toe easement area.

(e) Repair: The most common repair action for the landside chimney drain is anticipated to be rebuilding of the design triangular shape of the gravel toe protection if the gravel is displaced by vehicle traffic or local residents. Depressions, bulges, or sloughing of the levee slope above the chimney drain can be a sign the chimney drain is not performing as intended. The filter sand, drain rock, or geotextile could have become clogged with embankment fill material. Migration of drain rock and/or filter sand and/or embankment fill material out of the levee prism is a sign of internal erosion, which over time can form voids within the chimney drain and/or the surrounding embankment. If depressions, bulges, sloughing of the levee slope above the chimney drain and/or migration of drain rock/filter sand/embankment fill into the gravel toe occurs, then the slope and drain should be excavated to discover the cause. Clogged filter sand, geotextile, and/or drain rock should be replaced in kind and voids in the chimney drain and/or surrounding embankment should be repaired. This work shall be conducted in accordance with the applicable specifications from the construction contract. Surficial erosion of the levee slope above the drain shall be repaired in accordance with the Standard Manual, Section IV.

(f) Protection: Avoid driving over the gravel toe protection whenever possible. If driving over the toe protection cannot be avoided, drive very slowly (maximum 5 miles per hour) to minimize displacement of the gravel. Do not block the chimney drain outlet area.

2-05. Environment Protection.

a. Vegetation left during construction on the waterside berm or slope above the bank protection shall not be removed under normal maintenance. Dead trees with wildlife value will be retained except where they are a hazard to existing flood control works. *Revised September 1981

The following and USFWS BO #81420-2008-F-0805-1 within Exhibit I pertain to the repair sites at Lower American River RM 0.3L, 2.8L,

b. Trees, either preserved or planted, shall not be removed as long as they remain healthy. As unhealthy trees are removed or fall over, any subsequent cavities in the rock must be filled in a timely manner with rock material equal to the surrounding repair. Leave the fallen trees in place. Dead or fallen trees will be retained except where they are a hazard to existing flood control work.

c. In-stream Woody Material (IWM) has been used in conjunction with levee improvements at these locations. IWM is expected to degrade and wash away over time, therefore, it is not a requirement of normal maintenance to replace this material. IWM should not be removed from the site through maintenance activities. Additionally, any woody debris that arrives at the site and is deposited shall be left in place/not removed by the Local Sponsor, provided it is not posing a hazard to the existing flood control work.

d. Vegetation within mitigation areas shall be left in a natural state. No additional maintenance such as irrigation or mowing shall be required as a part of normal maintenance.

e. Soil placed on/in rock as a part of the original repair and all associated vegetation (grasses & woody shrubs/trees) within the footprint of the bank protection sites at these locations do not require replacement as a part of normal maintenance. In other words, if the soil is washed out it does not need to be replaced and re-vegetated. However, in areas where soil remains or new sediment is deposited and the vegetation is dislodged/ destroyed or leaves areas greater than 3' x 3' of exposed soil for more than 30 days during the months of April through November, those areas shall be hydro-seeded using the seed mix indicated on the As-Built.

f. Vegetation, soil, and IWM placed on the erosion repair site were done so as on-site mitigation for the construction of the site. Vegetation (trees and shrubs) helps protect against soil erosion and provides shade cover for endangered salmonid species migrating up and down the river during various times of the year. Living and dead IWM provides diverse habitat and refuge for several fish species during low flow conditions. These features shall not be removed or damaged in any way.

SECTION III

REPAIR OF DAMAGE TO PROJECT WORKS AND METHODS OF COMBATING FLOOD CONDITIONS

3-01. Repair of Damage. In the event of serious damage to the project works, whether due to flood control conditions or other causes, and which may be beyond the capability of local interests to repair, the Superintendent will contact a representative of the Division of Water Resources, State of California, who coordinates maintenance of project works of the Sacramento River Flood Control Project. The state representative will give assistance or advice, or will determine appropriate action to be taken.

During an extreme event, pay special attention to the temporary earthen closure structure at the east of the Mayhew levee (levee east end). Flood fighting methods are referenced in section 3-02 and in the Emergency Action Plan. It shall be the duty of the Superintendent to maintain a patrol and inspection of the project works during all periods of flood-flow. Intermediate inspections may be necessary to insure the best possible care of the levee. Immediate steps will be taken to mitigate hazardous or potentially hazardous conditions disclosed during such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

3-02. Applicable Methods of Combating Floods. For applicable methods of combating flood conditions, reference is made to Section VIII of the Standard Manual, where the subject is fully covered.

3-03. Emergency Action Plan. The Superintendent shall maintain documentation of levee system-specific emergency procedures and emergency contact personnel.

EXHIBIT A

FLOOD CONTROL REGULATIONS

(See Standard Manual)

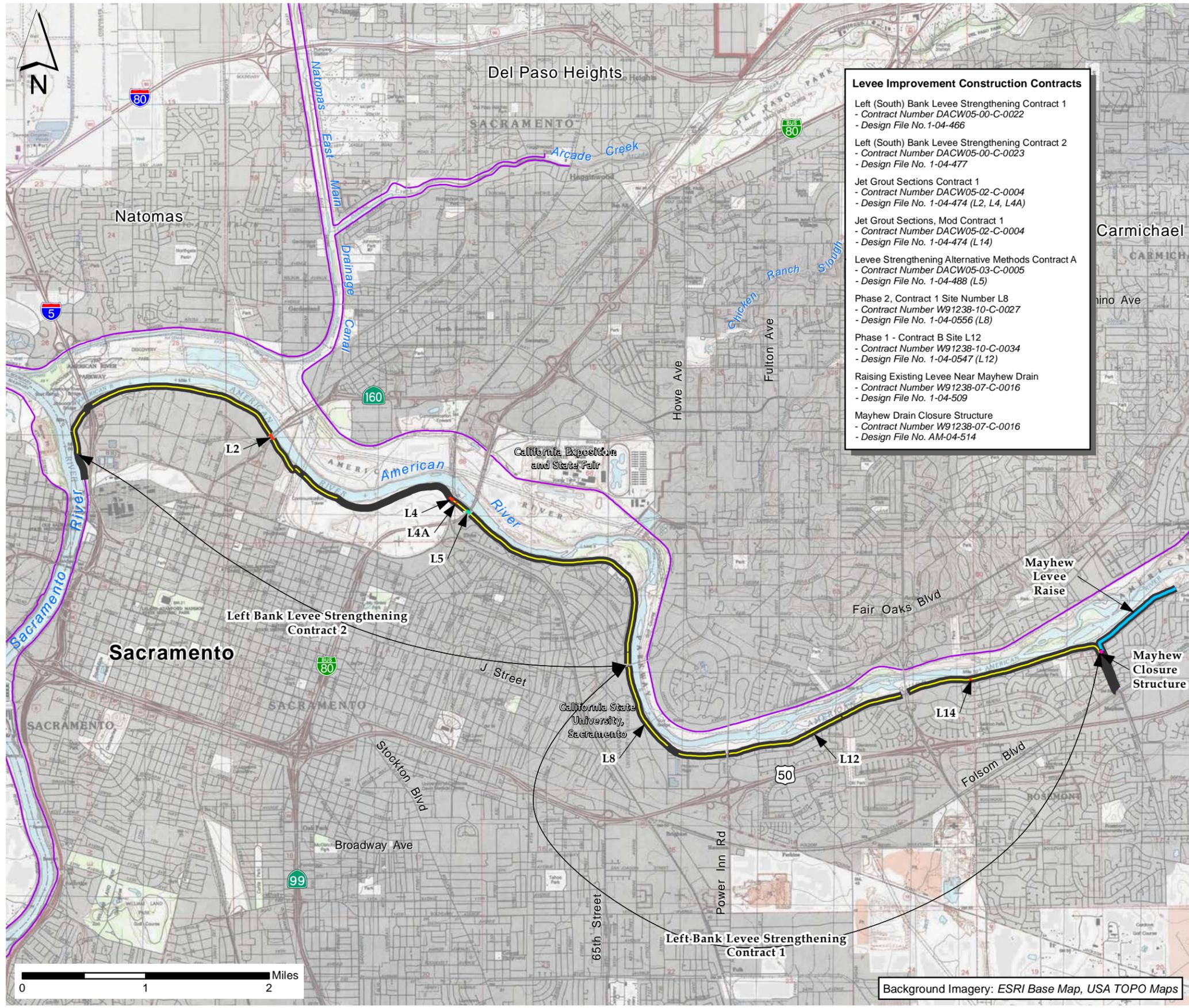


EXHIBIT B

“AS CONSTRUCTED”
DRAWINGS

See separate folder for the following drawings:

| <u>File No.</u> | <u>Title</u> |
|-----------------|---|
| 6-13-1100 | Sacramento River from Sacramento to Collinsville, sheet No. 1 |
| 50-10-2792 | Sacramento and American Rivers – Profile – Left Banks from Mi. 59.73 to 16 th Street Bridge, 1 sheet. |
| 1-4-374 | South Levee American River downstream from 16 th Street Bridge and “H” Street Bridge, 1 sheet. |
| 1-4-378 | Emergency Bank Protection – Left Bank American River upstream from W.P.R.R. Bridge, 1 sheet. |
| 1-4-362 | Enlargement of South Levee of American River from 16 th Street Bridge to Mayhews. Sheets 1 to 5, incl. |
| 50-4-2897 | Sacramento River Flood Control Project – Surface levee crown for patrol road purposes. Sheets 1 and 7. |
| 50-4-4118 | Bank Protection various locations left bank Sacramento and American River right and left banks Feather River and Elder Creek, in 12 sheets. |
| 50-4-3702 | Levee Rehabilitation and Patrol Roads, Vicinity of Sacramento, California, in 3 sheets. |
| 50-4-4283 | Bank Protection, Various Locations, Right and Left Banks, Sacramento River and Georgiana Slough, in 34 sheets. |
| 50-4-5130 | Bank Protection, Various Locations, Right and Left Banks, Sacramento River Mile 60.0 to Mile 110.0 in 41 sheets. |
| AM-04-514 | American River Watershed Project, Common Features, Left Bank Lower American River, Mayhew Drain Closure Structure, in 31 sheets. |
| 50-04-6280 | Sacramento River Bank Protection Project, Lower American River Repair Sites Rivermile (LAR RM) 0.3L, and 2.8L, in 25 sheets. |

- 1-04-0556 American River Common Features WRDA 1996 Levee Improvements Phase 2, Contract 1 Site Number L8, Contract No. W91238-10-R-0027, Sheets 1-27.
- 1-04-0547 American River Common Features Remaining Sites – WRDA 1996 Project Phase 1- Contract B Site L12. Contract No. W91238-10-C-0034, Sheets 1-25.
- 1-04-0509 American River Watershed Project Common Features Left Bank Lower American River Raising Existing Levee Near Mayhew Drain, Contract No. W91238-07-C-0016, Sheets 1 to 76.

“RECORD” DRAWINGS
(NOT As-Constructed)

- None American River, Mayhew, Temporary Plug (Temporary Earthen Closure Structure) Plan, Sheets 1-2. Constructed by ARFCD, January 2010.
- 1-04-466 Left (South) Bank Levee Strengthening Contract 1: Slurry cutoff wall construction contract. Contract No. DACW05-00-C-0022. Specification Number 9824A. Sheets 1-77.
- 1-04-477 Left (South) Bank Levee Strengthening Contract 2: Slurry cutoff wall construction contract. Contract Number DACW05-00-C-0023, Specification Number 1140. Sheets 1-103.
- 1-04-474 Jet Grout Sections Contract 1 (Sheets 1-60) and Jet Grout Sections Mod Contract 1(45 Sheets): Slurry cutoff wall construction contract. Contract Number DACW05-02-C-0004, Specification Number 1034.
- 1-04-488 Levee Strengthening Alternative Methods Contract A: Slurry cutoff wall construction contract. Contract Number DACW05-03-C-0005, Specification Number 1294. Design File Number Sheets 1-77.

Additional drawings of cross-sections, structures, and miscellaneous facilities are available in the Office of the District Engineer.

EXHIBIT C

PLATES OF SUGGESTED FLOOD FIGHTING METHODS

(See Standard Manual)

EXHIBIT D

CHECK LIST NO. 1

LEVEE INSPECTION REPORT

(See Standard Manual)

EXHIBIT E

CHECK LISTS OF LEVEES,

CHANNEL AND STRUCTURES

For definition of "flood" or "high water period", see paragraph 1-05 of this manual

CHECK LIST NO. 2

UNIT NO. 118-PART NO. 1

Inspector's Report Sheet No. _____

Inspector _____

Date _____

Superintendent _____

| Item | Remarks |
|--|---------|
| (a) Location by Station | |
| (b) Settlement, sloughing, or loss of grade | |
| (c) Erosion of levee slopes | |
| (d) Condition of roadways, including ramps | |
| (e) Evidence of seepage | |
| (f) Condition of farm gates and fencing | |
| (g) Maintenance measures taken since last inspection | |
| (h) Comments | |

INSTRUCTIONS FOR COMPLETING SHEET 2 EXHIBIT E
(To be printed on back of Sheet 2)

- Item (a) Indicate levee station of observation, obtained by pacing from nearest reference point; indicate right or left bank.
- Item (b) If sufficient settlement of earthwork has taken place to be noticeable by visual observation, indicate amount of settlement in tenths of a foot. If sloughing has caused a change in slope of the embankment section, determine the new slope. Note areas where erosion or gullyng of the section has occurred.
- Item (c) If sufficient erosion or gullyng of back face of back toe of levee has taken place to be noticeable by visual inspection, indicate area affected and depth.
- Item (d) Note any natural change in any section of roadway or ramps. Indicate any inadequacy in surface drainage system.
- Item (e) Indicate any evidence of seepage through the embankment section.
- Item (f) Indicate the serviceability of all farm gates across the embankments and roadway, and indicate if repainting is required.
- Item (g) Indicate maintenance measures that have been performed since last inspection and their condition at the time of this inspection.
- Item (h) Record opinion, if any, of contributory causes for conditions observed and also any observations not covered under other columns.

NOTE: One copy of the Inspector's Report is to be mailed to the District Engineer immediately on completion and one copy is to be attached to and submitted with the Superintendent's semi-annual report.

CHECK LIST NO. 3

CHANNEL AND RIGHT-OF-WAY

UNIT NO. 118-PART NO. 1

Inspector's Report Sheet No. _____ Inspector _____

Date _____ Superintendent _____

| Item | Remarks |
|--|---------|
| (a) Name of channel and location by stations | |
| (b) Vegetal growth in channel | |
| (c) Debris and refuse in channel | |
| (d) New construction within right-of-way | |
| (e) Extent of aggradation or degradation | |
| (f) Condition of riprapped section | |
| (g) Condition of bridges | |
| (h) Measures taken since last inspection | |
| (i) Comments | |

INSTRUCTIONS FOR COMPLETING SHEET 4, EXHIBIT E

(To be printed on back of sheet 4)

- Item (a) Indicate station of observation obtained by pacing from nearest reference point.
- Item (b) Note nature, extent, and size of vegetal growth within the limits of flood flow channel.
- Item (c) Note nature and extent of debris and refuse that might cause clogging of the conduits of the irrigation intake works, fouling of the tainter gates, or the bridges over the channel.
- Item (d) Report any construction along the diversion channel or above the diversion channel or above the diversion works that has come to the attention of the inspector and that might affect the functioning of the project.
- Item (e) Indicate any change in grade or alignment of the channels, either by deposition or sediment or scour, that is noticeable by visual inspection. Estimate amount and extent.
- Item (f) Indicate any change that has taken place in the riprap such as disintegration of the rock, erosion, or movement of the rock. Note the presence of vegetal growth through the riprap.
- Item (g) Note any damage or settlement of the footings of the bridges. Indicate condition of wooden structures and if repainting is required. Indicate condition of bridge approaches, headwalls, and other appurtenances.
- Item (h) Indicate maintenance measures that have been performed since the last inspection and their condition at time of this inspection.
- Item (i) Record opinion, if any, of contributory causes for conditions observed, also any observations not covered under other columns.

NOTE: One copy of the Inspector's Report is to be mailed to the District Engineer immediately on completion, and one copy is to be attached to and submitted with the Superintendent's semi-annual report.

CHECK LIST NO. 4

DRAINAGE AND IRRIGATION STRUCTURES

UNIT NO. 118-PART NO. 1

Inspector's Report Sheet No. _____

Inspector _____

Date _____

Superintendent _____

For the location of stations see drawings of Exhibit B.

| (a) Location by Station | (b) Bank | (c) Debris or other obstruc- tion to flow | (d) Damage or settlement of pipe or conduit | (e) Condition of concrete headwall or invert paving | (f) Condition of right-of-way adjacent to structure | (g) Repair Measures Taken since last inspection | (h) Comments |
|---------------------------------------|-------------|--|---|---|---|--|-----------------|
| <u>East Levee of Sacramento River</u> | | | | | | | |
| 60.04 | Left | | | | | | |
| 59.90 | " | | | | | | |
| <u>South Levee of American River</u> | | | | | | | |
| 10+00 | Left | | | | | | |
| 31+25 | " | | | | | | |
| 69+50 | " | | | | | | |
| 89+28 | " | | | | | | |
| 154+94 | " | | | | | | |
| 156+75 | " | | | | | | |
| 189+20 | " | 264+08 | Left | | | | |
| 202+80 | " | 263+70 | Left | | | | |
| 228+89 | " | 265+07 | " | | | | |

EXHIBIT E
Sheet 6 of 8

CHECK LIST NO. 4

DRAINAGE AND IRRIGATION STRUCTURES

UNIT NO. 118-PART NO. 1

Inspector's Report Sheet No. _____

Inspector _____

Date _____

Superintendent _____

For Location of stations see drawings of Exhibit B

| (a) Location by Station | (b) Bank | (c) Debris or other obstruction to flow | (d) Damage or settlement of pipe or conduit | (e) Condition of concrete headwall or invert paving | (f) Condition of right-of-way adjacent to structure | (g) Repair Measures Taken since last inspection | (h) Comments |
|----------------------------------|-------------|---|---|---|---|--|-----------------|
| 334+75 | Left | | | | | | |
| 341+00 | " | | | | | | |
| 367+40 | " | | | | | | |
| 409+02 | " | | | | | | |
| 480+30 | " | | | | | | |
| 512+10 | " | | | | | | |
| 522+80 | " | | | | | | |
| 535+29 | " | | | | | | |
| 552+40 | " | | | | | | |
| 552+82 | " | | | | | | |

INSTRUCTIONS FOR COMPLETING SHEET 6, EXHIBIT E

- (1) Enter station of all structures under Column (a) for check list.
- (2) Inspect inlet, barrel, and outlet for accumulation of sediment, rubbish, and vegetal matter. Note condition under Column (c).
- (3) If any settlement or damage to the pipe, barrel, or invert of the drain has occurred, estimate the location and amount. Note particularly if any backfill has come into the pipe or been disturbed. Record observations under Column (d).
- (4) Inspect the concrete portions of the structures for evidence of settlement, cracks, "pop-outs", spaces, abrasive wear, or other deterioration. Record conditions under Column (e).
- (5) Inspect backfill area adjacent to structure for evidence of erosion caused by overflow of the drainage structure and note conditions in Column (f).
- (6) Under Column (g) indicate physical measures that have been taken to correct conditions reported in last inspection, and their condition at time of this inspection.
- (7) Under Column (h) record opinion, if any, of contributory causes for conditions observed, also any observations not covered under other columns.
- (8) A copy of the inspector's report is to be mailed to the District Engineer immediately on completion, and a record copy shall be attached to the Superintendent's semi-annual report.

EXHIBIT F
LETTER OF ACCEPTANCE
BY STATE RECLAMATION BOARD

C
O
P
Y

THE RECLAMATION BOARD
OF THE
STATE OF CALIFORNIA

September 21, 1951

District Engineer
Sacramento District
U.S. Corps of Engineers
P.O. Box 1739
Sacramento, California

Dear Sir:

Reference your file SPKKO-P 824.3 (Sac. Riv. FCP) of September 10, 1951, in which you transferred to the State of California for maintenance and operation a portion of the levee along the left bank of the American River, Station 138/00 to 146/00, just upstream from the Western Pacific Railroad Bridge.

The Reclamation Board at its meeting September 19, 1951, accepted said levee on behalf of the State of California for maintenance and operation.

Yours very truly,
THE RECLAMATION BOARD
A. M. BARTON

Chief Engineer and General Manager
By /s/ S. A. Honaker
S. A. HONAKER
Assistant Secretary

C
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THE RECLAMATION BOARD
OF THE
STATE OF CALIFORNIA

March 11, 1953

District Engineer
Sacramento District
Corps of Engineers, U.S. Army
P.O. Box 1739
Sacramento 8, California

Dear Sir:

Reference your letters file No. SPKKO-P 824.3 (Sac. R.F.C.P.) dated 1 December 1951, 3 December 1951, 4 December 1951, three letters dated 6 December 1951, 7 December 1951 and six letters dated 8 December 1951. Subject letters transferred to The Reclamation Board for operation and maintenance, various levee units of the Sacramento River Flood Control Project.

The Reclamation Board at its 18 December 1951 meeting, on behalf of the State of California, accepted certain of the transferred units together with their contiguous waterway banks for operation and maintenance, and rejected others. A tabulation of the units so accepted or rejected is attached hereto.

Very truly yours,

THE RECLAMATION BOARD
A. M. BARTON
Chief Engineer and General Manager

By /s/ D. M. Carr
D. M. CARR

December 18, 1951

The Board accepted the transfer from the Corps of Engineers, in letter listed below, the following reaches of levee and their contiguous waterway banks where applicable for flood control operation and maintenance, as complete and meeting the requirements of the Sacramento River Flood Control Project.

| <u>No.</u> | <u>Date of Letter</u> | <u>Levee Location</u> | <u>Remarks</u> |
|------------|-----------------------|--|--|
| 1 | 1 Dec 1951 | ----- | |
| 11 | 8 Dec 1951 | South Levee American River from 16th Street Bridge to Mayhew except from S.N.R.R. to a point 800 feet east of W.P.R.R. | Maintained by American River Flood Control Project |

NOTE: Only item pertaining to Operation and Maintenance Manual No. 118-Part No. 1 is included in the above copy.

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THE RECLAMATION BOARD
OF THE
STATE OF CALIFORNIA

May 22, 1952

District Engineer
Sacramento District
Corps of Engineers, U.S. Army
P.O. Box 1739
Sacramento 8, California

Dear Sir:

Reference is made to your letter (1) SPKKO-P 824.3 (Sac.Riv. F.C.P.) 13 December 1951, (2) your letter SPKKO-P 824.3 (Sac.Riv. F.C.P.) 19 December 1951, and (3) your letter SPKKA 824.3 (Sac.Riv. F.C.P.) 13 December 1951, transferring 101 reaches of levee and contiguous banks to The Reclamation Board for flood control operation and maintenance.

On January 2, 1952, The Reclamation Board accepted the transfer of the reaches of levee listed in first tabulation attached and did not accept those reaches of levee and contiguous bank in the second tabulation.

Yours very truly,

By /s/ THE RECLAMATION BOARD
A. M. Barton
A. M. BARTON
Chief Engineer and General Manager

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January 2, 1952

The Board accepted the transfer from the Corps of Engineers, in letters as listed below, the following reaches of levees and their contiguous waterway banks, where applicable, for flood control operation and maintenance, as complete and meeting the requirements of the Sacramento River Flood Control Project:

| <u>No.</u> | <u>Date of Letter</u> | <u>Levee Location</u> | <u>Remarks</u> |
|------------|-----------------------|---|---|
| 1 | 13 Dec. 1951 | ----- | ----- |
| 3 | 13 Dec. 1951 | ----- | ----- |
| | 13 Dec. 1951 | d(46) East levee Sacramento River Mile 56.1 to Amer- ican River. | Constructed and maintained by City of Sacramento |
| 3 | 13 Dec. 1951 | ----- | ----- |

NOTE: Only item pertaining to Operation and Maintenance Manual No. 118-Part No. 1 is included in the above copy.

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THE RECLAMATION BOARD
OF THE
STATE OF CALIFORNIA

January 8, 1953

District Engineer
Sacramento District
U.S. Corps of Engineers
P. O. Box 1739
Sacramento, California

Dear Sir:

Reference your letter, File No. SPKKO-P 824.3 (Sac.R.F.C.P.) dated
4 December 1952.

The Reclamation Board at its meeting December 16, 1952, accepted,
on behalf of the State of California, the levee units herein described,
and their contiguous waterway banks, for operation and maintenance.

a. -----

b. Southerly levee of the American River, Part "E", Levee
and Patrol road, Station 19+00 at Jibboom Street Bridge, to Station
102+55 at 16th Street Bridge at Sacramento, California.

Yours very truly,

THE RECLAMATION BOARD
A. M. BARTON
Chief Engineer and General Manager

By /s/ D. M. Carr
D. M. CARR

NOTE: Only item pertaining to Operation and Maintenance Manual No.
118 Part No. 1 included in the above copy.

DEPARTMENT OF WATER RESOURCES

O. B.
CRAM
95802
916) 445-4286



C
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AUG 17 1978

District Engineer
Sacramento District
U. S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

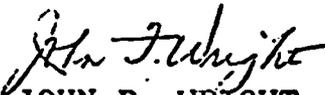
Dear Sir:

The Reclamation Board at its regular meeting of August 15, 1978, formally accepted from the District Engineer the completed flood control work on a portion of Unit No. 30 of the Sacramento River Bank Protection Project. The flood control work was transferred to the State of California by your letter of July 14, 1978.

The flood control work consisted of selective clearing, bank sloping, placement of stone bank protection, and such miscellaneous work as necessary to complete the construction at Site Mile 60.1 Left Bank, Sacramento River.

The work was constructed in a workmanlike manner and in conformance with Drawing No. 50-4-5130, Specification No. 5081, and Contract No. DACW 05-76-C-0107, insofar as could be determined visually.

Sincerely,


JOHN F. WRIGHT
Chief Engineer and
Acting General Manager

CERTIFIED MAIL 308239
RETURN RECEIPT REQUESTED



EXHIBIT F

transfer file



SPKCO-0

12 July 1978

The Reclamation Board
State of California
1416 - 9th Street, Room 335
Sacramento, California 95814

done

Gentlemen:

This is in regard to the joint inspection of 14 July 1978, made for the purpose of transferring a portion of the Sacramento River Bank Protection Project (Unit No. 30), to the State of California for operation and maintenance. The flood control work consisting of levee and bank sloping and placement of about 470 feet of stone bank protection on the Sacramento River left bank at Site Mile 60.1 (STA. 391+50 to 396+20) was completed on 14 July 1978 in accordance with Contract No. DACW05-76-C-0107, Specification No. 5081, and Drawing No. 50-4-5130.

The work was performed under the general authority of the Flood Control Act of 1960, 86th Congress, 2nd Session (PL86-645, 14 July 1960), and Section 2304(a), Title 10, and now meets the requirements of the Sacramento River Bank Protection Project. Therefore, said work together with the waterway bank contiguous thereto, is transferred as of 14 July 1978 to the State of California for operation and maintenance.

This portion of the work will be added by amendment to the Operation and Maintenance Manual, Supplement No. 118-Part No. 1, Sacramento River Bank Protection Project. Copies will be furnished your office at a later date.

Sincerely yours,

for *ROMP* *gh*
McBRIDE
MCBRIDE

DONALD M. O'SHEI
Colonel, CE
District Engineer

A. *for*
HEM
HEM

Unit 118.1

PROBASCO
own
PROBASCO

O'SHEI
Donald
O'SHEI

Copy furnished:
ODWR, ATTN: R. Franson
Robert Potter

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THE RECLAMATION BOARD
STATE OF CALIFORNIA

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August 19, 1969

4130.60.107

District Engineer
Corps of Engineers
U. S. Army
650 Capitol Mall
Sacramento, California 95814

Dear Sir:

Reference is made to your letter of August 7, 1969, concerning transfer to the State of California of a portion of the Sacramento River Bank Protection Project, Unit No. 15, consisting of Site Mile 4.8, left bank, American River for maintenance and operation.

This work was constructed in accordance with Specification No. 3349, Contract No. DACW05-69-C-0076, Drawing No. 50-4-4283.

The Reclamation Board, at its meeting of August 15, 1969, formally accepted the above referred to work for operation and maintenance.

Sincerely yours,

/s/ A. E. McCollam
A. E. McCOLLAM
Chief Engineer and
General Manager

EXHIBIT F

SPKCO-0



The Reclamation Board
State of California
1416 - 9th Street, Room 1335
Sacramento, California 95814

Gentlemen:

Reference is made to the American River joint inspection of 6 August 1969, made for the purpose of transferring a portion of the Sacramento River Bank Projection Project Work (Unit #15), to the State of California for operation and maintenance.

The flood control work consists of bank sloping and placement of 495 feet of stone bank protection on the left bank of the American River at Site Mile 4.8. The work was completed on 6 August 1969, in accordance with Specification #3349, Contract No. DACW05-69-C-0076, Drawing No. 50-4-4283.

The work was performed under the general authority of the Flood Control Act of 1960, 86th Congress, 2nd Session; and Section 2304(a), Title 10, and now meets the requirements of the Sacramento River Bank Protection Project. Therefore, said work together with the waterway banks contiguous thereto, is transferred to the State of California for operation and maintenance.

This portion of the project work will be added by amendment to the Operation and Maintenance Manual, Supplement No. 11B Part No. 1, Sacramento River Flood Control Project. Copies will be furnished your office at a later date.

Sincerely yours,

Unit #18.1

GEORGE E. SKINNER
Lieutenant Colonel, CE
Acting District Engineer

R
ROMPALA/p

C
COLEMAN

for MCB
HENSON

R
HART

SKINNER
8 Aug 69

Copy furnished:

- C* DWR
- C* OCE
- C* SPD

cc: Engr-Lev&Chan; Engr-Prog Dev; Valley; F&A(Cordano)

CERTIFIED MAIL

RETURN RECEIPT REQUESTED

[Handwritten signature]

Added
July - 66
change 1

THE RECLAMATION BOARD
State of California
January 11, 1966

C
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District Engineer
Corps of Engineers
U. S. Army
650 Capitol Mall
Sacramento, California

Dear Sir:

Reference is made to your letter of November 29, 1965, concerning transfer to the State of California of the Sacramento River Bank Protection Project, Contract 14, ten sites between Sacramento and Gerber, in accordance with Specification No. 3283.

The Reclamation Board, at its meeting of January 6, 1966, formally accepted the above referred to work for operation and maintenance.

Sincerely yours,

/s/ A. E. McCollam
A. E. MCCOLLAM
General Manager

EXHIBIT F

29 November 1965

The Reclamation Board
State of California
1416 - 9th Street, Room 1335
Sacramento, California 95814

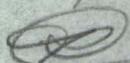
Gentlemen:

Reference is made to the joint inspections made on 17 & 19 November 1965, of flood control work pertaining to the Sacramento River Bank Protection Project for the purpose of transferring this work, upon completion, to the State of California for operation and maintenance.

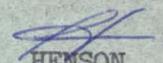
The flood control work, consisting of levee enlargement, levee set-back, shaping and placement of bank protection at 4 locations on Elder Creek near Highway U.S. 99W; one location on the Sacramento River at Hamilton Bend, three locations on the Feather River near Nicolaus and one location near the Gridley Bridge, and one location on the American River downstream from the "H" Street Bridge, as listed on the attached inclosure, was completed on 19 November 1965, in accordance with Specification No. 3283, Contract No. DA-04-167-CIVENG-66-28 and Drawing No. 50-4-4118.

cont 14

The flood control work as described on the attached inclosure now meets the requirements of the Sacramento River Bank Protection Project. Therefore, said flood control works, together with the waterway banks contiguous thereto are transferred to the State of California for operation and maintenance.

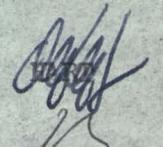
Hem

COLEMAN/I

This portion of the project work will be added by amendment to the Operation and Maintenance Manual, Supplement Nos. 118-Elder Creek, 136, 141 and 152-Sacramento River Flood Control Project, and furnished your office at a later date.


HENSON

Sincerely yours,

*Units
118-1, 136/141,
152
Elder Creek
10/11/2*


MATHE
cn

1 Incl
Summary Sheet

ROBERT E. MATHE
Colonel, CE
District Engineer

CERTIFIED MAIL

Copy furnished: RETURN RECEIPT REQUESTED cc: Lev & Chan; Prog Dev; Valley Res; Dept Water Resources w/incl F&A (ATTN: C. Cordano)

1507-55

SUMMARY OF LEVEE UNITS - RIGHT & LEFT BANKS
 AMERICAN RIVER, SACRAMENTO RIVER, FEATHER RIVER & ELDER CREEK

*Unit
19*

| LEVEE UNIT SITE MILE | LEVEE ENLARGEMENT | LINEAL FEET | LEVEE SETBACK | LINEAL FEET | BANK SLOPING | LINEAL FEET | STONE PROTECTION | LINEAL FEET | RIGHT OR LEFT BANK |
|----------------------|-------------------|-------------|---------------|-------------|--------------|-------------|------------------|-------------|--------------------|
|----------------------|-------------------|-------------|---------------|-------------|--------------|-------------|------------------|-------------|--------------------|

AMERICAN RIVER:

| | | | | | | | | | |
|------|--|--|--|--|-------------|------|-------------|------|------------|
| 5.84 | | | | | 3+00to18+50 | 1550 | 3+00to18+50 | 1550 | Left 118.1 |
|------|--|--|--|--|-------------|------|-------------|------|------------|

SACRAMENTO RIVER:

| | | | | | | | | | |
|--------|--|--|----------------|-----|--|--|----------------|-----|----------|
| 152.47 | | | 235+00to244+00 | 900 | | | 236+00to243+00 | 700 | Left 130 |
|--------|--|--|----------------|-----|--|--|----------------|-----|----------|

FEATHER RIVER:

| | | | | | | | | | |
|------|--------------|------|--------------|------|--------------|-----|---------------|------|------------|
| 6.5 | | | | | 77+00to86+00 | 800 | 78+00to86+00 | 800 | Left |
| 7.5 | 16+00to31+00 | 1500 | 16+00to31+00 | 1500 | 31+00to32+00 | 100 | 16+00to32+00 | 1600 | Left } 141 |
| 8.6 | 2+00to10+00 | 800 | 2+00to10+00 | 800 | | | 2+00to10+00 | 800 | Left |
| 49.6 | | | 3+00to14+00 | 1100 | 0+00to3+00 | 300 | 0+00 to 14+00 | 1400 | Right 152 |

ELDER CREEK:

| | | | | | | | | | |
|------|--|--|--|--|----------------|-----|----------------|-----|-------|
| 0.56 | | | | | 16+25to22+00 | 575 | 16+25to22+00 | 575 | Right |
| 1.25 | | | | | 62+60to70+50 | 790 | 62+60to70+50 | 790 | Left |
| 1.46 | | | | | 62+00to70+00 | 800 | 62+00to70+00 | 800 | Right |
| 1.85 | | | | | 124+50to131+00 | 650 | 124+50to131+00 | 650 | Right |

Vol 12

C
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THE RECLAMATION BOARD
of the
State of California

C
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June 29, 1962

District Engineer
Corps of Engineers
U. S. Army
P. O. Box 1739
Sacramento, California

Dear Sir:

Reference is made to your letter of June 19, 1962 concerning transfer to the State of California of flood control work consisting of levee rehabilitation and patrol roads on the Sacramento River, American River, and Natomas Canal which was completed on June 15, 1962 in accordance with Specifications No. 2817:

- Item 56d & e Provide patrol road along east levee of Natomas Canal downstream from Arcade Creek with turnaround at upstream end.
- Item 56f Provide patrol road and turnaround on left levee American River from W.P.R.R. upstream to existing road.
- Item 56g Construct turnaround ramp at Old U. S. 40 Floodgate, right bank American River.
- Item 56i Provide patrol road on left bank levee of the Sacramento River from S. P. Shops to Jibboom Street Bridge.
- Item 101-4 Low 100-foot reach on the right bank of the Sacramento River immediately downstream from "I" Street Bridge raised to project grade and provided with standard patrol road.

The Reclamation Board at its meeting of June 21, 1962 formally accepted the above referred to flood control work for operation and maintenance.

Sincerely yours,

/s/ Robert W. James
ROBERT W. JAMES
General Manager and Chief Counsel

EXHIBIT F

Supplement #1

19 JUN 1962

SPKKO-C

The Reclamation Board
State of California
1215 "O" Street
Sacramento 14, California

Gentlemen:

Reference is made to the joint inspection made on 14 June 1962 of flood control work on a unit of the Sacramento River Flood Control Project for the purpose of transferring it to the State of California for operation and maintenance. Reference is also made to Supplement dated 29 November 1957 to the Memorandum of Understanding entered into with the State of California under date of 30 November 1953, covering added items of work required to complete the Sacramento River Flood Control Project.

The flood control work consisting of levee rehabilitation and patrol roads on the Sacramento River, American River and Natomas Canal (items listed below as indicated in the referenced supplement) was completed on 15 June 1962, in accordance with Specifications No. 2817, Contract No. DA-04-167-CIVENG-62-63 and Drawing No. 50-4-3702:

Item 56d & e -- Provide patrol road along east levee of Natomas Canal downstream from Arcade Creek with turnaround at upstream end. 118.2

Item 56f -- Provide patrol road on left levee American River from W.P.R.R. upstream to existing road. 118.1

Item 56g -- Construct road ramp at Old U.S. 40 Floodgate, right bank American River. 118.2

Item 56i -- Provide patrol road on left bank levee of the Sacramento River from S.P. Shops to Jiboom Street Bridge. 118.1

Item 101-4 -- Low 100-foot reach on the right bank of the Sacramento River immediately downstream from "I" Street Bridge raised to project grade and provided with standard patrol road. 116

SPKCO-C
The Reclamation Board

19 JUN 1962

The foregoing supplemental work, having been completed to current standards for the Sacramento River Flood Control Project, is hereby transferred to the State of California for operation and maintenance. A manual for this portion of the project has already been furnished, which adequately covers operation and maintenance requirements for the above items.

A copy of this letter is being transmitted to the Department of Water Resources.

Sincerely yours,

1 Incl
F.C. Reg.

ARTHUR A. BECKER,
Major, CE
Acting District Engineer

Copy furnished:
Dept Water Resources
23rd & "R" Streets
Sacramento, Calif.

O.C.E. w/o incl
S.P.D. w/o incl

cc: Engr Div-Lev&Chan w/o incl
Engr Div-ProDevBr w/o incl
F&A Br w/o incl
Northern Area Ofc w/o incl

6/18/62
KRESTOF

THOMPSON

JOHNSON

BECKER

REGISTERED MAIL
Return Receipt
Requested

CdeA/rm

12/4/52

SPKKO-P 824.3 (Sac. R. F.C.P.)

4 DEC 1952

The Reclamation Board
State of California
1100 "O" Street
Sacramento, California

Gentlemen:

Reference is made to the District Engineer's letter dated 21 November 1952, wherein it was suggested that a joint inspection be made for the purpose of transferring to the jurisdiction of the State of California, when completed, four units of the Sacramento River Flood Control Project. Reference is also made to the joint inspection of these units of work which was made on 2 December 1952.

In accordance with the above, you are advised that the four levee units mentioned above, which are covered under Specification No. 1636, Drawing 50-4-2897, have been completed, as scheduled, on 29 November 1952. These units are described as follows:

a. Westerly levee of the Sacramento River:

- 348 (1) Part "D", Levee and patrol road, Station 243/25, at Elkhorn Ferry, River Mile 70.9, to Station 543/27, River Mile 76.5. 123
- 349 (2) Part "D", Levee and patrol road, Station 143/70, River Mile 60.75, to Station 171/00, River Mile 61.8 at Bryte's Bend State's Warehouse. 116
- 350 (3) Part "D", Levee and patrol road, Station 76/00, River Mile 59.45 at "I" Street Bridge, to Station 102/50, Mile 59.9. 116

b. Southerly levee of the American River:

- 351 Part "E", Levee and patrol road, Station 19/00 at Jibboom Street Bridge, to Station 102/55 at 16th Street Bridge at Sacramento, California. 118.1

824.3 (Sac. R. F.C.P.) SPK

80

Levee Sections
348 to 351
Letter No. 40

SPKKO-P 824.3 (Sac. R. F.C.P.)
The Reclamation Board

The levee units referred to above, together with the patrol roads thereon, form an integral part of the Sacramento River Flood Control Project and meet with the requirements of the project. Therefore, said levee units, together with the waterway banks contiguous thereto, are hereby transferred to the State of California for operation and maintenance.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress, approved 22 June 1936, as amended and supplemented. As provided under paragraph 208.10(10) of these regulations, a maintenance manual covering these levee units is in process of preparation and will be furnished to you upon completion.

A copy of this letter is being transmitted to the State Engineer.

FOR THE DISTRICT ENGINEER:

Copy furnished:
State Engineer
✓ 1120 "N" Street
Sacramento, California

cc: ✓ Office of C. of E.
✓ So. Pac. Div. Eng.
✓ Eng. Div.
✓ Sacto Project Eng.
✓ Service Section
✓ C. deArrieta

Sincerely yours,

Earl G. Peacock
Lt. Col., Corps of Engineers
Executive Officer

| | |
|-------------------|------------------------|
| Concurrence | |
| Original Date | 6.21.45 4 Dec. 1945 |
| Exec. O. | AT |
| Exec. Asst. | |
| Chief Ad. Asst. | 2 B |
| Acct. Asst. Exec. | |
| Audit | |
| Bud. & Acct. | |
| Manag. | |
| Property | |
| Office Svc. | |
| Constn-Oper. | |
| Engr'g | |
| R.E. | |
| Pers. | |
| Legal | |
| Supply | |

81



REGISTERED MAIL
Return Receipt
Requested

Letter No. 13

①

⑬

13 DEC 1951

SPEKA 624.3(Sac. Riv. F.C.P.)

The Reclamation Board
State of California
1100 "G" Street
Sacramento 14, California

Accepted by the Recl. Board:

-  Completed by Contract by C. of E.
-  Const. by Local Interests 203-246-250-285
-  No maint. is required. 204

Not Accepted

 No capable of separate maint.

Gentlemen:

Reference is made to your letter of 2 July 1951 acknowledging that certain reaches of the levees of the Sacramento River Flood Control Project and the waterway bank contiguous to said levee reaches meet the requirements of the project as authorized prior to the Flood Control Act of 1944.

The levee reaches in question are located as follows:

a. Sherman Island levee of Three Mile Slough.

- ✓  (1) State Highway Bridge to Sacramento River.  101
- ✓  (2) From the State Highway Bridge, 1300 feet toward the San Joaquin River.  101
- ✓  (5) From a point 3900 feet toward the San Joaquin River from the State Highway Bridge to a point 6900 feet toward the San Joaquin River from the State Highway Bridge. 101
- ✓  (4) From a point 10,500 feet toward the San Joaquin River from the State Highway Bridge to the San Joaquin River. 101

 b. Plug across Seven Mile Slough near Three Mile Slough.  102

✓  c. Sherman Island levee of Seven Mile Slough and Three Mile Slough from the Plug across Seven Mile Slough southwesterly to Sacramento River.  102

Items 199 to 295

⑬

SPRKA 624.S (Sac. Riv. F.C.P.)
The Reclamation Board

d. Easterly levee of the Sacramento River.

Reach
19

- 205 (1) From a point 25,850 feet, measured along the Sherman Island levee, downstream from Three Mile Slough to a point 21,950 feet downstream from Three Mile Slough. 101
- 206 (2) From a point 14,850 feet, measured along the Sherman Island levee, downstream from Three Mile Slough to a point 7,700 feet downstream from Three Mile Slough. 101
- 207 (3) From a point 6,300 feet, measured along the Sherman Island levee, downstream from Three Mile Slough to a point 3,450 feet downstream from Three Mile Slough. 101
- 208 (4) From a point 5,500 feet, measured along the Sherman Island levee, downstream from Three Mile Slough to a point 700 feet downstream from Three Mile Slough. 101
- 209 (5) From a point 500 feet, measured along the Sherman Island levee, downstream from Three Mile Slough to Three Mile Slough. 101
- 210 (6) Three Mile Slough to Mile 10.58. 102
- 211 (7) Mile 10.71 to Mile 13.1. 102
- 212 (8) Mile 13.59 to Mile 14.5 (Junction Point). 102
- 213 (9) Mile 14.5 (Junction Point) to Mile 15.0. 102
- 214 (10) Mile 15.1 to Mile 16.9. 102
- 215 (11) Mile 16.95 to Mile 17.5. Brannan 102
- 216 (12) Mile 17.6 to Mile 18.0. Andrus 103
- 217 (13) Mile 18.15 to Mile 18.5. " 103
- 218 (14) Mile 18.5 to Mile 21.5. ✓ ○ " 103
- 219 (15) Mile 21.6 to Mile 26.3. ✓ ○ " 103
- 220 (16) Mile 26.4 to Georgiana Slough. ✓ ○ 103
- 221 (17) Mile 26.5 to Mile 27.55. ✓ ○ III
- 222 (18) Mile 27.7 to Mile 28.5. III

2 X

Reach
19

SPKKA 824.3(Sac. Riv. F.O.P.)
The Reclamation Board

d. Easterly levee of the Sacramento River. (cont'd)

- ✓ 223 (19) Mile 28.6 to Mile 28.9.
- ✓ 224 (20) Mile 29.1 to Mile 29.9.
- ✓ 225 (21) Mile 30.25 to Mile 30.55.
- ✓ 226 (22) Mile 30.75 to Mile 31.5.
- ✓ 227 (23) Mile 31.8 to Mile 32.2.
- ✓ 228 (24) Mile 32.4 to Mile 33.0.
- ✓ 229 (25) Mile 33.1 to Mile 34.45.
- ✓ 230 (26) Mile 34.65 to Mile 34.95.
- ✓ 231 (27) Mile 35.1 to Mile 35.35.
- ✓ 232 (28) Mile 35.38 to Mile 35.74. ✓
- ✓ 233 (29) Mile 35.85 to Mile 36.55.
- ✓ 234 (30) Mile 36.5 to Mile 36.75.
- ✓ 235 (31) Mile 36.85 to Mile 37.15.
- ✓ 236 (32) Mile 37.3 to Mile 37.85.
- ✓ 237 (33) Mile 38.0 to Mile 38.3.
- ✓ 238 (34) Mile 38.5 to Mile 39.15.
- ✓ 239 (35) Mile 39.75 to Mile 39.9.
- ✓ 240 (36) Mile 40.0 to Mile 40.15.
- ✓ 241 (37) Mile 40.25 to Mile 40.35.
- ✓ 242 (38) Mile 40.5 to Mile 40.8.
- ✓ 243 (39) Mile 41.2 to Mile 41.6.
- ✓ 244 (40) Mile 41.75 to Mile 42.35.
- ✓ 245 (41) Mile 42.5 to Mile 43.05.

Reach 17



SPKRA 324.3 (Sac. Riv. F.C.P.)
The Reclamation Board

d. Easterly levee of the Sacramento River. (cont'd)

Reach 17

- ✓ (246) (42) Mile 43.3 to Mile 43.55. } III
- ✓ (247) (43) Mile 43.55 to Mile 44.2. }
- ✓ (248) (44) Mile 44.5 to Mile 45.3. x D 115
- ✓ (249) (45) Mile 55.4 to Mile 55.5. 115
- ✓ (250) (46) Mile 55.1 to American River. x D 118.1

- (251) (47) West levee of Sutter Bypass to Mile 87.5.
- (252) (48) Mile 91.4 to Mile 92.1.
- (253) (49) Mile 92.6 to Mile 92.7.
- (254) (50) Mile 92.9 to Mile 94.0. ✓ ○
- (255) (51) Mile 96.6 to Mile 97.4.
- (256) (52) Mile 97.5 to Mile 97.7. ✓ ○
- (257) (53) Mile 97.7 to Mile 97.8.
- (258) (54) Mile 99.9 to Mile 102.5. ✓ ○
- (259) (55) Mile 103.45 to Mile 103.7.
- (260) (56) Mile 103.8 to Mile 104.2.
- (261) (57) Mile 104.2 to Mile 104.7. ✓ ○
- (262) (58) Mile 104.7 to Mile 105.65.
- (263) (59) Mile 110.9 to Mile 111.5. ✓ ○
- (264) (60) Mile 118.4 to Mile 118.6 (South End Tisdale Weir)
- (265) (61) At Tisdale Weir. ✓ ○ 150

Reach 1A



(266) e. Northerly levee of Miner Slough from a point 1,200 feet easterly from the easterly levee of Yolo Bypass to a point 4,400 feet easterly from the easterly levee of Yolo Bypass.

SPKKA 224.3 (Sac. Riv. F.C.P.)
The Reclamation Board

Letter No. 13

13

f. Westerly levee of Sutter Slough.

113

Ranch 36

- ✓ (267) (1) Mile 26.5 to Mile 26.7.
- ✓ (268) (2) Mile 27.05 to Mile 27.2.
- ✓ (269) (3) Mile 27.3 to Elkhorn Slough.

g. Westerly levee of Elkhorn Slough.

113

- ✓ (270) (1) Sutter Slough to Station "A" 431+00.
- ✓ (271) (2) Station "A" 429+50 to Station "A" 405+00.
- ✓ (272) (3) Station "A" 403+50 to Station "A" 344+75.
- ✓ (273) (4) Station "A" 340+75 to Station "A" 326+00.
- ✓ (274) (5) Station "A" 70+50 to Station "A" 60+50.

h. Westerly levee of the Sacramento River.

131

Ranch 3

- ✓ (275) (1) Mile 119.2 to Mile 119.7.
- ✓ (276) (2) Mile 131.4 to Mile 131.8.
- ✓ (277) (3) Mile 133.1 to Mile 133.3. ✓ 0
- ✓ (278) (4) Mile 134.0 (Meridian Bridge) to Mile 134.3.
- ✓ (279) (5) Mile 134.3 to Mile 140.6. ✓ 0
- ✓ (280) (6) Mile 140.6 to Mile 141.3.
- ✓ (281) (7) Mile 141.3 to Mile 142.0. ✓ 0
- ✓ (282) (8) Mile 142.0 to Mile 142.3.
- ✓ (283) (9) Mile 142.3 to Mile 142.7 (Union Oil Co. Wharf). ✓ 0

AX (284) 1. Easterly levee of Georgiana Slough from the S.P.R.R. stream 22,500 feet. ✓ 0 103

AB

(285) j. Northerly levee of the American River and the back levee of Reclamation District No. 1000 from Jibboom Street Bridge to El Camino Avenue. x D

125

13

SPEKA 524.3(Sac.Riv.F.C.F.)
The Reclamation Board

k. Northerly levee of Natoms Cut.

- 48 ✓ (286) (1) From Sacramento River easterly to a point 1,550 feet easterly from the Garden Highway Bridge. 142
- ✓ (287) (2) From a point 2,550 feet easterly from the Garden Highway Bridge to a point 3,250 feet easterly from the Garden Highway Bridge. 142

Rec'd No. 30

✓ (288) l. Back levee of Reclamation District No. 2068 along the S.N.R.R. from the County Road northeasterly 7,200 feet to high ground. 109

✓ (289) m. Southerly levee of North Dry Creek near Wheatland from high ground to the W.P.R.R. Interceptor. 145

✓ (290) n. Easterly levee of the W. P. R. R. Interceptor from North Dry Creek southerly to Bear River. 145

✓ (291) o. Northerly levee of Bear River from the W. P. R. R. Interceptor easterly to South Dry Creek. 145

✓ (292) p. Northerly levee of South Dry Creek near Wheatland from Bear River easterly to high ground, including the Singh saddle closure levee. 145

✓ (293) q. Southerly levee of Bear River from the W.P.R.R. easterly to a point 5,400 feet easterly from Carlin Bridge. 141.1

✓ (294) r. Southerly levee of South Dry Creek near Wheatland from Bear River easterly 1.86 miles. 144

✓ (295) s. Northerly levee of Bear River from South Dry Creek easterly to a point 4,000 feet easterly from Carlin Bridge. 144

The records of this office show that your Board has accepted the levees and/or works covered by Items d.(14), d.(15), d.(16), d.(29), d.(50), d.(52), d.(54), d.(57), d.(59), d.(61), h.(3), h.(5), h.(7), h.(9), i., m., n., o., p., q., r., and s., above, as complete. Accordingly the waterway bank contiguous to said Items is hereby transferred to the State of California for maintenance and operation.

The levee covered by Items a. to c., inclusive, d.(1) to d.(13), inclusive, d.(17), to d.(27), inclusive, d.(29), to d.(49), inclusive, d.(51), d.(53), d.(55), d.(56), d.(58), d.(60), e., f., g., h.(1), h.(2), h.(4), h.(6), h.(8) and j. to l., inclusive, above, although complete has not been formally transferred as contemplated by the Project documents.

Letter No. 13

13

SPEKA 824.5(Sac,Riv.F.C.P.)
The Reclamation Board

Accordingly the levee covered by said Items, together with the waterway bank contiguous thereto, is hereby transferred to the State of California for maintenance and operation.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress approved 22 June 1936, as amended and supplemented. As provided under paragraph 208.10(10) of these regulations, a maintenance manual covering these works is in process of preparation and will be furnished your Board upon completion.

A copy of this letter is being transmitted to the State Engineer.

FOR THE DISTRICT ENGINEER:

Sincerely yours,

Copy Furnished:
Office, Chief of Engrs.
So. Pac. Div. Engr.
State Engineer
Engr. Div. (2)
C. de Arrieta

H. R. Reifsnyder
Lt. Colonel, Corps of Engineers
Executive Officer

13

RECEIVED MAIL
Receipt Receipt
Requested

Letter No. 12

12

SPKKA 824.3(Sac. Riv. F.C.P.)

8 DEC 1951

The Reclamation Board
State of California
1100 "G" Street
Sacramento 16, California

Gentlemen:

Reference is made to your letter of 22 June 1951 acknowledging that certain reaches of the levees of the Sacramento River Flood Control Project and the waterway bank contiguous to said levee reaches meet the requirements of the project as authorized prior to the Flood Control Act of 1944.

The levee reaches in question are located as follows:

140. a. Northerly levee of the American River from Jibboom Street Bridge to Sacramento River. 118.2 (P)

b. Easterly levee of the Sacramento River.

Reach 15 141. (1) American River to Natones Out. 60.25 to 79.0 124

Reach No. 11 142. (2) At Moulton Weir. (man 2) 154

143. (3) Mile 158.5 (North End Moulton Weir) to Mile 164.4 (Princeton Ferry). (man 2) ? 134

144. (4) Mile 168.5 to Mile 168.9 (at Butte City). (man 2) ? 138

c. Westerly levee of the Sacramento River.

145. (1) Mile 59.3 to Mile 60.75. 116

146. (2) Mile 61.3 to Mile 62.65 (at Drye Bend) 116

62.65

Accepted by letter dated 9 March 1953

Letter 12 Items 140 to 198

12

SPKIA 624.3 (Sac. Riv. F. C. P.)
The Reclamation Board

Letter No. 12

12

c. Westerly levee of the Sacramento River, (cont'd)

- ✓ 147. (3) Mile 62.65 to Mile 63.1 (South End Sacramento Weir). 116
- ✓ 148. (4) At Sacramento Weir. 158
- ✓ 149. (5) Mile 63.5 (North End Sacramento Weir) to Mile 67.11. 122
- ✓ 150. (6) Mile 68.42 to Mile 70.9. 122
- ✓ 151. (7) Mile 76.5 to Mile 81.7 (East End Fremont Weir). 123
- ✓ 152. (8) Along Fremont Weir. 157
- ✓ 153. (9) Mile 84.0 (West End Fremont Weir) to Mile 85.3. 128
- ✓ 154. (10) Mile 85.5 to Mile 85.9. 128
- ✓ 155. (11) Mile 87.6 to Mile 88.4. 128
- ✓ 156. (12) Mile 89.2 to Mile 89.8 (Knights Landing Highway Bridge). 128
- ✓ 157. (13) Mile ^{89.2} 89.8 (Knights Landing Highway Bridge) to Sycamore Slough. 89.9 128
- ✓ 158. (14) Mile ^{100.6} 100.6 to Mile 101.4. 128
- ✓ 159. (15) Mile 110.9 to Mile 111.2. 128

Reach No. 5

Reach No. 4

d. Westerly levee of the Feather River.

- Reach 39 ✓ 160. (1) Sutter Bypass to Nicolaus Bridge. 143
- ✓ 161. (2) From a point 3.51 miles northerly from Nicolaus Bridge to the Fifth Street Bridge between Marysville and Yuba City. 143, 144
- Reach 38 ✓ 162. (3) From a point 1,400 feet northerly from the Fifth Street Bridge between Marysville and Yuba City to Station 774+00 "Y.C.N.B." Traverse. 144
- ✓ 163. (4) From a point east of Station 1188+00 "Y.C.N.B." Traverse to high ground just northerly from the Western Canal Headgate. 144

Reach 42 ✓ 164. a. Easterly levee of the Sacramento River from Matomas Cut to Feather River. 141.1

12

Letter No. 12

12

f. Easterly levee of the Feather River.

- Reach 42 ✓ (165) (1) Sacramento River to a point 2.37 miles southerly from Nicolaus Bridge. 141 Pt 1
- Reach 41 ✓ (166) (2) Bear River to Mile 14.4. } 145
- ✓ (167) (3) Mile 14.4 to Mile 14.7. }
- ✓ (168) (4) Mile 14.7 to Mile 21.5. }
- ✓ (169) (5) Mile 21.5 to Mile 22.75. }
- ✓ (170) (6) Mile 22.75 to Mile 26.5 (Point where levee and S.N.R.R. meet). 145

g. Levees protecting the City of Marysville. AU 147

- Reach 43 ✓ (171) (1) From the W.P.R.R. at Simerly Slough easterly to the Yuba River.
- ✓ (172) (2) Along the Yuba River from the "D" Street Bridge to the back levee near the Valley Meat Company.

h. Levees protecting Reclamation District No. 10.

- Reach No. 40 ✓ (173) (1) Northerly levee of Simerly Slough from the W.P.R.R. to the S.P.R.R. 151
- ✓ (174) (2) Easterly levee of the Feather River from Simerly Slough to a point 4.3 miles northerly from Simerly Slough. 151

Reach 46 ✓ (175) i. Northerly levee of the Yuba River from the back levee of the City of Marysville to a point 1.3 miles easterly from said back levee. 147

Reach 47 ✓ (176) j. Southerly levee of the Yuba River from Feather River (i.e. S.N.R.R.) easterly to the S.P.R.R. Main Line. 147

45 ✓ (177) k. Northerly levee of Bear River from Feather River easterly to the W. P.R.R. Interceptor. 145

45 ✓ (178) l. Westerly levee of the W.P.R.R. Interceptor and Clark Slough Interceptor (i.e. back levee of Reclamation District No. 784) from Bear River to the southerly end of the Clark Slough Interceptor. 145

12

SPEKA 824.3(Sac.Riv.F.C.P.)
The Reclamation Board

Letter No. 12

12

m. Southerly levee of the American River.

Reach No. 25

- ✓ 179. (1) Sixteenth Street Bridge to the S.N.R.R. 118.1
- ✓ 180. (2) From a point 800 feet easterly from the W.P.R.R. to Mayhew Station. 118.1

n. Westerly levee of the Yolo Bypass.

- ✓ 181. (1) Sacramento River to Knights Landing Ridge Cut. 127
- ✓ 182. (2) Knights Landing Ridge Cut to the northeast corner of the Cache Creek Settling Basin. 126
- 28 ✓ 183. (3) S.N.R.R. Woodland Branch to a point 1.6 miles southerly from said railroad. 121
- 28 ✓ 184. (4) From a point 1.6 miles southerly from the S.N.R.R. Woodland Branch to the Willow Slough Pipes. 121
- 28 ✓ 185. (5) From a point 1.48 miles southerly from the Willow Slough Pipes to a point 1.9 miles southerly from said pipes. 121
- 28 ✓ 186. (6) From a point 1.9 miles southerly from the Willow Slough Pipes to the Willow Slough Interceptor. 121
- 28 ✓ 187. (7) From the Willow Slough Interceptor to Highway U.S. 40. 120
- ✓ 24 ✓ 188. (8) From Highway U.S. 40 to Putah Creek. 119

27 ✓ 189 o. Easterly and Westerly training levees of Cache Creek Settling Basin from Cache Creek southerly. 126

28 ✓ 190 p. Northerly and Southerly levees of the Willow Slough Interceptor from the S.P.R.R. to the Yolo Bypass. 120

29 ✓ 191 q. Northerly levee of Putah Creek from Yolo Bypass westerly to high ground. 119

✓ 192 r. Southerly levee of Putah Creek from high ground on Dixon Ridge westerly to high ground. 119

s. Southerly levee of Knights Landing Ridge Cut. 127

- 26 ✓ 193 (1) From Yolo Bypass westerly 600 feet. Also covered under Unit 96-A
- 26 ✓ 194 (2) { From a point 2,500 feet westerly from Yolo Bypass to a point 2,900 feet westerly from Yolo Bypass. 127
Also covered under 96-A

12

SPKKA 624.3(Sac.Riv.F.C.P.)
The Reclamation Board

Letter No. 12

12

s. Southerly levee of Knights Landing Ridge Cut. (cont'd)

- 76 ✓ 195 (3) { From a point 3,300 feet westerly from Yolo Bypass to a point 7,100 feet westerly from Yolo Bypass. 127
Also covered under Unit No. 96-A
- 35 ✓ 196 t. That portion of the back or westerly levee of Hastings Tract which runs east and west along the County Road for a distance of approximately one mile. 107
- ✓ 197 u. Northerly levee of Sycamore Slough from Sacramento River to Knights Landing Outfall Gates. 130
- ✓ 198 v. Southerly levee of Sycamore Slough from Sacramento River to Knights Landing Outfall Gates. 132

The records of this office show that your Board has accepted the levees and/or works covered by Items b.(1), b.(2), b.(3), c.(2), c.(4), c.(8), c.(11), c.(12), c.(14), d.(1), d.(3), d.(4), f.(3), f.(5), g., h., i., l., m., n.(1), n.(2), n.(3), n.(6), n.(7), n.(8), o., p., q., r. and s.(1) above, as complete. Accordingly the waterway bank contiguous to said Items is hereby transferred to the State of California for maintenance and operation.

The levee covered by Items a., b.(4), c.(1), c.(3), c.(5), c.(6), c.(7), c.(9), c.(10), c.(15), c.(15), d.(2), e., f.(1), f.(2), f.(4), f.(6), j., k., n.(4), n.(5), s.(2), s.(3), t., u. and v., above, although complete has not been formally transferred as contemplated by the Project documents. Accordingly the levee covered by said Items, together with the waterway bank contiguous thereto, is hereby transferred to the State of California for maintenance and operation.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress approved 22 June 1936, as amended and supplemented. As provided under paragraph 208.10(10) of these regulations, a maintenance manual covering these works is in process of preparation and will be furnished your Board upon completion.

A copy of this letter is being transmitted to the State Engineer.

FOR THE DISTRICT ENGINEER:

Sincerely yours,

Copy Furnished:
Office, Chief of Engrs.
So. Pac. Div. Engr.
State Engineer
Engr. Div. (2)
C. de Arrieta

H. R. Reifsnnyder
Lt. Colonel, Corps of Engineers
Executive Officer

12

Cdeh

RECEIVED
Requested

10 SEP 1951

SRKCO-P 824.3 (Sac. Riv. FCP)

The Reclamation Board
State of California
1100 "O" Street
Sacramento, California

Gentlemen:

Reference is made to letter from this office dated 8 August 1951 relative to transferring to the State of California for operation and maintenance the levee recently completed along the left bank of the American River, Station 138+00 to 145+00, just upstream from the W.P. R.R. bridge, and suggesting that a joint inspection of this levee be made on 14 August 1951.

According to the records in this office, the suggested inspection was made on 16 August 1951. It is understood that, on this inspection, the levee referred to above was found to be satisfactory by all concerned as meeting project requirements under the Sacramento River Flood Control Project.

Therefore, in accordance with the understanding referred to above, said levee together with the river bank contiguous thereto is hereby transferred to the State of California for maintenance and operation.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations which have been prescribed by the Secretary of The Army pursuant to Section 3 of the Act of Congress, approved 22 June 1928, as amended and supplemented. As provided under paragraph 203.10(10) of these regulations, a maintenance manual covering this levee unit is in process of preparation and will be furnished your Board upon completion.

A copy of this letter is being transmitted to the State Engineer.

Sincerely yours,

118.1

C. C. Haug
Colonel, Corps of Engineers
District Engineer

18

Copy Furnished:
The Chief of Engineers
The Division Engineer
The State Engineer

Unit No. 76-A = 318

23

15 MAR 1951

The Reclamation Board
State of California
1100 "O" Street
Sacramento, California

Gentlemen:

Reference is made to letter from this office dated 9 March 1951 proposing the transfer of two completed units of the Sacramento River Flood Control Project. Reference is also made to recent verbal discussions held with representatives of your staff wherein it was agreed that a joint inspection of said units of work was not necessary.

In accordance with the above, the two units of work listed below are hereby transferred to the jurisdiction of the State of California for maintenance and operation.

- a. Levee along the left bank of the American River from Station 110/05 to 112/47J downstream and near 16th Street Bridge.
- b. Levee along the left bank of the American River from Station 301/00 to 312/00 downstream and near "H" Street Bridge.

The work referred to above was completed on 18 January 1951 by J. R. Reeves, contractor, under Contract No. M-04-167-eng-397, in accordance with approved drawing No. 1-4-374 and Specification No. 1483.

There is inclosed a copy of the Flood Control Regulations prescribed by the Secretary of the Army pursuant to the provisions of Section 3 of the Act of Congress approved 22 June 1936, as amended and supplemented, to govern the maintenance and operation of flood control works, of which the construction referred to above is a part. In accordance with

Unit 44 A

Service Sub - Mr. Arilla

118-1

PSEHO-P 224.3 (Sec. 8, FCP)
The Reclamation Board

Paragraph 208.10(10) of these regulations this office will furnish you and local interests, at a later date, with an operation and maintenance manual to assist in carrying out the obligations established.

A copy of this letter with inclosure is being transmitted to the State Engineer.

Sincerely yours,

1 Incl.

1. Flood Control Reg.

C. C. HAUG

Lt. Colonel, Corps of Engineers
District Engineer

Copy Furnished:

Engineering Div. (2) w/o incl.

O. C. E. w/o incl.

Div. Engr. w/o incl.

State Engr. w/incl.

Service Section w/incl.

unit 44A

R E S O L U T I O N

PASSED AND ADOPTED BY THE RECLAMATION BOARD

DECEMBER 22, 1948

- - -

WHEREAS The Reclamation Board has heretofore approved plans for the completion to grade and section, or for the setback and reconstruction, bank protection, etc., of certain units of levee in the Sacramento River Flood Control Project, as follows:

- (1) Enlargement of the South Levee of the American River from 16th Street Bridge, Sacramento, to Mayhew Station, a distance of approximately nine miles;
- (2) Setback and Bank Protection of the West Levee of the Sacramento River from Mile 50.4 to Mile 50.9, in Reclamation District No. 765, Yolo County;
- (3) Setback and Bank Protection of the East Levee of the Sacramento River at Mile 35.5, a distance of approximately 1800 feet, in Reclamation District No. 755, Sacramento County, and,

WHEREAS, said units of levees have been completed, in accordance with said plans, and the District Engineer, Sacramento District, Corps of Engineers, Department of the Army, has under date of December 10, 1948, in accordance with established procedure, transferred said completed levees to the State of California, Reclamation Board, for maintenance,

NOW THEREFORE, be it resolved that said units of levee as heretofore itemized be and the same are hereby accepted by The Reclamation Board, for and on behalf of the State of California, for maintenance in accordance with Section 42 of Chapter 1514 of the Statutes of 1945, and

BE IT FURTHER RESOLVED, that said units of levee, as com-

8370, et seq., of the Water Code of the State of California.

- (1) The South Levee of the American River from the 16th Street Bridge to Mayhew Station, to the American River Flood Control District;
- (2) The West Levee of the Sacramento River from Mile 50.4 to 50.9, to Reclamation District No. 765, Yolo County;
- (3) The East Levee of the Sacramento River, in the vicinity of Mile 35.5 to Reclamation District No. 755;

and said Districts shall as of this date take charge of and maintain said levees in accordance with regulations as prescribed by the Secretary of War.

- - -

STATE OF CALIFORNIA)
COUNTY OF SACRAMENTO) ss.
Office of The Reclamation Board)

I, S. A. HONAKER, Assistant Secretary of The Reclamation Board, do hereby certify that the above and foregoing is a true and correct copy of a Resolution made by said Board at its meeting held December 22, 1948.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of The Reclamation Board this 29 day of December, 1948.


S. A. HONAKER
Assistant Secretary

DEC 10 1948

PSKKB

The Reclamation Board
State of California
1100 "O" Street
Sacramento, California

Gentlemen:

Levee construction authorized under the Sacramento River Flood Control Project, has recently been completed at three sites described below:

- 18 *Unit No. 18* a. Enlargement of the south levee of the American River from 15th Street Bridge to Mayhews, a distance of approximately nine miles.
- 19 *Unit No. 19* b. Setback and bank protection of the west levee of the Sacramento River from Mile 50.4 to Mile 50.9.
- 20 *Unit No. 20* c. Setback and bank protection of the east levee of the Sacramento River at Mile 35.5 for a distance of approximately 1,800 feet.

Therefore, in accordance with established procedure, these sections of completed levees are hereby transferred to the State of California for maintenance.

This construction forms an integral part of the Sacramento River Flood Control Project. The details and extent of the work are shown on the inclosed drawings.

There is also inclosed copy of Flood Control Regulations prescribed by the Secretary of War (now designated the Secretary of the Army) pursuant to the provisions of Section 3 of the Act of Congress approved 22 June 1936, as amended and supplemented, to govern the maintenance and operation of flood control works, of which the levees referred to are a part. In accordance with paragraph 208.10 (10) of said regulations, this office will furnish your Board and local interests at a later date with an Operation and Maintenance Manual to assist in carrying out their obligations established by these regulations.

For the records of this office, acknowledgment of receipt of this letter is requested on or before 15 January 1949.

Units 18-19-20

PSKKB
The Reclamation Board

DEC 10 1948

Copy of this letter with inclosures is being transmitted to the State Engineer.

FOR AND IN THE ABSENCE OF THE DISTRICT ENGINEER:

Incls.

Drawings, File Nos.
1-4-362 (in 5 sheets)
1-4-366
50-4-1717, 1825, 2209,
2278, 2370, 2371, and
2375
Flood Control Regulations

ELBERT H. DAVIS
Lt. Colonel, Corps of Engineers
Executive Officer

Copy furnished:
State Engineer
(with inclosures)

cc: CdeA
Engineer Div.

Units No 18-19-20
2

DEC 10 1948



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

APR 19 2011

Operations and Readiness Branch

Mr. Jay Punia, Executive Office
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Mr. Punia:

This letter is to transfer the U.S. Army Corps of Engineers (Corps) recently completed portion of work (Mayhew Drain Closure Structure) performed under the authority of the Water Resources Development Act of 1999 (WRDA 99). American River Common Features as authorized by WRDA 99 consists of work including raising the left bank of the non-Federal levee upstream of the Mayhew Drain for a distance of 4,500 feet by an average of 2.5 feet, and installing gates to the existing Mayhew Drain culvert and pumps to prevent backup of floodwater on the Folsom Boulevard side of the gates. The pumps were deleted during the design phase due to high cost, and the required size of pumps only provided a minor reduction in induced flooding upstream of Folsom Boulevard. This turnover letter is for the Mayhew Drain culvert only.

The Mayhew Drain Closure Structure is located on the left bank of the Lower American River at approximately River Mile 11.0. The Closure Structure is located within the existing Mayhew Drain about 300 feet upstream of the confluence with the American River. The Closure Structure is a 111-foot long box culvert with four 8'x10' openings, and four risers containing automated sluice gates. The downstream openings also have flapgates. There is levee fill on top of the concrete riser up to the elevation of the existing west and east levees of the Mayhew Drain. There are also 70-foot long concrete transitions upstream and downstream of the culvert connecting into the existing concrete lined Mayhew Drain.

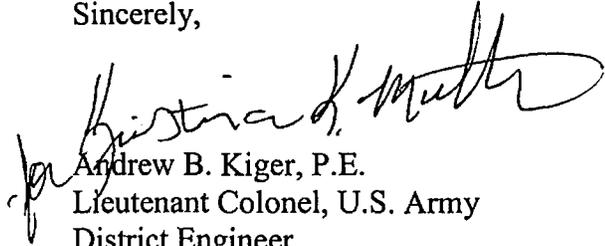
The construction was completed in accordance with American River Common Features WRDA 1999 – Lower American River Mayhew Drain Closure Structure. Specification 1555, Design File Number AM-04-514. Contract Number W91238-07-C-0016. As constructed drawings and the Supplement to the Operation and Maintenance Manual are enclosed. Also, a copy of the "Written Notice of Acceptance of Completed Work" is included as required by the Project Cooperation Agreement (PCA). Both hard-copy and electronic versions (CD) are provided.

This work meets the requirements of the existing Supplement to Standard Operation and Maintenance Manual Sacramento River Flood Control Project Unit No. 118 – Part No. 1 East Levee of Sacramento River from American River to Tower Bridge and South Levee of American River from Mayhew Downstream to Sacramento River; therefore, said flood control work is transferred as of the date of this letter to the State of California for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R). This letter of acceptance into the Federal flood control system should not be construed as an endorsement for inclusion in to the National

Flood Insurance Program as outlined in Title 44 of the Code of Federal Regulations Section 65.10 of the National Flood Insurance Regulations (44 CFR Section 65.10).

If you have any questions regarding this project, please contact the Project Manager, Mr. John Hoge, at (916) 557-5304. If you have any questions regarding this transfer, please contact Mr. Ryan Larson at (916) 557-7568, Flood Protection and Navigation Section. A copy of this letter is being furnished to Mr. Rick Johnson, Sacramento Area Flood Control Agency, 1007 7th Street, Sacramento, CA 95814.

Sincerely,



Andrew B. Kiger, P.E.
Lieutenant Colonel, U.S. Army
District Engineer



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

NOV - 5 2012

Flood Protection and Navigation Section

Mr. Jay Punia, Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Mr. Punia:

This letter is to transfer the U.S. Army Corps of Engineers (Corps) recently completed portions of work for three sites: Site L8, Site L12 and Mayhew Levee Raise performed under the authority of the Water Resources Development Act of 1996 (WRDA 96) and WRDA 99. American River (Common Features) as authorized by WRDA 96 and 99 consists of lower American River levee strengthening of 8.9 miles of the right (north) bank and 10.6 miles of the left (south) bank levees, and 12.1 miles of Sacramento River east levee and berm raising. Previously completed construction left "windows" in the seepage cutoff wall in the vicinity of bridge abutments, deep underground utilities and under low overhead utility lines. Continuity of the cutoff wall has been ensured at three of these windows through completion of additional construction. The construction at each of these three sites is described as follows:

Site L8 is located near River Mile (RM) 07 along the left (south) bank of the American River at the Guy West Bridge, California State University Campus. Project improvements include approximately 302 feet of cement bentonite cutoff wall, 3-feet wide and 50-feet deep and impervious fill. The cutoff wall envelops 6 steel storm drains ranging between 14 and 24 inches diameter and are owned by the City of Sacramento Department of Utilities. Construction was completed in August 2010. The construction was completed in accordance with American River Common Features WRDA 1996 Levee Improvements Phase 2, Contract 1, Site Number L8, Contract Number W91238-10-R-0027, Specification Number 1722, Design File Number 1-04-0556.

Site L12 is located between RM 08 and RM 09 along the left (south) bank of the American River near Glenbrook River Access Park between Howe Avenue and Watt Avenue. The site is adjacent to the Florin-Perkins Pump Station. Project improvements include approximately 214 feet of slag-cement-bentonite cutoff wall, controlled low strength material (CLSM) and impervious fill. The cutoff wall is 3-feet wide and 52-feet deep. The cutoff wall provides closure around three 36-in welded steel stormwater force mains owned by the City of Sacramento. A portion of an abandoned, concrete-filled, 54-inch corrugated metal pipe gravity drain, owned by the City of Sacramento, Department of Utilities, was removed where the cutoff wall was installed. Construction was completed in November 2010. The construction was completed in accordance with American River Common Features Remaining Sites – WRDA 1996 Project Phase 1 Contract B, Site L12, Contract Number W91238-10-C-0034, Specification Number 1710, Design File Number 1-04-0547.

The Mayhew Levee Raise is located between RM 10.7 and 11.5 along the left (south) bank of the American River. The project area extends from the Mayhew Drain closure structure upstream for approximately 4,400 linear feet. To reduce flood risk, a cutoff wall was installed to resist seepage and the crest was raised about three feet and widened. Project improvements include 4,400 feet of raised levee, 4,400-feet of cement bentonite cutoff wall (3-feet wide and 45-feet deep), a French drain, a landside chimney drain and a temporary earthen closure structure. Construction was completed in October 2008, except the temporary earthen closure structure which was constructed in January 2010 by the American River Flood Control District. Mayhew Levee Raise construction was completed in accordance with the American River Watershed Project, Common Features, Left Bank Lower American River, Raise Existing Levee Near Mayhew Drain and Section 101(a)(1) of WRDA 1996 (Public Law 104-303)(110 Stat. 3662-3663) and Section 366 of WRDA 1999 (Public Law 106-53), Contract Number W91238-07-C-0016, Specification Number 1501, Design File Number 1-04-509.

As-built drawings and revisions to the Operation and Maintenance Manual Supplement Unit 118, Part 1 (Manual) are enclosed. Construction drawings for the interim earthen closure structure are included. Also, copies of the "Written Notice of Acceptance of Completed Work" are included as required by the Project Cooperation Agreement (PCA). Both hard-copy and electronic versions (CD) are provided.

This work meets the requirements of the existing Supplement to Standard Operation and Maintenance Manual Sacramento River Flood Control Project Unit No. 118 – Part No. 1 East Levee of Sacramento River from American River to Tower Bridge and South Levee of American River 0.8 Miles Above Mayhew Drain Downstream to Sacramento River; therefore, said flood control work is transferred as of the date of this letter to the State of California for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R).

These construction has been completed in accordance with authority granted under the WRDA 96 and 99. However, the Corps recognizes that additional actions in the vicinity of these three sites may be required to fully comply with current Corps levee safety policy. An American River – Common Features General Reevaluation Report is underway to determine the federal interest in these and other additional actions.

This letter should not be construed as an endorsement for inclusion in to the National Flood Insurance Program as outlined in Title 44 of the Code of Federal Regulations Section 65.10 of the National Flood Insurance Regulations (44 CFR Section 65.10). The State of California or its designee shall prepare an Emergency Action Plan per the Manual, Section 3-03.

If you have any questions regarding this project, please contact the Project Manager, Mr. John Hoge, at (916) 557-5304. If you have any questions regarding this transfer, please contact Mr. Ryan Larson at (916) 557-7568, Flood Protection and Navigation Section. A copy of this letter is being furnished to Mr. Rick Johnson, Sacramento Area Flood Control Agency, 1007 7th Street, 7th Floor, Sacramento, CA 95814.

Sincerely,


For William J. Leady, P.E.
Colonel, U.S. Army
District Commander
LTC, EN
DPY CMDR

Enclosures



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

Flood Protection and Navigation Section

JUL 17 2013

Mr. Jay Punia, Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Mr. Punia:

This letter is to transfer the U.S. Army Corps of Engineers (Corps) completed portions of work for six contracts: Left (South) Bank Levee Strengthening Contract 1, Left (South) Bank Levee Strengthening Contract 2, Right (North) Bank Levee Strengthening Howe Avenue to Watt Avenue, Right (North) Bank Levee Strengthening, Jet Grout Sections Contract 1 and Jet Grout Sections Mod Contract 1 and Levee Strengthening Alternative Methods Contract A performed under the authority of the Water Resources Development Act of 1996 (WRDA 96) and WRDA 99. American River (Common Features) as authorized by WRDA 96 and 99 consists of lower American River levee strengthening of 8.9 miles of the right (north) bank and 10.6 miles of the left (south) bank levees, and 12.1 miles of Sacramento River east levee and berm raising.

These contracts included installation of cutoff walls along reaches of the aforementioned levees and closures of "windows," constructed between 1998 and 2004, approximately. Cutoff wall construction left "windows" in the seepage cutoff wall in the vicinity of bridge abutments, deep underground utilities and under low overhead utility lines. The cutoff wall is continuous along the levee alignment through the execution of the construction contracts described herein along with previously constructed and transferred work. Other design/construction contracts are currently underway and that work will be transferred upon completion.

The six completed construction projects are further described as follows:

Left (South) Bank Levee Strengthening Contract 1: Slurry cutoff wall construction contract. Contract Number DACW05-00-C-0022, Specification Number 9824A, Design File Number 1-04-466.

Left (South) Bank Levee Strengthening Contract 2: Slurry cutoff wall construction contract. Contract Number DACW05-00-C-0023, Specification Number 1140, Design File Number 1-04-477.

Right (North) Bank Levee Strengthening Howe Avenue to Watt Avenue, Contract Number DACW05-98-C-0053, Specification Number 9866, Design File Number 1-04-467.

Right (North) Bank Levee Strengthening, Contract Number DACW05-99-0048, Specification Number 9985, Design File Number AMI-4-793.

Jet Grout Sections Contract 1 and Jet Grout Sections Mod Contract 1, Contract Number DACW05-02-C-0004, Specification Number 1034, Design File Number 1-04-474.

Levee Strengthening Alternative Methods Contract A, Contract Number DACW05-03-C-0005, Specification Number 1294, Design File Number 1-04-488.

Record drawings and revised operation and maintenance (O&M) manuals are enclosed. Both hard-copy and electronic versions (CD) are provided.

This work meets the requirements of the Operation and Maintenance Manual, American River Flood Control Project, American River – Part No. 1 Levee Construction from Carmichael Bluffs Downstream 8.3 Miles and the following three Supplements to the Sacramento River Flood Control Project Operation and Maintenance Manual:

- a. Supplement to Standard Operation and Maintenance Manual, Sacramento River Flood Control Project, Unit No. 118 – Part No. 1 East Levee of Sacramento River from American River to Tower Bridge and South Levee of American River 0.8 Miles Above Mayhew Drain Downstream to Sacramento River
- b. Supplement to Standard Operation and Maintenance Manual, Sacramento River Flood Control Project, Unit No. 118 – Part No. 2 North Levee of the American River East Levee of Natomas Canal Both Levees of Arcade Creek South Levee of Linda Creek and Magpie Creek Diversion Channel
- c. Supplement to Standard Operation and Maintenance Manual, Sacramento River Flood Control Project, Unit No. 124 North Levee of American River from Natomas East Canal to the Sacramento River and East Levee of the Sacramento River from Natomas Cross Canal to American River

Therefore, the above flood control work is transferred as of the date of this letter to the State of California for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R).

This letter should not be construed as an endorsement for inclusion in to the National Flood Insurance Program as outlined in Title 44 of the Code of Federal Regulations Section

65.10 of the National Flood Insurance Regulations (44 CFR Section 65.10). The State of California or its designee shall prepare an Emergency Action Plan per the Manual.

If you have any questions regarding this project, please contact the Project Manager, Mr. John Hoge, at (916) 557-5304. If you have any questions regarding this transfer, please contact Mr. Ryan Larson at (916) 557-7568, Flood Protection and Navigation Section. A copy of this letter is being furnished to Mr. Rick Johnson, Sacramento Area Flood Control Agency, 1007 7th Street, 7th Floor, Sacramento, CA 95814.

Sincerely,


MICHAEL J. FARRELL
COL, EN
Commanding

Enclosures

EXHIBIT G
SUGGESTED SEMI-ANNUAL REPORT FORM

TO: The District Engineer
Sacramento District
Corps of Engineers
1209-8th Street
Sacramento, California

(1 May 19__)
(1 Nov. 19__)

Dear Sir:

The semi-annual report for the period (1 May 19__ to 31 October 19__) (1 November 19__ to 30 April 19__) Sacramento River Flood Control Project Unit No. 118-Part No. 1, the east levee of the Sacramento River from the American River to the Tower Bridge and south levee of the American River from Mayhews downstream to the Sacramento River is as follows:

a. The physical condition of the protective works is indicated by the inspector's report, copies of which are inclosed, and may be summarized as follows:

(Superintendent's summary of conditions)

It is our intention to perform the following maintenance work in order to repair or correct the conditions indicated:

(Outline the anticipated maintenance operations for the following 6 months.)

b. During this report period, major high water periods (water level at 26.0 on the gage at "I" Street and 40.0 on the gage at "H" Street Bridge) occurred on the following dates:

| <u>Dates</u> | <u>Maximum Elevation</u> |
|--------------|--------------------------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Comments on the behavior of the protective works during such high water periods are as follows:

(Superintendent's log of flood observations)

During the high water stages when the water level reached a height of _____, on the gage or excess thereof (dates) _____, it was necessary to organize and carry out flood operations as follows:

(See Maintenance Manual _____.)

c. The inspections have indicated (no) or (the following) encroachments or trespasses upon the project right-of-way.

d. (No) (_____) permits have been issued for (the following) improvements or construction within the project right-of-way.

Executed copies of the permit documents issued are transmitted for your files.

e. The status of maintenance measures, indicated in the previous semi-annual report as being required or as suggested by the representatives of the District Engineer, is as follows:

(Statement of maintenance operations, item by item with percent completion.)

f. The fiscal statement of the Superintendent's operations for the current report period is as follows:

| | <u>Labor</u> | <u>Material</u> | <u>Equipment</u> | <u>Overhead</u> | <u>Total</u> |
|---------------------------------|--------------|-----------------|------------------|-----------------|--------------|
| 1. Inspection | | | | | |
| 2. Maintenance | | | | | |
| 3. Flood fighting operations | | | | | |
| TOTAL | | | | | |

Respectfully submitted,

Superintendent of Works

Exhibit H

Local Cooperation Agreement

AGREEMENT BETWEEN
THE UNITED STATES OF AMERICA
AND
THE STATE OF CALIFORNIA
FOR LOCAL COOPERATION ON THE
SACRAMENTO RIVER BANK PROTECTION PROJECT CALIFORNIA

THIS AGREEMENT entered into this 20th day of April 1984 by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this agreement, and the STATE OF CALIFORNIA, (hereinafter called the "State"), represented by the California State Reclamation Board, WITNESSETH THAT:

WHEREAS, construction of the Sacramento River Flood Control Project, California (hereinafter call the "Project"), was authorized by Congress in the Flood Control Act of 1960, approved 86th Congress, Second Session (Public Law 86-645), as supplemented by the River Basin Monetary Authorization Act of 1974, approved 93rd Congress, Second Session (Public Law 93-251), as supplemented further by Joint Resolution of Congress (Public Law 97-377); and

WHEREAS, the State hereby represents that it has the authority and capability to furnish the non-federal cooperation required by the federal legislation authorizing the Project and by other applicable law.

NOW, THEREFORE, the parties agree as follows:

1. The State agrees that, upon notification that the Government will commence construction of the Sacramento River Bank Protection Project substantially in accordance with federal legislation authorizing such Project, Public Law 86-645 and Public Law 93-251, the State shall, in consideration of the Government commencing construction of such Project, fulfill the requirements of non-federal cooperation specified in such legislation, to wit:

a. Provide, without cost to the Government, all real estate interests necessary for the Project;

b. Hold and save the Government free from damages due to the construction, operation and maintenance of the Project except damages due to the fault or negligence of the Government or its contractors;

c. Operate and maintain the Project, or integral parts thereof, in accordance with regulations prescribed by the Secretary of the Army;

d. Undertake all relocations and alterations of roads, bridges (except railroad bridges), buildings, irrigation facilities, and other utilities which are necessary for the construction and operation of the Project;

f. Comply with Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) that no person shall be excluded from participation in, denied the benefit of, or be subjected to discrimination in connection with the Project on the grounds of race, creed, or national origin;

g. Assure that, in conjunction with acquiring rights-of-way, affected persons will be adequately informed of the benefits, policies, and procedures described in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), and in accordance with Sections 210 and 305 of said Act and implementing regulations, assure that;

(1) Fair and reasonable relocation payments and assistance shall be provided to or for displaced persons, as are required to be provided by a Federal agency under Sections 202, 203 and 204 of the Act;

(2) Relocation assistance programs offering the services described in Section 205 of said Act shall be provided to such displaced persons;

(3) Within a reasonable period of time prior to displacement, decent, safe, and sanitary replacement dwellings will be available to displaced persons in accordance with Section 205(c)(3) of said Act;

(4) In acquiring real property, it will be guided, to the greatest extent practicable under State law, by the land acquisition policies in Section 301 and the provisions of Section 302 of said Act;

h. Assume responsibility and pay damages, if necessary, in the event there is a failure to perform in accordance with the terms of this agreement and any other applicable provisions of Section 221 of Public Law 91-611;

1. Contribute an amount in cash which, when added to the cost of lands, easements, rights-of-way, and utility changes, equals one-third of the cost of each unit of the remedial work, this contribution to be based on the cost of the improvements shown by estimates approved by the Chief of Engineers to have economic superiority over possible alternative measures;

(1) The State shall maintain books, records, documents and other evidence pertaining to costs and expenses incurred in the acquisition of the required real estate interests to the extent and in such detail as will properly reflect all net costs of whatever nature involved therein. The State shall make available at their offices at reasonable times, the accounting records for inspection and audit by an authorized representative of the Division or District Commander.

(2) The Government shall credit the State for its participation upon receipt of properly certified invoices, in quadruplicate, supported by such evidence of payment as may be required by the contracting officer and upon approval of the sufficiency of the real estate interests acquired by the contracting officer.

j. For reaches where local interests prefer bank stabilization to the setbacks recommended by the Chief of Engineers, contribute the costs over and above the costs of setbacks, and provide also the local contribution as indicated above;

2. This Agreement shall apply only to the second phase of work on the Project as described in the supporting engineering documents and shall not revoke, rescind, modify or otherwise alter any prior agreements or assurances on this Project.

3. The State hereby gives the Government a right to enter, at reasonable times and in a reasonable manner, upon land which it owns or controls, for access to the Project for the purpose of inspection, and for the purpose of repairing and maintaining the Project if such inspection shows that the State for any reason is failing to repair and maintain the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the California State Reclamation Board. No repair and maintenance by the Government in such event shall operate to relieve the State of responsibility to meet its obligations as set forth in paragraph 1 of the Agreement, or to preclude the Government from pursuing any other remedy at law or equity.

IN WITNESS WHEREOF, the parties hereto have executed this contract on the day and year first above written.

THE UNITED STATES OF AMERICA

APPROVED:

By

Arthur E. Williams
Colonel, Corps of Engineers
District Engineer
Contracting Officer

FOR THE SECRETARY OF THE ARMY

DATE: 2 May 84

THE STATE OF CALIFORNIA

By:

Robert E. Bush
The Reclamation Board

DATE: April 20, 1984

CERTIFICATE OF APPROVAL

I, the undersigned Attorney General for the State of California, hereby certify that I have reviewed the contract dated the 20th day of April, 1984, between the United States of America and the State of California through the Board of Reclamation and have approved said contract and the provisions contained therein, both as to form and substance, including, but not limited to, those provisions whereby the State of California has agreed to pay damages, if necessary, in the event of failure to perform in accordance with Section 221 of Public Law 91-611.

IN WITNESS WHEREOF, I have made and executed this Certificate
this 17th day of April, 1984.

JOHN K. VAN DE KAMP, Attorney General

By: William D. Cravens
Deputy Attorney General
State of California

CERTIFICATE OF AUTHORITY

I, David B Anderson do hereby certify that I am one of the attorneys for the Reclamation Board, that the Board is a legally constituted public body with full authority and legal capability to perform the terms of the agreement between the United States of America and the Board in connection with the Sacramento River Bank Protection Project, to pay damages, if necessary, in the event of the failure to perform in accordance with Section 221 of Public Law 91-611, that the person who has executed the contract on behalf of the Board has acted within his or her statutory authority, and that the Board has satisfied the legal requirements of Article 13B of the California Constitution and Section 8517.1 of the California Water Code.

IN WITNESS WHEREOF, I have made and executed this Certificate this 17 day of April, 1984.

By: David B Anderson
Attorney for the Reclamation Board

CERTIFICATE OF APPROVAL

I, the undersigned Attorney at Law, as legal counsel for The Reclamation Board which has undertaken to act as local sponsor of the Sacramento River Bank Protection Project, hereby certify that I have reviewed the contract dated the 20th day of April, 1984, between the United States of America and the Board and have approved said contract and the provisions contained therein, both as to form and substance, including, but not limited to, those provisions whereby the Board has agreed to pay damages, if necessary, in the event of failure to perform in accordance with Section 221 of Public Law 91-611.

IN WITNESS WHEREOF, I have made and executed this Certificate this 17 day of April, 1984.

By: David B. Adams
Attorney for the Reclamation Board

DECLARATION OF FINANCIAL ABILITY

I, Raymond Bush, General Manager of the State Reclamation Board, do hereby declare that the Board, under the laws of the State of California, is financially capable of meeting the construction, operation and maintenance costs of the Project and is in compliance with Article 13B of the California Constitution and Section 8617.1 of the California Water Code.

I further declare that the Reclamation Board Activities Program fund will be used for the purpose of construction, operation and maintenance of the Project. There were \$ 1,851,000 allocated to the fund for this fiscal year. As of this day there is a balance of \$ 234,150 on hand in that fund. *There is \$2,150,000 allocated to the fund for fiscal year 1985.*

Dated this 20th day of April, 1984.

By: 
General Manager, State Reclamation Board

Sacramento River Bank Protection Project,
California

DECLARATION OF FINANCIAL ABILITY

I, Raymond Darsch, General Manager of the State Reclamation Board, do hereby declare that the Board, under the laws of the State of California, is financially capable of meeting the construction, operation and maintenance costs of the Project and is in compliance with Article 138 of the California Constitution and Section 8617.1 of the California Water Code.

I further declare that the Reclamation Board Activities Program fund will be used for the purpose of construction, operation and maintenance of the Project. There were \$ 1,831,000 allocated to the fund for this fiscal year. As of this day there is a balance of \$ 234,000 on hand in that fund. There is \$ 2,150,000 allocated to the fund for fiscal year 1985.

Dated this 20th day of April, 1984.

By: 
General Manager, The Reclamation Board

Sacramento River Bank Protection Project,
California



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

03/22/2006

Executive Office

Mr. Dan S. Fua, Acting General Manager
The Reclamation Board
State of California
3310 El Camino Avenue, Room LL40
Sacramento, California 95821

MAR 22 2006

Dear Mr. Fua:

A Local Cooperation Agreement (LCA) for the Sacramento River Bank Protection Project, California was executed between the Department of the Army and the State of California on April 20, 1984. The LCA was executed based on authority provided through the Flood Control Act of 1960 (Public Law 86-645); and, this authority was further supplemented through the River Basin Monetary Authorization Act of 1974 (Public Law 93-251) and a Joint Resolution of Congress (Public Law 97-377).

The enclosed amendment establishes the maximum length of bank erosion repair at 405,000-linear feet in accordance with the referenced project authority. Execution of the enclosed amendment was completed based upon review and approval by the President of the State of California Reclamation Board on March 18, 2006. One complete copy of this amendment has been enclosed for your records.

If you have any questions or concerns with regard to this issue, please feel free to contact the Project Manager, Mr. Stan Wallin, at (916) 557-5225.

Sincerely,

Ronald N. Light
Colonel, U.S. Army
District Engineer

Enclosure

Copy Furnished (w/encl):

Ms. Deborah Condon, State of California, Department of Water Resources, 3310 El Camino Avenue, Room 140, Sacramento, CA, 95821

**AMENDMENT NUMBER 1
TO THE
LOCAL COOPERATION AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE STATE OF CALIFORNIA
ON THE SACRAMENTO RIVER BANK PROTECTION PROJECT**

THIS AMENDMENT is entered into this 12 day of MARCH 2006 by and between the **DEPARTMENT OF THE ARMY** (hereinafter represented by the Assistant Secretary of the Army (Civil Works)), and the **STATE OF CALIFORNIA** (hereinafter the "Non-Federal Sponsor"), represented by the Reclamation Board.

WITNESSETH, THAT:

WHEREAS, the Government and the Non-Federal Sponsor entered into a Local Cooperation Agreement on April 20, 1984 (hereinafter referred to as the "Agreement") for the Sacramento River Bank Protection Project (hereinafter referred to as the "Project");

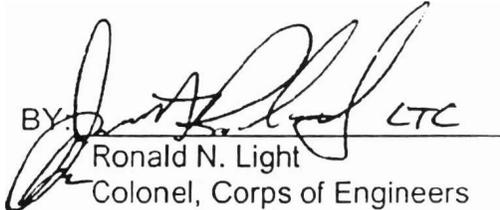
WHEREAS, the original agreement terms failed to reference a number for the lineal feet of river bank authorized by the statute for inclusion in the project,

NOW, THEREFORE, the Government and the Non-Federal Sponsor agree that the Agreement is hereby amended in the following particulars but in no others by adding the following:

4. As the original agreement terms failed to reference a number for the lineal feet of river bank authorized by the statute for inclusion in the project, the agreement is hereby amended to state the authorized project lineal footage is 405,000 linear feet, as established by the Flood Control Act of 1960, approved 86th Congress, Second Session (Public Law 86-645), as supplemented by the River Basin Monetary Authorization Act of 1974, approved 93rd Congress, Second Session (Public Law 93-251), as supplemented further by Joint Resolution of Congress (Public Law 97-377).

IN WITNESS WHEREOF, the parties hereto have executed this amendment to the Agreement, which shall become effective upon the date it is signed by the authorized representative of the Government.

THE DEPARTMENT OF THE ARMY

BY:  LTC
Ronald N. Light
Colonel, Corps of Engineers
Sacramento District

DATE: 26 MARCH 2006

THE STATE OF CALIFORNIA
Represented by the Reclamation Board

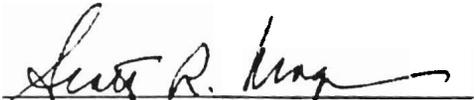
BY: 
Ben Carter
Reclamation Board
President

DATE: 18 MARCH 2006

CERTIFICATE OF AUTHORITY

I, Scott Morgan, do hereby certify that I am the principal legal officer of the State of California, acting by and through its Reclamation Board, a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the State of California, as amended by Amendment Number 1 to the Agreement, in connection with THE SACRAMENTO RIVER BANK PROTECTION PROJECT and to pay damages in accordance with the terms of the amended Agreement, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Agreement on behalf of the City of Oakland, California, the State of California, acting by and through its Reclamation Board, have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification on this 16 day of March 2006.


Attorney for the Reclamation Board

CERTIFICATION REGARDING LOBBYING

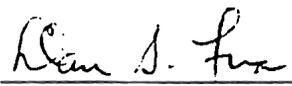
The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

BY: 
Dan Fua
The Reclamation Board
Acting Manager

DATE: MAR 17 2005

CERTIFICATION OF LEGAL REVIEW OF THE
LOCAL COOPERATION AGREEMENT AMENDMENT 1
BETWEEN THE DEPARTMENT OF THE ARMY
AND
THE STATE OF CALIFORNIA DEPARTMENT OF WATER
RESOURCES/THE RECLAMATION BOARD

Amendment 1 for the Sacramento River Bank Protection Project, including associated documents required by both parties for the Local Cooperation Agreement, dated April 20, 1984 including explicating appendices dated September 7, 1988, has been reviewed by the Office of Counsel, Sacramento District and is approved as legally sufficient.

Date 11/16/2000



WILLIAM HENSON
Sr. Assistant District Counsel

**AMENDMENT NUMBER 2
TO THE
AGREEMENT BETWEEN
THE UNITED STATES OF AMERICA
AND
THE STATE OF CALIFORNIA
FOR LOCAL COOPERATION ON THE
SACRAMENTO RIVER BANK PROTECTION PROJECT CALIFORNIA**

THIS AMENDMENT is entered into this 5th day of MAY, 2006, by and between the **UNITED STATES OF AMERICA**, acting by and through the **DEPARTMENT OF THE ARMY** (hereinafter the "Government"), represented by the Assistant Secretary of the Army (Civil Works), and the **STATE OF CALIFORNIA**, acting by and through the California State Reclamation Board (hereinafter the "State"), represented by its President.

WITNESSETH, THAT:

WHEREAS, the Government and the State entered into a Local Cooperation Agreement on April 20, 1984 (hereinafter referred to as the "Agreement") for construction of the second phase of the Sacramento River Bank Protection Project (hereinafter referred to as the "Project");

WHEREAS, the Agreement was subsequently amended on March 26, 2006, to add paragraph 4 to the Agreement in order to state the authorized lineal footage for the second phase of the Project;

WHEREAS, the State proposes to accelerate its provision of funds to the Government in an amount not to exceed the current estimate of the State's required cash contribution for the Project, less any funds previously contributed, for the immediate use by the Government for construction of the Project; and

WHEREAS, the parties agree that such acceptance shall not represent or give rise to an obligation of the United States, including any obligation to provide reimbursement of the funds the State elects to provide or any obligation to request future funds to match the amount the State elects to provide, and that such funds will be credited against the State's future cost share only if additional Federal funds are appropriated.

NOW, THEREFORE, the Government and the State agree that the Agreement, as previously amended, is hereby further amended in the following particulars but in no others by adding the following paragraph:

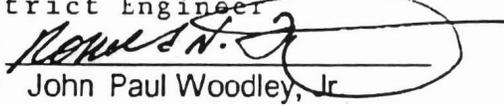
5. In fulfilling the obligations set forth in paragraph 1 of this Agreement, the following conditions and procedures shall apply to a State offer to accelerate its contribution of funds to the Government:

a. The State may offer in writing to accelerate a portion or all of its required cash contribution during the period of construction for immediate use by the Government. This offer shall be limited to an amount that does not exceed the most current estimate of the total of the State's required cash contribution as determined by the Government in coordination with the State, less any funds previously contributed by the State. Upon receipt of such offer or offers, the Government, subject to receiving such approvals and concurrences as customarily are required to accept such funds, may accept the funds, or such portion thereof as the Government determines to be necessary to meet the costs of construction of the Project. If the Government elects to accept such funds, it shall notify the State of such acceptance in a writing that sets forth any applicable terms and conditions. In the event of a conflict between this Agreement and any such writing, this Agreement shall control. Such funds shall be used by the Government for construction of the Project.

b. As Federal appropriations are made available to pay the Federal share of construction of the Project, the Government shall afford credit for funds provided during the period of construction in accordance with paragraph 5.a. of this Agreement. The Government shall credit this amount, provided during the period of construction, toward the State's cash contribution. If after the final accounting at the end of the period of construction, it is determined that the State has provided funds in excess of its required cash contribution, the Government shall proceed to determine whether a refund is applicable. However, if in the event of a final accounting due to termination prior to the end of the period of construction, it is determined that the State has provided funds in excess of its required cash contribution, the Government shall not reimburse the State for any such excess funds, except that any such excess funds which have not been obligated by the Government on the Project shall be refunded to the State, subject to the availability of funds.

IN WITNESS WHEREOF, the parties hereto have executed this amendment to the Agreement, which shall become effective upon the date it is signed by the authorized representative of the Government.

THE UNITED STATES OF AMERICA
acting by and through the
Department of the Army
Ronald N Light, Colonel
District Engineer

BY: 
FOR John Paul Woodley, Jr.
Assistant Secretary of the Army
(Civil Works)

DATE: 5/5/06

THE STATE OF CALIFORNIA,
acting by and through the
California State Reclamation Board

BY: 
Ben Carter
President
California State Reclamation Board

DATE: 5 MAY 2006

CERTIFICATE OF AUTHORITY

I, Scott R. Mowse, do hereby certify that I am the principal legal officer of the California State Reclamation Board, that the State Reclamation Board is a legally constituted public body with full authority and legal capability to perform, on behalf of the State of California, the terms of the Agreement between the United States of America and the State of California, as amended by Amendment Number 2 to the Agreement, in connection with the Sacramento River Bank Protection Project, and to pay damages in accordance with the terms of the amended Agreement, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Agreement on behalf of the State of California, acting by and through its State Reclamation Board, have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification on this 5th day of May, 2006.

Scott R. Mowse
Attorney for the California State Reclamation Board

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

BY: Stephen T. Brodley
for Dan Fua
Acting Manager
California Reclamation Board

DATE: 5-5-06

**AMENDMENT NUMBER 3
TO THE
LOCAL COOPERATION AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE STATE OF CALIFORNIA
ON THE SACRAMENTO RIVER BANK PROTECTION PROJECT
CALIFORNIA**

THIS AMENDMENT is entered into this 20~~th~~ day of JUNE 2006, by and between the DEPARTMENT OF THE ARMY (hereinafter referred to as the "Government"), represented by the U.S. Army Engineer, Sacramento District, and the State of California (hereinafter referred to as the "State"), acting by and through the State Reclamation Board, represented by its President.

WITNESSETH, THAT:

WHEREAS, the Sacramento River Bank Protection project, California (hereinafter referred to as the "Project"), as described in Senate Document No. 103, 86th Congress, 2nd Session, and House Document No. 93-151, 93rd Congress, 1st Session, was authorized by Section 203 of the Flood Control Act of 1960, Public Law 86-645 (74 Stat. 498), as supplemented by Section 202 of the River Basin Monetary Authorization Act of 1974, Public Law 93-251 (88 Stat. 49) and by Public Law 97-377 (96 Stat. 1916);

WHEREAS, the Government and the State entered into a Local Cooperation Agreement (hereinafter referred to as the "Agreement") on April 20, 1984, for construction of the Project;

WHEREAS, the Government and the State entered into Amendment Number 1 to the Agreement on March 26, 2006 to identify the authorized lineal footage for the Project;

WHEREAS, the Government and the State entered into Amendment Number 2 to the Agreement on May 5, 2006 to document the State's proposal to accelerate its provision of funds to the Government;

WHEREAS, Section 215 of the Flood Control Act of 1958, Public Law 90-483, as amended (42 U.S.C. 1962d-5a; hereinafter "Section 215"), provides that the Secretary of the Army may, when he determines it to be in the public interest, enter into agreements providing for credit to States or political subdivisions thereof for the costs of certain work

performed by such non-Federal bodies at authorized water resources development projects;

WHEREAS, the State desires to perform certain work (hereinafter the "Section 215 work") which is a part of the Project and receive credit pursuant to Section 215 for the costs of such work;

WHEREAS, it has been determined that providing the State credit toward the amount of its required contributions for the Project for the costs of the Section 215 work to be accomplished by the State pursuant to this Amendment Number 3 is in the public interest; and

WHEREAS, Section 215 limits the amount of credit that may be provided for a single project to no more than \$5,000,000 or 1 percent of the total project costs, whichever is greater.

NOW, THEREFORE, the Government and the State agree that the Agreement, as previously amended, is hereby further amended in the following particulars but in no others:

1. Paragraph 1.i. of the Agreement is amended by deleting the phrase: " and utility changes," and substituting "utility changes, and the credit to be afforded for the Section 215 work pursuant to paragraph 6.h. of this Agreement,".
2. Paragraph 1.i(1) of the Agreement is amended by adding "and performance of the Section 215 work" after "interests".
3. The Agreement is amended by adding Paragraph 6 at the end thereof:

"6. The State shall perform the Section 215 work, described below, pursuant to Section 215 of the Flood Control Act of 1958, Public Law 90-483, as amended, subject to the conditions and limitations of this paragraph.

a. The State shall construct 3 setback levees, as described below, along the left bank of Cache Creek at three critical erosion sites located at Levee Miles (LM) 0.8, LM1.1 and LM 2.4 in Yolo County northwest of the City of Woodland and north and south of the town of Yolo. The project is described in two environmental documents – *Cache Creek North Levee Setback Project, Critical Erosion Sites 1, and 2* and *Cache Creek North Levee Setback Project, Critical Erosion Site 3*.

(1) Site 1 at LM 0.8 – A new levee will be constructed approximately 700 feet in length, and would be placed between 100 and 50 feet from the existing levee. Approximately 3,900 cubic yards of material would be needed for construction. Drawing no. S3-1, S3-2, S3-3, S3-4 and S3-5 provide design details.

(2) Site 2 at LM 1.1 – A new levee will be constructed approximately 825 feet in length, and would be placed between 100 and 50 feet from the existing levee. Approximately 4,500 cubic yards of material would be needed for construction. Drawing no. S4-1, S4-4, and S4-5 provide design details.

(3) Site 3 at LM 2.4 – A new levee will be constructed approximately 890 feet in length, and would be placed approximately between 100 and 50 feet from the existing levee. Approximately 7,200 cubic yards of material would be needed for construction. Drawing no. S5-1, S4-2, S5-3, and S5-4 provide design details.

The base of all three new levees will be between 40 and 50 feet wide. The new levees will tie into the existing levee that would be left in place; notches would be cut into the existing levee at each site to provide for drainage of areas between the existing and new setback levees. Construction of the setback levees will take approximately 3 months.

b. Manner of Performing the Section 215 Work. The Section 215 work includes the preparation of the design memorandum, engineering plans, geology reports, and the environmental review. The U.S. Army Corps of Engineer District, Sacramento, environmental planning staff will participate in the environmental review to insure compliance with Federal environmental law. In addition, the State will provide funding to the U.S. Army Corps of Engineer District, Sacramento, to review all designs, plans and specifications, and to perform construction quality assurance.

c. Review of Designs, Detailed Plans and Specifications. No construction of Section 215 work shall commence under this Agreement until the designs, detailed plans and specifications, and arrangements for prosecution of the work have been approved by the U.S. Army Engineer, Sacramento District (hereinafter the "District Engineer"). Proposed changes in approved designs, plans, and specifications also must be reviewed and approved by the District Engineer in advance of the related construction.

d. Prosecution of Work by Contract. In the event the State prosecutes the Section 215 work described herein by contract, all bids received and the proposed provisions of any contract shall be subject to review by the Government prior to contract award. Any such contract shall contain all of the applicable provisions required by Federal laws and regulations, including, but not necessarily limited to, applicable labor and equal opportunity provisions.

e. **Environmental Requirements.** No construction of Section 215 work shall commence under this Agreement until all applicable environmental laws and regulations have been complied with, including, but not limited to the National Environmental Policy Act of 1969 (42 U.S.C. 4321–4347) and Section 401 of the Federal Water Pollution Control Act (33 U.S.C. 1341).

f. **Expiration of Period to Commence Section 215 Work.** In order for the Section 215 work to be eligible for credit pursuant to this paragraph the Section 215 work must be commenced within one year of the effective date of Amendment Number 3 to this Agreement.

g. **Determination of Costs of Section 215 Work.** The Government shall determine the costs incurred by the State for Section 215 work, subject to the conditions and limitations of this paragraph. The State in a timely manner shall provide the Government with such documents as are sufficient to enable the Government to determine the amount of costs for Section 215 work.

(1) Section 215 work shall be subject to an on-site inspection and determination by the Government that the work was accomplished in a satisfactory manner and is suitable for inclusion in the Project.

(2) The amount of the State's costs for Section 215 work shall be subject to an audit to determine the reasonableness, allocability and allowability of such costs.

(3) The costs of any Section 215 work undertaken by the State prior to the effective date of Amendment Number 3 to this Agreement shall not be included in the costs considered for credit pursuant to this Agreement.

(4) The State's costs for Section 215 work are not subject to interest charges, nor are they subject to adjustment to reflect changes in price levels between the time the Section 215 work is completed and the time the credit for such costs is afforded.

(5) In the performance of the Section 215 work, the State must comply with applicable Federal labor laws covering non-Federal construction, including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*) and the Copeland Anti- Kickback Act (formerly 40 U.S.C. 276c)). Costs for the Section 215 work may not be included in the costs considered for credit by the Government, in whole or in part, as a result of the State's failure to comply with its obligations under these laws.

(6) For purposes of affording of credit for Section 215 work under paragraph 6.h. of this Agreement, the costs of the Section 215 work shall not include the costs of the lands, easements, rights-of-way, and utility changes that are associated with the Section 215 work.

h. Affording of Credit for Section 215 Work. The Government, in accordance with this paragraph, shall afford credit toward the State's contribution of funds required under paragraph 1.i. of this Agreement for the costs of the Section 215 work determined in accordance with paragraph 6.g. of this Agreement.

(1) The amount of credit to be afforded by the Government shall not exceed the Government's estimate of what the cost of the Section 215 work would be if were to be accomplished by the Government as a component of the Project, or the State's actual auditable costs for the section 215 work, whichever is less. As of the effective date of Amendment Number 3 to this Agreement, the Government's estimate of the Section 215 work is \$1,892,460.00.

(2) The credit for the Section 215 work shall be applied solely against the State's required cost-share contributions for future bank protection work under the Project.

(3) Notwithstanding any other provision of this Agreement, the amount of credit afforded by the Government for the Section 215 work, in combination with any credit provided pursuant to any other Section 215 agreements executed for the Project, shall not exceed the statutory limitation of \$5,000,000 or 1 percent of total project costs, whichever is greater. For the purposes of this Agreement, the term "total project costs" shall be understood to mean the sum of Federal and non-Federal first costs upon conclusion of the project construction actually and finally undertaken.

i. This Agreement shall not be construed as either committing the Government to assume any responsibility placed upon the State or any other non-Federal entity by the conditions of project authorization or any other applicable statute or regulation, or as committing the Government to reimburse the State if the remaining work on the Project is not undertaken or is modified so as to make the Section 215 work performed by the State no longer an integral part of the Project."

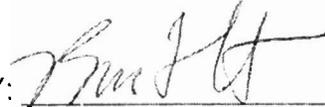
4. All other terms and conditions of the Agreement, as previously amended, remain unchanged.

IN WITNESS WHEREOF, the parties hereto have executed this Amendment Number 3 which shall become effective upon the date it is signed by the Assistant Secretary of the Army (Civil Works).

THE DEPARTMENT OF THE ARMY

THE STATE OF CALIFORNIA
The Reclamation Board

BY:  LTC/EN
for Ronald N. Light
Colonel, Corps of Engineers
District Engineer

BY: 
Benjamin F. Carter
President
The Reclamation Board

DATE: 20 JUN 06

DATE: 20 JUNE 2006

CERTIFICATE OF AUTHORITY

I, Scott R. Morgan do hereby certify that I am the principal legal officer of the California State Reclamation Board, that the State Reclamation Board is a legally constituted public body with full authority and legal capability to perform, on behalf of the State of California, the terms of the Agreement between the United States of America and the State of California, as amended by Amendment Number 3 to the Agreement, in connection with the Sacramento River Bank Protection Project, and to pay damages in accordance with the terms of the amended Agreement, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Agreement on behalf of the State of California, acting by and through its State Reclamation Board, have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification on this
16 day of June 2006

Scott R. Morgan
Scott Morgan, Counsel
The Reclamation Board

CERTIFICATION REGARDING LOBBYING

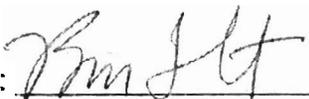
The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

BY: 
Benjamin F. Carter
President
The Reclamation Board

DATE: 20 JUNE 2006

Exhibit I
Biological Opinion

This is an excerpt from USFWS BO June 23, 2008 Reference #81420-2008-F-0805-1, and NOAA Fisheries BO July 2, 2008 Reference #2007/07158 and applies to work performed at Lower American River RM 0.3L, 2.8L

Operations and Maintenance:

Once repairs are complete, a project site may require limited maintenance. During the initial establishment period, maintenance activities are anticipated to be required for 3 to 5 years, and include removing invasive vegetation detrimental to project success, pruning and watering planted vegetation to promote optimal growth, replacing plantings, monitoring navigational hazards, and placing fill and rock revetment if the site is damaged during high flow events or by vandalism. Once established, the riparian vegetation should be self-maintaining. Annual maintenance at each site will be limited to placement of no more than 600 cubic yards of material, which corresponds to a disturbance length of less than 300 feet; should more material be required in any year, the operating and maintaining agency (i.e., Central Valley Flood Protection Board) will obtain the necessary permits from the regulatory agencies. The Corps will be responsible for ensuring that conservation measures and environmental standards are stipulated in permits and all required documentation is maintained. Similarly, if outside alterations of a project site are proposed by other agencies or private entities, the Corps will work with the NMFS to ensure that environmental features at the project sites are maintained or that off-site compensation is implemented to make up for any deficits.

Any needed in-water maintenance work will be conducted during time periods that minimize adverse effects on listed fish species. Unless approved otherwise by the NMFS, in-water maintenance will be conducted between July 1 and November 30 of each year for sites above RM 60 and between August 1 and November 30 for sites below RM 60. Any maintenance not requiring in-water work may be conducted year-round.

Effects of Project Operation and Maintenance:

O&M activities are expected to occur between July 1 and November 30 for the life of the project (i.e., 50 years) to maintain the flood control and environmental values of the site. Anticipated O&M actions include vegetation management and irrigation for up to three years, periodic rock placement to prevent or repair localized scouring, and periodic replacement or modification of IWM structures. Effects would be limited to the annual placement of up to 600 cubic yards of material at each site. Impacts from O&M actions generally will be similar to the impacts of initial construction, except that they will be smaller and localized. Effects may include injury or death to salmon and steelhead from predation cause by turbidity changes that temporarily disrupt normal behaviors, and affect sheltering abilities. However, since O&M actions are only expected to repair damaged elements of the project, they are expected to be infrequent (i.e., occurring only once every several years), small (i.e., only affecting small sections of the project area), and will not occur at all sites. Therefore, relatively few fish should be affected by O&M actions, and actual injury and mortality levels will be low relative to overall population abundance and not likely to cause any long-term, negative population responses. Any O&M actions that affect habitat conditions will incorporate BMPs, summer in-water construction windows, and other minimization and avoidance measures to reduce the potential for effects to anadromous salmonids, green sturgeon, and their habitat.

Exhibit J

MAYHEW CLOSURE STRUCTURE MANUALS

MAYHEW DRAIN CLOSURE STRUCTURE SACRAMENTO COUNTY, CA

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**MAYHEW DRAIN CLOSURE STRUCTURE
SACRAMENTO COUNTY, CA**

**SECTION 35 20 17
SLUICE – FLAP GATES**

**OPERATION, MAINTENANCE,
AND INSTALLATION MANUAL**

**CONTRACTOR:
FCI CONSTRUCTORS, INC.
2100 GOODYEAR ROAD
BENICIA, CA 94510
PHONE: (707) 742-8000
FAX: (707) 746-0949**

**MANUFACTURER:
GOLDEN HARVEST, INC.
PO BOX 287
BURLINGTON, WA 98233
360-757-4334
FAX: 360-757-1135
ghi@goldenharvestinc.com**

GHI NO: 07-0764

SEPTEMBER / 2008

INTRODUCTION

Golden Harvest, Inc., Golden Gates™ has developed a complete line of aluminum and stainless steel gates for distribution worldwide. These products, based on extensive experience in all types of environments, are the results of intensive research, computer, lab, field testing and analysis.

Golden Harvest, Inc.'s, Golden Gate's, Operation and Maintenance Manual, was created, to give information to all personnel, (engineers, contractors, operators, and installers) who will be affected with the operating, maintaining and installing of this equipment.

Every precaution is taken at the factory to insure that superior quality equipment is shipped. However, we cannot be accountable for damage caused by vandalism or negligence after shipping or improper installation of the equipment. Therefore, the information in this manual is Golden Harvest, Inc., Golden Gates™ recommended procedures for handling, storage, installation, adjustment, and initial operation for the related equipment and operating mechanisms to be used in conjunction with the approved installation drawings furnished by Golden Harvest, Inc. If appropriate care and accuracy are observed in the field when installing Golden Harvest, Inc., Golden Gates™, they will operate as designed at optimum efficiency.

WARRANTY

LIMITED WARRANTY

Golden Harvest, Inc., warrants its gates against defects in material and workmanship for one full year from date of acceptance by owner and such warranty can only be enforced by the original purchaser. During the warranty period, the gates will be repaired or replaced at **GOLDEN HARVEST, INC.'S** option and at no cost to the purchaser. Measure of damage is the original purchase price of the defective material only. Any claim for defects in material and/or workmanship shall be in writing and within ten (10) days of the inspected defect. No charges for labor or expense required to remove or replace defective material or for any consequential damages will be allowed.

AUTHORIZED SERVICE

For service and/or warranty repair, please contact:

Golden Harvest, Inc
PO Box 287
Burlington, WA 98233

Phone: (360) 757-4334
Fax: (360) 757-1135

Please reference the Golden Harvest Job # 07-0764 in all correspondence regarding this job

RECEIVING SHIPMENT

All individually shipped parts, assemblies, and equipment are listed on a packing list. These should be inspected and counted immediately upon arrival. Should a deficiency occur notify Golden Harvest, Inc. immediately. We cannot be responsible for any shortages reported more than 30 days after receipt of shipment. Special attention should be taken in counting and safely storing all bolts, nuts, and other small items which are often misplaced or lost at job sites.

Unless your contract with Golden Harvest, Inc. states otherwise, all parts and equipment are shipped F.O.B. factory. Therefore, any equipment or parts that have been damaged in transit, become the purchaser's responsibility for filing claims with the transportation company. For help in filing any claim and/or replacing equipment, please contact Golden Harvest, Inc. 1-800-338-6238.

STORAGE AND HANDLING

All Golden Harvest, Inc., Golden Gates'™ equipment and parts are durably constructed. However, there are precision machined seats and surfaces which require special attention when handling, storing, and installing. Although all equipment and parts are of sturdy design, it is possible to warp frames, heads, stems, and other parts and equipment.

To avoid these problems we recommend the following:

DO NOT DISASSEMBLE FOR STORAGE OR INSTALLATION.

1. Always brace, taking precautions not to harm the stem threads.
 2. Warehouse equipment on a flat, clean, dry surface to prevent distortion.
 3. Do not stack equipment without proper bracing and covering.
 4. Handle all equipment and parts like you would any other precision machinery.
-

INSTALLATION OF ANCHOR BOLTS

Golden Harvest, Inc. furnishes type 304-316 stainless steel anchor studs as required for the project. Adhesive is the responsibility of the contractor. Golden Harvest Inc.'s anchor bolt design calculations are based on the Ramset Epcon series adhesive.

EPCON™ A7 SERIES

GENERAL INFORMATION



Product

Epcon A7 Series is a chemical anchor system based on acrylic mortar. The two parts are dispensed and mixed in one action through a static mixing nozzle, which allows accurate mixing with no mess.



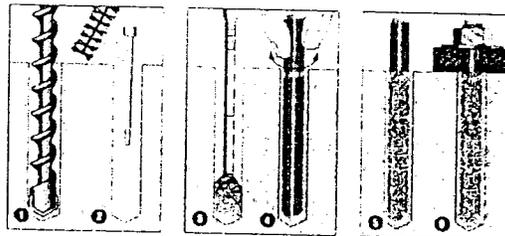
Features

- High strength in shallow embedment.
- Close to edge, stress free anchoring.
- Close anchor spacing.
- No prewarming of cartridge required in cold environments.
- Suitable for use with zinc plated, hot dipped galvanised or stainless steel Chemset Anchor Studs.
- Resistant to cyclic loading and vibration.
- High strength with grade 5.8 steel Chemset Anchor Studs.

Principal Applications

- Structural beams and columns.
- Bottom plate and batten fixing.
- Installing signs, handrails, balustrades and gates.
- Racking.
- Safety barriers.
- Stadium seating.
- Machinery and heavy plant hold down.

Installation



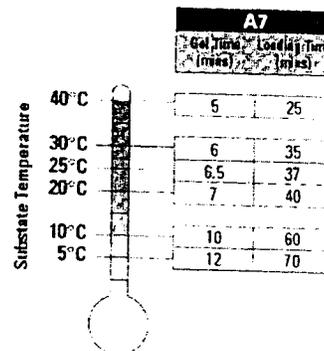
1. Drill recommended diameter and depth hole.
2. Clean hole with hole cleaning brush. Remove all debris using hole blower. Hole must be dry.
3. Insert mixing nozzle to bottom of hole. Fill hole to 3/4 the hole depth slowly, ensuring no air pockets form.
4. Insert Ramset Chemset Anchor Stud/rebar to bottom of hole while turning.
5. Epcon A7 to cure as per setting times.
6. Attach fixture.

Installation temperature limits:

- Substrate: -20°C to 40°C
- Mortar: 0°C to 40°C.

Load should not be applied to anchor until the chemical has sufficiently cured as specified.

Approximate Setting Times





7 Epcon™ A7 Series

Installation and Working Load Limit performance details:
Epcon™ A7 Series and Chemset™ Anchor Studs

| Anchor Size | Minimum Embedment (mm) | | Minimum Spacing (mm) | | | | Minimum Edge Distance (mm) | | | | |
|-------------|------------------------|------------|----------------------|------------|----------|------------|----------------------------|------------|----------|------------|------|
| | Vertical | Horizontal | Vertical | Horizontal | Vertical | Horizontal | Vertical | Horizontal | Vertical | Horizontal | |
| M8 | 10 | 10 | 80 | 10 | 30 | 50 | 100 | 5.3 | 6.5 | 6.5 | 6.5 |
| M10 | 12 | 12 | 90 | 20 | 40 | 60 | 120 | 7.1 | 7.7 | 8.9 | 9.5 |
| M12 | 14 | 15 | 110 | 40 | 50 | 70 | 140 | 10.5 | 11.3 | 12.9 | 13.9 |
| M16 | 18 | 19 | 125 | 95 | 65 | 100 | 160 | 19.9 | 15.3 | 17.6 | 18.8 |
| M20 | 24 | 24 | 150 | 180 | 80 | 120 | 190 | 30.0 | 22.0 | 25.3 | 27.1 |
| | | | 170 | | | | 220 | 30.0 | 26.6 | 30.6 | 32.7 |
| M24 | 36 | 26 | 160 | 315 | 95 | 145 | 200 | 43.4 | 26.1 | 30.0 | 32.1 |
| | | | 210 | | | | 270 | 43.4 | 39.2 | 45.1 | 48.3 |

* Note: For shear loads acting towards an edge or where these minimum dimensions are not achievable, please use the simplified strength limit state design process to verify capacity.

7.2

DESCRIPTION AND PART NUMBERS

| Part Description | Capacity (kN) | Part Number |
|------------------|---------------|-------------|
| A7-28 Cartridge | 825 ml | A7-28 |
| A7-28 Nozzles | - | A50 |
| A7-8 Cartridge | 235 ml | A7-8 |
| A7-8 Nozzles | - | A24 |

Effective depth, h (mm)

Preferred $h = h_n$ otherwise,

$$h = L_e - t$$

$$h \geq 6 \cdot d_h$$

t = total thickness of material(s) being fastened.

7.3

ENGINEERING PROPERTIES

Refer to "Engineering Properties" for Chemset Anchor Studs on page 7.

ADJUSTMENT OF GATES WITH P-SEALS

ADJUSTING:

Check the clearance between the seal and the head following installation with a .002 feeler gauge. Gauge should not pass at any point around the seal perimeter.

SPECIAL INSTALLATION NOTE:

Any dual operated or wide (60" or over) weir or slide gate 'P' seals are to be adjusted after installation of gate to wall.

TO ADJUST P-SEAL:

1. Loosen P-Seal retainer bolts.
2. Force P-Seal retainer and P-Seal against head.
3. Tighten P-Seal retainer bolts.

REPLACEMENT OF P-SEALS:

To replace worn or damaged P-Seal's

1. Remove P-Seal retainer bolts.
2. Remove P-Seal retainer and P-Seal.
3. Place new P-Seal on spigot.
4. Place P-Seal retainer over P-seal tail.
5. Replace P-Seal retainer bolts.
6. Force P-Seal retainer and P-Seal against gate head and tighten P-Seal retainer bolts.

PROCEDURE FOR INSTALLING WALL THIMBLES

1. The front face is marked on the vertical centerline of all Golden Gate's thimbles.
2. Bracing "when necessary for handling" is installed on Golden Harvest, Inc. thimbles.
3. Wall thimbles should be set with the top mark up and top and bottom centerline marks plumb.
4. After being set at the proper elevation, the wall thimble must be internally braced to carry the weight of the concrete. Care should be used in placement of the braces so as not to distort the wall thimble. Gate attaching holes and hardware will not be in alignment if the wall thimble is distorted. The "shipping" bracing may be removed so as to not interfere with the "installation bracing".
5. The wall thimble should be firmly supported on the form. Forms should be supported and stiffened against movement. If forms move they will distort the wall thimble mounting flange, and the sluice gate will leak.
6. Unless otherwise shown or noted the gate mounting flange should be flush with the wall.
7. After the concrete has hardened and the forms removed, the front surface of the wall thimble should be thoroughly cleaned. Make sure to remove any concrete that has flowed onto the surface from the edges.

INSTALLATION OF FABRICATED SLUICE GATES TO CONCRETE WALL

NOTE FIRST:

The most critical aspect for ensuring a proper sluice gate installation: Be sure sluice gate frames are installed plumb and straight. Failure to do so will impair smooth operation and cause excessive leakage.

ATTACH TO WALL

1. Secure all anchor bolts in the proper position on the concrete wall, (using frame rail for template). For proper size, projection and anchor type see installation drawings. Wedge or epoxy type anchors are normally provided. For installing anchor bolts, see section, "Installation of Anchor Bolts", for manufacturer's recommended installation procedure.
2. Two nuts are provided per bolt. Place one nut on bolt allowing for approximately 1" of grout (or as shown on the drawings) between gate frame and concrete wall. Place the gate frame into position on the anchor bolts. Install second nut on each anchor bolt. Align the gate frame by adjusting the front and back nuts. Be sure that both frame rails are parallel and plumb, as an improperly aligned or warped gate frame will cause excessive leakage and impair smooth operation of the gate.
3. After guide frame is mounted plumb and straight and nuts are tightened, fill the void between gate frame and concrete wall with a non-shrink grout.

MOUNTING SLUICE GATES

INSTALLATION ON WALL THIMBLES:

1. The face of the wall thimble and the mounting flange of the sluice gate should be thoroughly cleaned.
2. Wall thimble studs should be in place.
3. A rubber gasket is provided and is placed between the surface of the thimble and the mounting flange of the sluice gate. Two beads of Bostik 1000 urethane sealant should be placed on both sides of the gasket.
4. The gate can now be lifted and set over the studs and nuts put in place and tightened.
5. Trim off any exposed gasket.

UPPER GATE FRAME ANCHOR BOLTS:

Anchor bolts are required to support the upper frame members. These anchor bolts are provided with double nuts so that upper gate frame members can be clamped in position.

ADJUSTMENT OF SLUICE GATES

ADJUSTING STAINLESS STEEL SLUICE GATES

WEDGE BAR BOLTS

1. Make sure gate head is in fully closed position.
2. Loosen lock nuts on all adjusting bolts.
3. Turn each bolt until it just contacts pressure bar.
4. Tighten each bolt exactly one half (1/2) turn. Set lock nuts.

TOP WEDGES

1. Adjust wedge pads until they contact mating surfaces on gate head.
2. Tighten each nut one full turn.

If, after both tightening procedures are completed, gate leakage exceeds specified allowable rate: Repeat procedure increasing turns on each wedge bar bolt by 50%, and the wedge by 25%.

INSTALLATION OF PEDESTAL AND OPERATOR ON OPERATING FLOOR

IMPORTANT: After assembling stem be sure to screw bottom stop nut onto stem.

1. Place a nut on each anchor bolt and run down to operating floor.
2. Lower pedestal over stem and onto anchor bolts to approximately one inch from floor.
3. Carefully lower the lift unit over the upper threaded portion of stem engaging the threads of the lift unit and stem.
4. Turn the crank or handwheel to lower the lift onto the base of pedestal, align operator and pedestal mounting holes. Use bolts and nuts provided to secure lift to pedestal platform.
5. Using the leveling nuts under the base of the pedestal for adjustment, align center line of lift nut until it is parallel with the center line of the stem. Tighten top nuts on anchor bolts and grout void under pedestal.

INSTALLATION OF ELECTRIC LIFTS

NOTE: During wiring installation, should it become necessary to leave the unit for a period of time, close and tighten switch compartment and any open conduit taps so that electrical components are not left exposed to the elements.

1. Install the electrical operator the same as the manual operator described in section, "Installation of Pedestal and Operator on Operating Floor".
IMPORTANT: Alignment of operator and stem is imperative. (Reexamine all segments, stem, stem guides, brackets, pedestal, operator, etc.)
2. Operate the unit by handwheel ONLY when initially setting the limit switches. Before using the electrical controls, manually open the gate a minimum of 4 inches. Carefully check for correct motor rotation direction. If the motor is driving the gate in the wrong direction, interchange any two leads on three phase motors or switch the armature leads on D.C. and single phase motors.
3. Use protective plastic stem cover. Check gate stem travel and clearance before mounting cover on rising stem.
4. Replace all molded plastic conduit and top protectors (installed for shipping purposes only) with pipe plugs when installation wiring is complete.
5. Set up periodic operating schedule for infrequently used gates.
6. Keep the gate stem clean and lubricated.
7. Do not force the declutch lever into motor operation. LEVER WILL AUTOMATICALLY RETURN TO MOTOR OPERATION WHEN MOTOR IS ENERGIZED.
8. Do not force the declutch lever into hand operation. If the clutch does not easily engage, rotate handwheel slowly while operating the declutch lever.

CAUTION: Shut off incoming power before opening switch compartment.

MOUNTING WALL BRACKETS AND STEM GUIDES

1. Place anchor bolts for wall brackets and stem guides as shown on installation drawings.
 2. Check for proper alignment of wall brackets, stem guides, and gate.
 3. Place wall brackets and stem guide brackets on anchor bolts and tighten nuts. Top surface of brackets must be aligned perpendicular with stem and stem must be near the center of stem slot.
 4. Install stem guide bushings on stem guide brackets with the stainless steel bolts provided. If a base plate stem guide is required be sure to insert it between wall bracket and pedestal base.
-

INSTALLATION OF STEMS

Installing stems

1. When required, stems are shipped with thrust nuts and stem couplings attached.
2. After gate has been mounted, lower proper stem section through the stem guide on top of gate yoke.
3. When a thrust nut is used, place it in the stem pocket. Thread or place the stem into the thrust nut until the stem is flush with bottom of nut. Tighten set screws or place bolts thru holes in stem block and stem. When an aluminum or stainless steel stem pocket is used instead of a thrust nut, place stem in pocket and place bolts thru the angles and stem and attach nuts.
4. If stems are in more than one piece, stems must be installed in their proper order from bottom to top. The end of each stem section and stem coupler are match marked to insure correct installation.

INSTALLATION OF STOP NUTS

IMPORTANT: If bottom stop nut is required it must be ran down on the stem prior to mounting operator.

1. After lift installation and gate is in the fully closed position and wedges adjusted (if required), run stop nut down on the top of the projecting stem until firm contact is made with the top of the lift nut. Mark stem with set screw, back stop nut off and drill stem 1/8" deep. Reposition collar and tighten stop nut set screw.
 2. With gate in full open position place bottom stop nut (if required) against the upward stop. Mark stem with set screw and drill as described above.
-

INSTALLATION OF STEM COVERS

IMPORTANT: Clear plastic stem covers have drilled vent holes make sure this end is up.

1. When clear plastic stem covers are used care must be taken not to scratch or break cover. Covers are marked to match gate. Check to make sure cover is approximately 6" longer than gate height.
 2. A threaded PVC adaptor is provided. Sealant (Bostik 1000 provided) should be used on threads. Screw adaptor into receiver on top of lift housing. Place a bead of sealant (Bostik 1000 provided) into the receiving end of the adaptor. Be sure stem cover is plum. Place a bead of sealant (Bostik 1000 provided) in the top cap and install on the top end of stem cover.
-

ATTACHING MYLAR INDICATORS TO CLEAR PLASTIC STEM COVERS

After lift and stem cover has been properly installed, the gate adjusted for proper seating, and the stop nuts are set and locked, the calibrated indicator must be installed.

1. Clean plastic stem cover.
2. Graduated, self-adhesive mylar tape is provided to indicate gate position.
3. Indicate on plastic stem cover where top of stem comes when gate is in closed position.
4. Remove protective coating from the mylar tape and smoothly apply to plastic stem cover.

SLUICE GATE INSTALLATION CHECK LIST AND INITIAL OPERATING INSTRUCTIONS

1. Make sure all foreign material is removed from seating surfaces of the sluice gate.
2. Check to make sure that stem guides and brackets are securely fastened.
3. Clean and lubricate stem.
4. Adjust stop nut to within 1/16" of the top of lift nut and lock in place.
5. Install stem cover if required.
6. The sluice gate should be operated to the fully opened and fully closed position slowly to check for any misalignment or problems in operation.
7. If operation becomes difficult. **EXCESSIVE FORCE SHOULD NOT BE APPLIED** to crank or hand wheel. Check **SLUICE GATE TROUBLE SHOOTING SECTION** for remedy.

FLAP GATE INSTALLATION CHECK LIST AND INITIAL OPERATING INSTRUCTIONS

AFTER INSTALLING FLAP GATE AND BEFORE INITIAL OPERATION CHECK THE FOLLOWING:

1. Check guide frame for proper alignment.
2. Clean the gate slide, guides, seals and invert of all foreign material.
3. If P-seals, are used, clean contact area and adjust seal.
4. Install stem cover if required.
5. If gate does not operate smoothly or shows excess leakage, see FLAP GATE TROUBLE SHOOTING SECTION for remedy.

FLAP GATE TROUBLE SHOOTING

| <u>PROBLEM</u> | <u>REASON</u> | <u>SOLUTION</u> |
|--------------------------|------------------------------------|--|
| HARD TO OPERATE | Warped or distorted guides | Loosen anchor bolt nuts, shim gate to true plane. Place non-shrink grout between guide and wall |
| LEAKAGE – SIDES | Guides warped or distorted | Loosen anchor bolt nuts, shim gate to true plane, place non-shrink grout between guides and wall |
| LEAKAGE – BOTTON OF GATE | Foreign material on or around seal | Remove foreign material |

FLAP GATE MAINTENANCE

No maintenance other than periodic cleaning and operation of the flap gates is required. (Gates should be operated every three months.

STAINLESS STEEL SLUICE GATE TROUBLE SHOOTING

| <u>PROBLEM</u> | <u>REASON</u> | <u>SOLUTION</u> |
|--------------------------|--|--|
| HARD TO OPERATE | Warped or distorted guides | Loosen anchor bolt nuts, shim gate to true plane. Place non-shrink grout between guides and wall. |
| | Foreign material in guide grooves | Remove foreign material from guide grooves. |
| | Dry or dirty stem threads | Clean threads and grease with recommended lubricant. |
| | Gates with dual stems: Head operating unevenly | Disconnect couplings on interconnecting shaft. Rotate hoist until gate head is level. Reconnect couplings. |
| LEAKAGE – GENERAL | Wedge bar bolts/top wedge loose | See "Adjusting Sluice Gates" |
| LEAKAGE – SIDES | Guides warped or distorted | Loosen anchor bolts nuts, shim gate to true plane, place non-shrink grout between guides and wall. |
| | Foreign material wedged between head and guide | Remove foreign material from guides. |
| LEAKAGE – BOTTOM OF GATE | Foreign material on or around seal | Remove foreign material. |
| LEAKAGE – TOP OF GATE | Over tightening operator in closed position | Limit operator, force to 40 lbs of pull. Make sure stop nut is properly installed. |
| BOWING STEM | Loosen stem guides | Tighten stem guide anchor bolts and stem guide bushing bolts. |
| | Stem guides not installed per installation drawings. | Install stem guides per drawings. |
| | Excessive operator output | Limit input to crank or hand wheel to 40 lbs. |

LUBRICATION

OPERATORS:

At least twice a year all grease fittings on manual operators should be lubricated with a small amount of heavy duty grease. (See lubrication chart).

OPERATING STEM:

To insure proper operation and life of operating stems and lift nuts, it is very **IMPORTANT THAT OPERATING STEMS ARE CLEANED AND GREASED EVERY SIX MONTHS**. To help keep stem and lift nuts clean, the use of stem covers are recommended. (For recommended grease see lubrication chart).

LUBRICATION CHART

OPERATORS:

Mobilgrease Special*

Lubriplate #630-AA*

Chevron R.M.P. Heavy Duty Grease EPNLGI2*

Unocal Megaplex XD-2*

STEMS:

Lubriplate #630-2*

Shell Alvania 2-EP*

Mobilox 2-EP*

Valvoline Val-Lith 2-EP*

Chevron Ultra Duty Grease EP-2*

Unocal Unoba EP-2*

*If food grade grease is required use high quality food grade grease intended for use in potable water

OPERATOR SAFETY

Golden Harvest Inc. does not have specific instructions beyond basic plant safety practices for its products.

SPARE PARTS LIST

Golden Harvest Inc. doesn't have any "high wear" parts on this equipment, therefore, no spare parts are recommended.

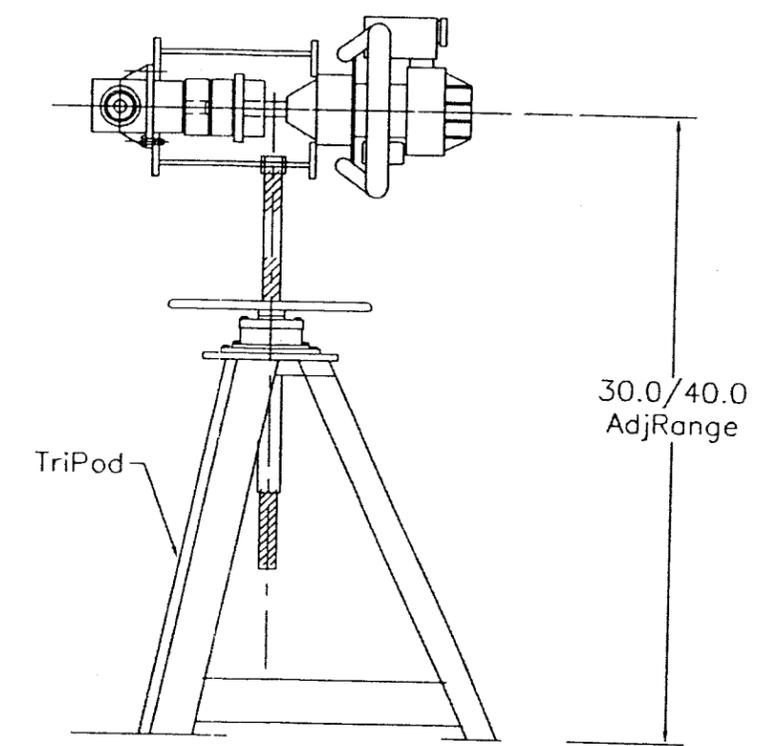
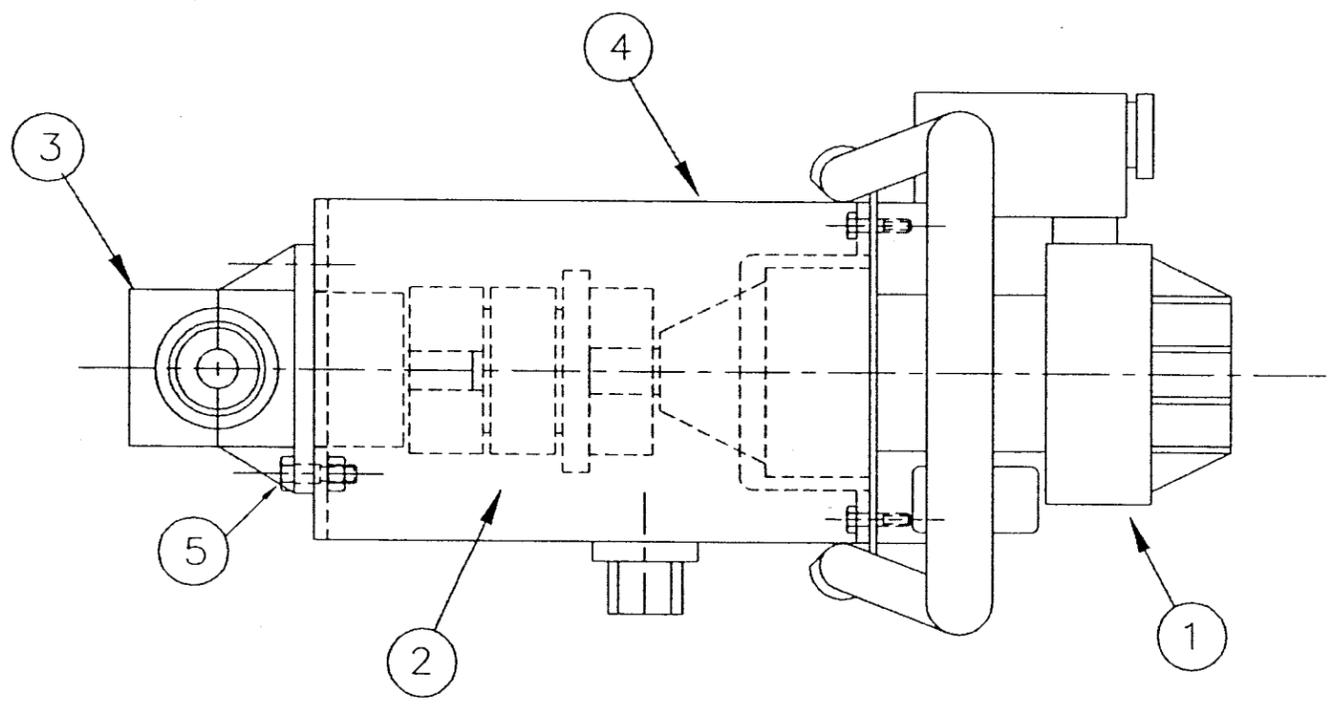
PARTS LIST

The parts list for each gate is located on the corresponding drawing.

SPECIAL TOOLS

No special tools are required to install or maintain Golden Harvest gates.

| BILL OF MATERIAL | | | |
|------------------|-----|-----------------------|-----------|
| ITEM | QTY | DESCRIPTION | MATERIAL |
| 1 | 1 | Gas Powered Driver | E 43 |
| 2 | 1 | Torque Limit Clutch | R & W |
| 3 | 1 | Rt Angle Gear Box | Model 175 |
| 4 | 1 | Support Housing | ALUM 5052 |
| 5 | 4 | 1/4x1.25 SSTL HXHDBLT | COML |
| | | | |
| | | | |
| | 1 | Tripod | Alum/Sstl |



(1) REQUIRED

| | | | | |
|---|--|--------|-----------------|-----------------|
| GOLDEN HARVEST GOLDEN GATES P.O. BOX 287 1-800-338-6238 Burlington, WA 98233 | | | Date Drawn: | 02-19-08 |
| | | | Revision: | |
| PORTABLE GAS OPERATOR | | | Revision: | |
| | | | Revision: | |
| | | | G.H. Drawing #: | 3 |
| Drawn By: | | Scale: | Job No.: | Contract Sht #: |
| MK | | NTS | 07-0764 | |



Golden Harvest, Inc

Golden Gates™

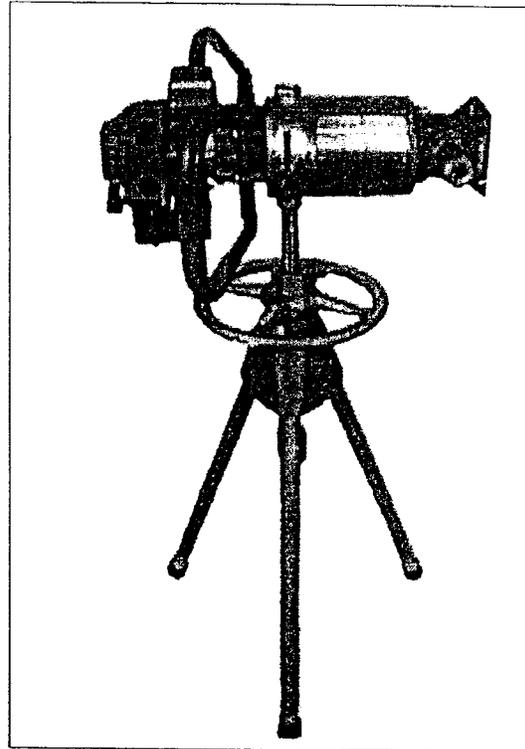
GH-1100 GASOLINE POWERED PORTABLE VALVE ACTUATOR

GOLDEN HARVEST, INC. GH-1100 "UNIVERSAL" GASOLINE POWERED PORTABLE VALVE ACTUATOR

Introducing the Golden Harvest, Inc. "Universal" Portable Valve Actuator driven by a powerful gasoline engine. The Universal actuator is designed to rotate input shafts on a variety of valve types including butterfly, gate plug, ball, sluice and slide, regardless of brand. By simply rotating the unit 180 degrees, a clockwise or counterclockwise output can be generated, allowing either opening or closing functions.

The Universal GH-1100 actuator can include a "64 spline to 3/4 square" coupler for interchanging between the two output shafts. Adapters can be included for use with almost any input, including 2" square, half round, or a variety of square shaft sizes.

The GH-1100 actuator is available with an optional all aluminum tripod cart for ease of operation. The unit may also be used with an optional single leg steadyrest or be hand held.



MODEL GH-1100 GASOLINE POWERED PORTABLE ACTUATOR

TYPICAL SPECIFICATION

A portable, two-cycle, gasoline engine actuator shall be furnished with all the necessary adaptors to drive the gates and valves specified.

Maximum output torque shall be less than 80 foot pounds. Drive unit shall incorporate a direct drive design only. (Belt and chain drive mechanisms are unacceptable.) The unit shall drive the operators using a (T-drive) gear box. Reverse operation is achieved by rotating the drive unit 180 degrees. A safety clutch must be supplied with any unit that exceeds 80 foot pounds of output torque. The entire unit shall weigh less than 40 pounds. The actuator shall be Model GH-1100 as manufactured by Golden Harvest, Inc. or an approved equal.

INSTRUCTIONS FOR THE OPERATION AND MAINTENANCE OF MODEL GH-100 GAS POWERED OPERATOR

READ PRIOR TO OPERATING

OPERATION:

The gasoline powered portable operator is designed to rotate the stem shaft of slide gates or sluice gates.

The portable operator is capable of rotating the stem CW or CCW.

This is accomplished by utilizing the proper operator output.

The operator will include a spline to 2"sq drive adapter or a spline to ¾" sq coupler and an extension shaft with a 2"sq nut driver.

The adapters may be used at either operator drive location.

WARNING

Do not carry the operator while the engine is running.

- a. Use the butterfly handles only for carrying the operator.
- b. Use of the Tri-pod stand or peg-leg will reduce the risk of manpower fatigue.
- c. Continual clutch slippage will cause over heating of the clutch shoes and reduce its ability to transfer torque.
- d. For extremely cold weather operation; store the operator in a cool dry place when not in use. The transfer of the operator from a warm location to a cold location can form harmful condensation.

MAINTENANCE:

1. Read the engine operating manual and follow the instructions for type of fuel, starting technique and general operation.
2. The engine should be operated for two hours or more before it is "broken in" for the best results. All units are tested at the factory but are not operated for the full break-in period.
3. Clutch slippage may occur during its break-in. The clutch unit should be kept free of oil or other moisture for efficient operation.
4. The output shaft and coupler should not rotate when the engine is idling. The coupler or shaft should begin to rotate when the engine RPM is brought up.
5. The red gear case has 4oz. of grease inserted at the factory. Check twice yearly and add only when needed, DO NOT overfill.

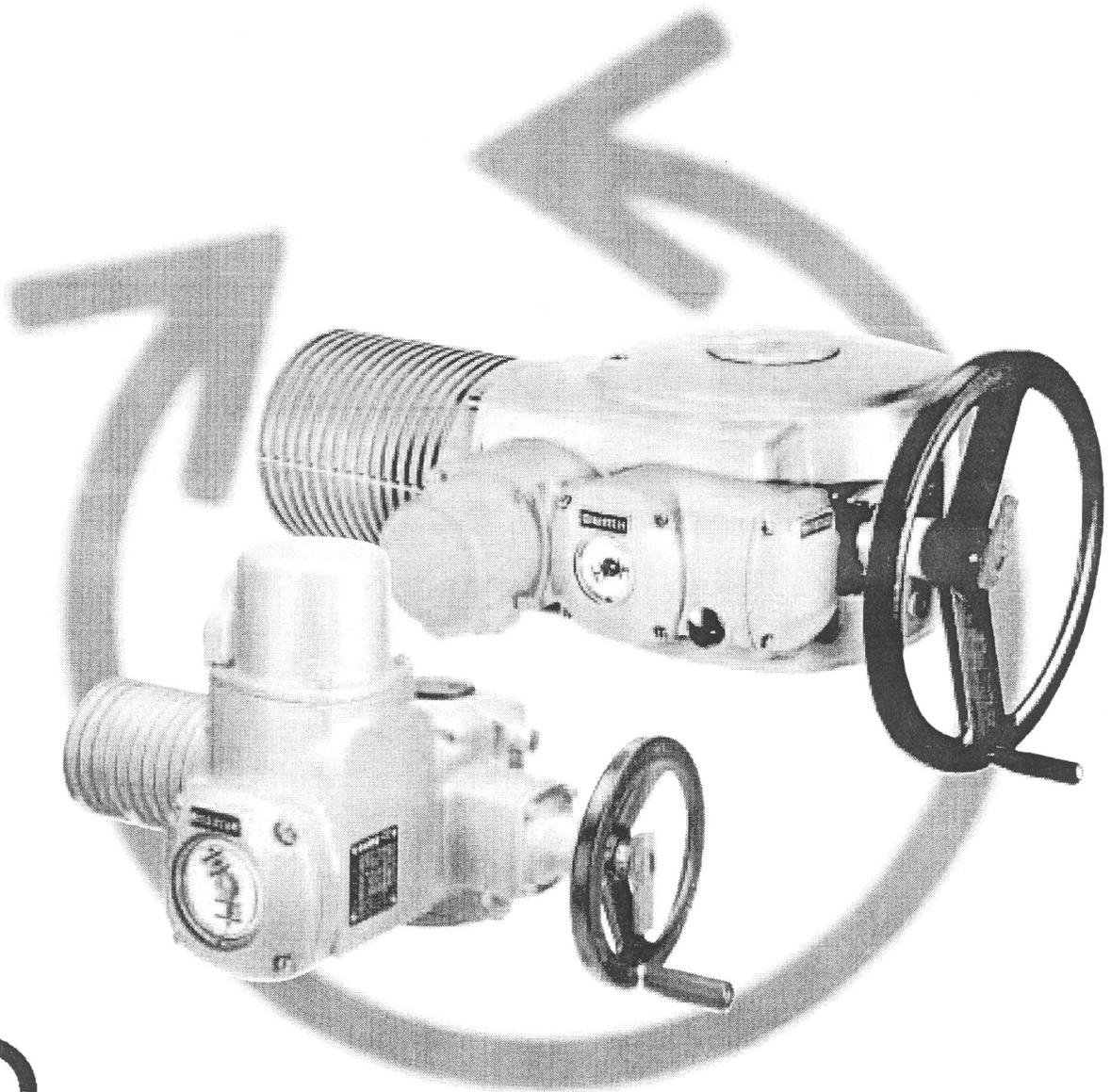
WARRANTY:

The gas engine is warranted by the engine manufacturer in a separate warranty, for a period of two years. All parts of this operator assembly are warranted for 90 days.

auma®

Electric multi-turn actuators

SA 07.1 – SA 48.1
SAR 07.1 – SAR 30.1
AUMA NORM
for flanges type FA



AUMA Actuators, Inc.
Registered to ISO 9001
Certificate No. A4682

Operation instructions

Scope of these instructions: These instructions are valid for multi-turn actuators of the type range SA 07.1 – SA 48.1 and SAR 07.1 – SAR 30.1 in version AUMA NORM. These operation instructions are only valid for “clockwise closing”, i.e. driven shaft turns clockwise to close the valve.

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1. Safety instructions

- 1.1 Range of application** AUMA actuators are designed for the operation of industrial valves, e.g. globe valves, gate valves, butterfly valves and ball valves. For other applications, please consult us. The manufacturer is not liable for any possible damage resulting from use in other than the designated applications. Such risk lies entirely with the user.
Observance of these operation instructions is considered as part of the actuator's designated use.
- 1.2 Commissioning (electrical connection)** During electrical operation, certain parts inevitably carry lethal voltages. Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.
- 1.3 Maintenance** The maintenance instructions (refer to page 25) must be observed, otherwise a safe operation of the actuator is no longer guaranteed.
- 1.4 Warnings and notes** Non-observance of the warnings and notes may lead to serious injuries or damage. Qualified personnel must be thoroughly familiar with all warnings and notes in these operation instructions.
Correct transport, proper storage, mounting, and installation, as well as careful commissioning are essential to ensure a trouble-free and safe operation.
During operation, the multi-turn actuator warms up and surface temperatures > 140 °F may occur. Check the surface temperature prior to contact in order to avoid burns.
The following references draw special attention to safety-relevant procedures in these operation instructions. Each is marked by the appropriate pictograph.



This pictograph means: Note!

“Note” marks activities or procedures which have major influence on the correct operation. Non-observance of these notes may lead to consequential damage.



This pictograph means: Electrostatically endangered parts!

If this pictograph is attached to a printed circuit board, it contains parts which may be damaged or destroyed by electrostatic discharges. If the boards need to be touched during setting, measurement, or for exchange, it must be assured that immediately before a discharge through contact with an earthed metallic surface (e.g. the housing) has taken place.



This pictograph means: Warning!

“Warning” marks activities or procedures which, if not carried out correctly, can affect the safety of persons or material.

2. Short description

AUMA multi-turn actuators type SA 07.1 – SA 48.1 and SAR 07.1 – SAR 30.1 have a modular design. The limitation of travel is realized via limit switches in both end positions. Torque seating is also possible in both end positions. The type of seating is determined by the valve manufacturer.

3. Technical data

Table 1: Multi-turn actuator SA 07.1 – SA 48.1 / SAR 07.1 – SAR 30.1

| | |
|---|---|
| Multi-turn actuators AUMA NORM require electric controls. AUMA offers the controls AUMA MATIC AM or AUMATIC AC for the sizes SA(R) 07.1 - SA(R) 16.1. These can also easily be mounted to the actuator at a later date. | |
| Features and functions | |
| Type of duty ¹⁾ | Standard: SA Short time duty S2 - 15 min SAR Intermittent duty S4 - 25 % Option: SA Short time duty S2 - 30 min SAR Intermittent duty S4 - 50 % Intermittent duty S5 - 25 % |
| Motors | Standard: 3-ph AC asynchronous motor, type IM B9 according to IEC 34 Options: 1-ph AC motor, type IM B14 according to IEC 34 DC shunt motor, type IM B14 according to IEC 34 DC compound motor, type IM B14 according to IEC 34 Special motors |
| Insulation class | Standard: F, tropicalized Option: H, tropicalized |
| Motor protection | Standard: Thermostats (NC) Option: PTC thermistors (according to DIN 44082) |
| Supply voltage | Refer to motor nameplate |
| Self-locking | yes; for output speeds from 4,8 to 108 rpm and from size SA 35.1 for output speeds from 4,8 to 26 rpm |
| Limit switching | Counter gear mechanism for end positions CLOSED and OPEN for 1 to 500 turns per stroke (optional for 1 to 5,000 turns per stroke) Standard: Tandem switch (2 NC and 2 NO) for each end position; switches galvanically isolated Options: Single switch (1 NC and 1 NO) for each end position Triple switch (3 NC and 3 NO) for each end position, switches galvanically isolated Intermediate position switch (DUO limit switching) |
| Torque switching | adjustable torque switching for direction OPEN and CLOSE Standard: Single switch (1 NC and 1 NO) for each direction Options: Tandem switch (2 NC and 2 NO) for each direction, switches galvanically isolated |
| Non-intrusive setting (option) | Magnetic limit and torque transmitter MWG for the sizes SA 07.1 – SA 48.1 (only possible in combination with actuator controls AUMATIC) for 1 to 500 turns per stroke or for 10 to 5,000 turns per stroke |
| Position feedback signal, analogue (options) | Potentiometer or 0/4 – 20 mA For further details see separate data sheet |
| Torque feedback signal, analogue (option) | Only in combination with magnetic limit and torque transmitter MWG and actuator controls AUMATIC |
| Mechanical position indicator (option) | Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED |
| Running indication (option) | Blinker transmitter |
| Heater in switch compartment | Standard: self-regulating PTC heater, 5 – 20 W, 110 – 250 V DC/AC Options: 24 – 48 V DC/AC or 380 – 400 V AC A resistance type heater (5 W, 24 V DC) is installed in the actuator in combination with the actuator controls AUMA MATIC or AUMATIC. |
| Motor heater (option) | SA(R) 07.1 – 10.1: 12.5 W SA(R) 14.1 – 16.1: 25 W SA(R) 25.1 – 30.1: 50 W SA 35.1 – 48.1: 50 W |
| Manual operation | Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation. Option: Handwheel lockable |
| Electrical connections | Standard: SA(R) 07.1 – 16.1: AUMA plug/socket connector with screw type connection, SA(R) 25.1 – 48.1: Control connections on AUMA plug/socket connector, motor connection via terminals Option: for special motors: Motor connection directly via terminal board at the motor |
| Threads for cable glands | Standard: NPT-threads Options: Pg-threads, G-threads |
| Terminal plan | Terminal plan according to commission number included in delivery |
| 1) Based on 68 °F ambient temperature and at an average load with running torque according to Technical data SA(R). | |

| Service conditions | |
|---|--|
| Output drive types | A, B1, B2, B3, B4 according ISO 5210 (A, B2, B4 according to MSS SP-102) A, B, D, E according to DIN 3210 C according to DIN 3338 Special output drives: AF, AK, AG, IB1, IB3 |
| Enclosure protection according to EN 60 529 ²⁾ | Standard: IP 67 Options: IP 68 IP 67-DS (Double Sealed) IP 68-DS (Double Sealed) (Double Sealed = additional protection of the interior of the housing against ingress of dust and dirt when removing the plug) |
| Corrosion protection | Standard: KN Suitable for installation in industrial units, in water or power plants with a low pollutant concentration Options: KS Suitable for installation in occasionally or permanently aggressive atmosphere with a moderate pollutant concentration (e.g. in wastewater treatment plants, chemical industry) KX Suitable for installation in extremely aggressive atmosphere with high humidity and high pollutant concentration KX-G Same as KX, however aluminium-free version (outer parts) |
| Finish coating | Standard: Two part acrylic polyurethane |
| Color | Standard: Dark grey (DB 702, similar to RAL 9007) Option: Other colours are possible on request |
| Ambient temperature ³⁾ | Standard: SA – 20 to + 80 °C/ – 20 to + 175 °F SAR – 25 to + 60 °C/ – 20 to + 140 °F Options: SA – 40 to + 60 °C/ – 40 to + 140 °F (low temperature) – 50 to + 60 °C/ – 58 to + 140 °F (extreme low temperature) – 60 to + 60 °C/ – 75 to + 140 °F (extreme low temperature) – 0 to + 120 °C/ + 32 to + 250 °F (high temperature) SAR – 40 to + 60 °C/ – 40 to + 140 °F (low temperature) |
| Vibration resistance according to IEC 60068-2-6 | 2 g, for 10 to 200 Hz (only for sizes SA(R) 07.1 – SA(R) 16.1 without controls) Resistant to vibrations during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Valid for multi-turn actuators in version AUMA NORM (with AUMA plug/socket connector, without actuator controls). Not valid in combination with gearboxes |
| Lifetime ⁴⁾ | SA 07.1 – SA 10.1 20,000 operating cycles (OPEN - CLOSE - OPEN) with 30 turns per stroke SA 14.1 – SA 16.1 15,000 operating cycles SA 25.1 – SA 30.1 10,000 operating cycles SA 35.1 – SA 48.1 5,000 operating cycles SAR 07.1 – SAR 10.1 ⁴⁾ 5 million starts SAR 14.1 – SAR 16.1 ⁴⁾ 3.5 million starts SAR 25.1 – SAR 30.1 ⁴⁾ 2.5 million starts |
| Other information | |
| Reference documents | Product description “Electric multi-turn actuators SA” Dimension sheets SA(R) Electrical data sheets SA/SAR Technical data sheets SA/SAR |
| <p>2) For 3-phase asynchronous motors in enclosure protection IP 68, higher corrosion protection KS or KX is strongly recommended. Additionally, for enclosure protection IP 68, we recommend to use the double sealed terminal compartment DS. For 1-phase AC motors, DC motors, or special motors, the enclosure protection according to the name plate applies.</p> <p>3) Versions with RWG up to max. to + 158 °F</p> <p>4) The lifetime depends on the load and the number of starts. A high starting frequency will rarely improve the modulating accuracy. To reach the longest possible maintenance and fault-free operation time, the number of starts per hour chosen should be as low as permissible for the process.</p> | |

4. Transport, storage and packaging

4.1 Transport

- For transport to place of installation, use sturdy packaging.
- Do not attach ropes or hooks to the handwheel for the purpose of lifting by hoist.
- If multi-turn actuator is mounted on valve, attach ropes or hooks for the purpose of lifting by hoist to valve and not to multi-turn actuator.

Fitting the handwheel:

For transport purposes, handwheels from a diameter of 400 mm (1 inch corresponds to 25.4 mm) are supplied separately.



Engage manual operation prior to mounting the handwheel! If the manual operation is not engaged, damages can occur at the change-over mechanism.

- Engage manual operation (figure A-1):
Manually lift the red change-over lever while slightly turning the shaft back and forth until manual operation engages. The manual operation is correctly engaged if the change-over lever can be lifted by approx. 85°.



Manual force is sufficient for operating the change-over lever. It is not necessary to use an extension. Excessive force may damage the change-over mechanism.

- Install the hand wheel over the red change-over lever on to the shaft (figure A-2).
- Secure handwheel using the snapping supplied.

Figure A-1

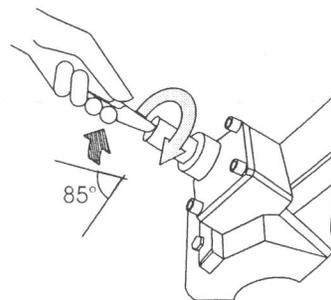
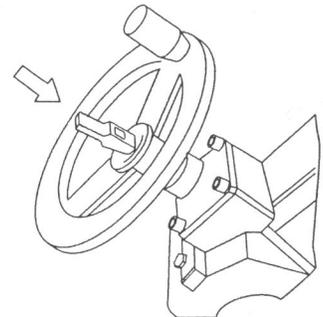


Figure A-2



4.2 Storage

- Store in well-ventilated, dry room.
- Protect against floor dampness by storage on a shelf or on a wooden pallet.
- Cover to protect against dust and dirt.
- Apply suitable corrosion protection agent to uncoated surfaces.

If multi-turn actuators are to be stored for a long time (more than 6 months), in addition, the following points must imperatively be observed :

- Prior to storage: Protect uncoated surfaces, in particular the output drive parts and mounting surface, with long-term corrosion protection agent.
- Check for corrosion approximately every 6 months. If first signs of corrosion show, apply new corrosion protection.



After mounting, connect actuator immediately to electrical system, so that the heater prevents condensation.

4.3 Packaging

Our products are protected by special packaging for the transport ex works. The packaging consists of environmentally friendly materials which can easily be separated and recycled.

We use the following packaging materials: wood, cardboard, paper and Polyurethane foam. For the disposal of the packaging material, we recommend recycling and collection centers.

5. Mounting to valve/gearbox



- Prior to mounting the multi-turn actuator must be checked for damage. Damaged parts must be replaced by original spare parts.
- After mounting, check multi-turn actuator for damage to paint finish. If damage to paint-finish has occurred after mounting, it has to be touched up to avoid corrosion.

Mounting is most easily done with the valve shaft/gearbox shaft pointing vertically upward. But mounting is also possible in any other position. The multi-turn actuator leaves the factory in position CLOSED (limit switch CLOSED tripped).

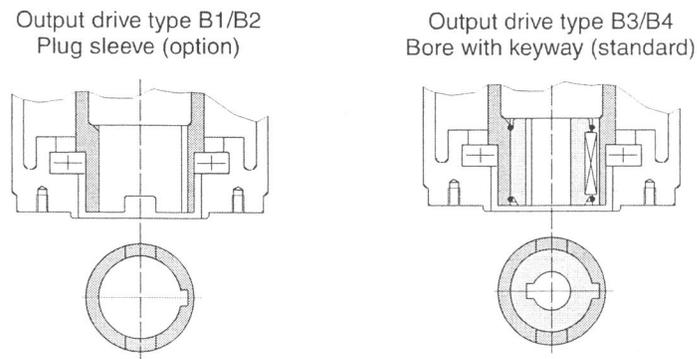
- Check if mounting flange fits the valve/gearbox.



Spigot at flanges should be loose fit!

The output drive types B1, B2, B3 or B4 (figure A-3) are delivered with bore and keyway (usually according to ISO 5210) and are sometimes shipped with bore and keyway according to customer request.

Figure A-3



For output drive type A (figure B-1), the internal thread of the stem nut must match the thread of the valve stem. If not ordered explicitly with thread, the stem nut is unbored or with pilot bore when delivered. For finish machining of stem nut refer to next page.

- Check whether bore and keyway match the input shaft of valve/gearbox.
- Thoroughly degrease mounting faces at multi-turn actuator and valve/gearbox.
- Apply a small quantity of grease to input shaft of valve/gearbox.
- Place actuator on valve/gearbox and fasten. Fasten bolts (quality grade 5, refer to table 2) evenly crosswise.

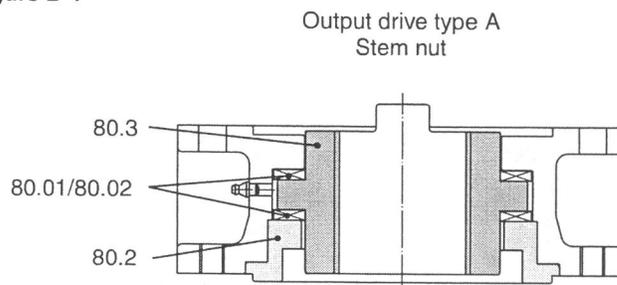
Table 2: Standard dry fastening torques for bolts

| UNC threads | T _A (ft lbs) |
|-------------|-------------------------|
| 5/16 - 18 | 19 |
| 3/8 - 16 | 33 |
| 1/2 - 13 | 78 |
| 5/8 - 11 | 155 |
| 3/4 - 10 | 255 |
| 1 - 8 | 590 |
| 1 1/4 - 7 | 1,200 |

Conversion factor: 1 Nm corresponds to 1.3529 ft lbs.

Finish machining of stem nut (output drive type A):

Figure B-1



The output drive flange does not have to be removed from the actuator.

- Remove spigot ring (80.2, figure B-1) from mounting flange.
- Take off stem nut (80.3) together with thrust bearing (80.01) and thrust bearing races (80.02).
- Remove thrust bearing and thrust bearing races from stem nut.
- Drill and bore stem nut and cut thread.
When fixing in the chuck, make sure stem nut runs true!
- Clean the machined stem nut.
- Apply Lithium soap EP multi-purpose grease to thrust bearing and races, then place them on stem nut.
- Re-insert stem nut with thrust bearings into the mounting flange. Ensure that dogs are placed correctly in the slots of the hollow shaft.
- Screw in spigot ring until it is firm against the shoulder.
- Press Lithium soap EP multi-purpose grease on mineral oil base into the grease nipple with a grease gun (for quantities, refer to table below):

Table 3: Grease quantities for lubricating bearings

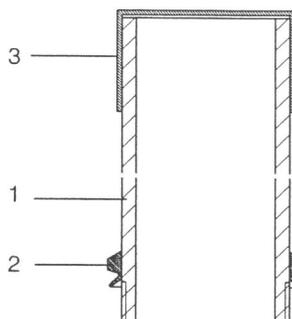
| Output drive | A 07.2 | A 10.2 | A 14.2 | A 16.2 | A 25.2 | A 30.2 | A 35.2 | A 40.2 | A 48.2 |
|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Qty ¹⁾ in g | 1.5 g | 2 g | 3 g | 5 g | 10 g | 14 g | 20 g | 25 g | 30 g |

1) For grease with a density $\rho = 900 \text{ g/dm}^3$; conversion factor: 1 oz corresponds to 28.35 g

Protection tube for rising valve stem

- Protection tubes may be supplied loose. Seal thread with hemp, Teflon tape, or thread sealing material.
- Screw protection tube (1) into thread (figure B-2) and tighten it firmly.
- Push down the sealing (2) to the housing.
- Check whether cap (3) is available and without damage.

Figure B-2: Protection tube for rising valve stem



6. Manual operation

The actuator may be operated manually for purposes of setting and commissioning, and in case of motor failure or power failure. Manual operation is engaged by an internal change-over mechanism.

- Engaging manual operation:**
- Lift up change-over lever in the center of the handwheel to approx. 85°, while slightly turning the handwheel back and forth until manual operation engages (figure C).

Figure C

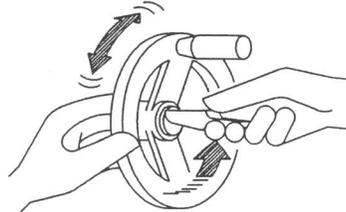


Figure D



Manual force is sufficient for operating the change-over lever. It is not necessary to use an extension. Excessive force may damage the change-over mechanism.

- Release change-over lever (should snap back into initial position by spring action, figure D), if necessary, push it back manually.



Operating the change-over lever while the motor is running (figure E) can lead to increased wear at the change-over mechanism.

Figure E

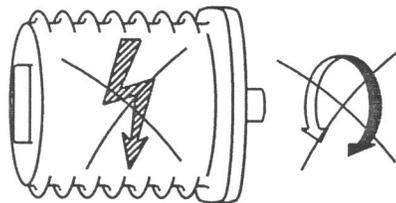
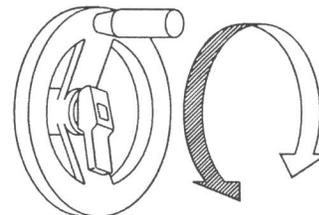


Figure F



- Turn handwheel in desired direction (figure F).

Disengaging manual operation:

Manual operation is automatically disengaged when the motor is started again. The handwheel does not rotate during motor operation.

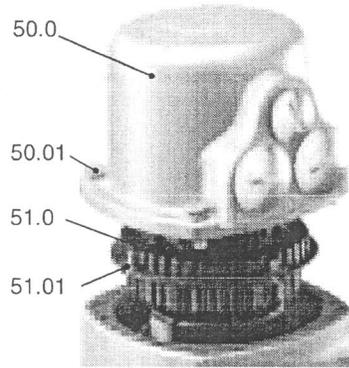
7. Electrical connection



Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

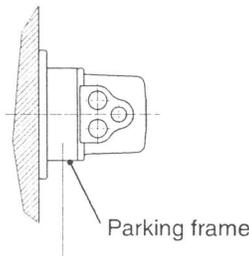
7.1 Connection with AUMA plug/socket connector

Figure G-1: Connection



- Check whether type of current, supply voltage, and frequency correspond to motor data (refer to name plate at motor).
- Loosen bolts (50.01) (figure G-1) and remove plug cover.
- Loosen screws (51.01) and remove socket carrier (51.0) from plug cover (50.0).
- Insert cable glands or conduit fittings suitable for connecting cables. (The enclosure protection stated on the name plate is only ensured if properly sealed connections are made).
- Seal cable entries which are not used with sealed threaded plugs.
- Connect cables according to order-related terminal plan.
- The terminal plan applicable to the actuator is placed inside the terminal compartment, the operation instructions are attached to the handwheel in a weather-proof bag.

Figure G-2: Parking frame (accessory)



A special parking frame (figure G-2) for protection against touching the bare contacts and against environmental influences is available.

Table 4: Technical data AUMA plug/socket connectors

| Technical data | Power terminals ¹⁾ | Protective earth | Control pins |
|-------------------------------|-------------------------------|----------------------------|---|
| No. of contacts max. | 6 (3 are used) | 1 (leading contact) | 50 pins/sockets |
| Marking | U1, V1, W1, U2, V2, W2 | according to VDE | 1 to 50 |
| Voltage max. | 750 V | – | 250 V |
| Nominal current max. | 25 A | – | 16 A |
| Type of customer connection | Screws | Screw for ring lug | Screws |
| Cross section max. | 6 mm ² (10 AWG) | 6 mm ² (10 AWG) | 2.5 mm ² (12 AWG) |
| Material: Pin/ socket carrier | Polyamide | Polyamide | Polyamide |
| Contacts | Brass (Ms) | Brass (Ms) | Brass, tin plated or gold plated (option) |

1) Suitable for copper wires. For aluminium wires it is necessary to contact AUMA.
From size SA(R) 25.1, the motor connection is realised via a separate terminal board

7.2 Motor connection for the sizes SA(R) 25.1/SAR 30.1 – SA 48.1.

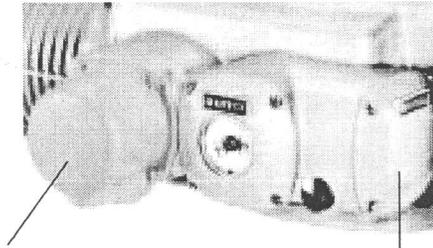
From the size SA(R) 25.1, the power for the motor is connected to separate terminals. For this, the cover at the motor connection compartment has to be removed.

The control contacts are connected to the AUMA plug/socket connector.

Cross section motor terminals:

16 mm² to 70 mm² (6 to 2/0 AWG), depending on the actuator size

Figure G-3: Connection to SA(R) 25.1



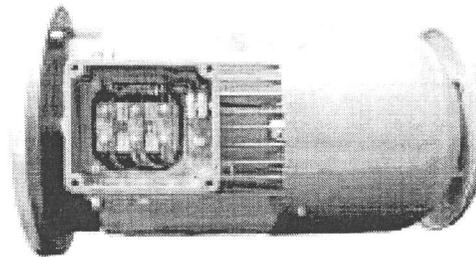
AUMA plug/socket connector

Cover motor connection compartment

7.3 Motor connection for special motors

For versions with special motors (e.g. DC motors), the connection is performed directly at the motor (figure G-4).

Figure G-4: Connection special motor



7.4 Delay time

The delay time is the time from the tripping of the limit or torque switches to the motor power being removed. To protect the valve and the actuator, we recommend a delay time < 50 ms. Longer delay times are possible provided the output speed, output drive type, valve type, and the type of installation are taken into consideration.

We recommend to switch off the corresponding contactor directly by the limit or torque switch.

7.5 Controls made by AUMA

In case the required reversing contactors are not to be installed in the control cabinet, the controls AUMA MATIC or AUMATIC for the sizes SA(R) 07.1 – SA(R) 16.1 can be easily mounted to the actuator at a later date.

For enquiries and more information, please state our commission no. (refer to actuator name plate).

7.6 Heater

AUMA multi-turn actuators have a heater installed as standard. To prevent condensation, the heater must be connected.

7.7 Motor protection

In order to protect against overheating and extreme high temperatures at the actuator, PTC thermistors or thermostats are embedded in the motor winding. The thermostat is tripped as soon as the max. permissible winding temperature has been reached.

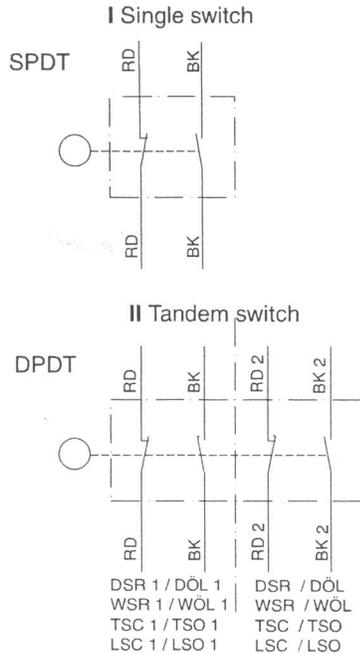
Failure to integrate PTC thermistors or thermostats into the control circuit voids the warranty for the motor.

7.8 Remote position transmitter

For the connection of remote position transmitters (potentiometer, RWG) shielded cables must be used.

7.9 Limit and torque switches

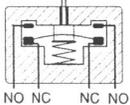
Figure G-5



Only the same potential can be switched on the two circuits (NC/NO contact) of a limit or torque switch. If different potentials are to be switched simultaneously, tandem switches are required.

To ensure correct actuator indications, the leading contacts of the tandem switches must be used for that purpose and the lagging contacts for motor switching off.

Table 5: Technical data for limit and torque switches

|  | Mechanical lifetime = 2 x 10 ⁶ starts | | |
|---|---|--------------------------------|-------|
| | Type of current | Switch rating I _{max} | |
| | 30 V | 125 V | 250 V |
| 1-phase AC (ind. load) cos phi = 0,8 | 5 A | 5 A | 5 A |
| DC (resistive load) | 2 A | 0,5 A | 0.4 A |
| with gold plated contacts | min. 5 V, max. 50 V | | |
| Current | min. 4 mA, max. 400 mA | | |

7.10 Fitting of the cover

After connection:

- Insert the socket carrier (51.0) into the plug cover (50.0) and fasten it with screws (51.01).
- Clean sealing faces at the plug cover and the housing.
- Check whether O-ring is in good condition.
- Apply a thin film of non-acidic grease (e.g. Vaseline) to the sealing faces.
- Replace plug cover (50.0) and fasten bolts (50.01) evenly crosswise.
- Fasten conduit connections with the specified torque to ensure the required enclosure protection.

8. Opening the switch compartment

To be able to carry out the following settings (sections 9. to 15.), the switch compartment must be opened and, if installed, the indicator disc must be removed.

These settings are only valid for “clockwise closing”, i.e. driven shaft turns clockwise to close the valve.



Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

8.1 Removing the switch compartment cover

- Loosen 4 bolts and take off the cover at the switch compartment (figures H).

Fig. H-1: Cover with indicator glass

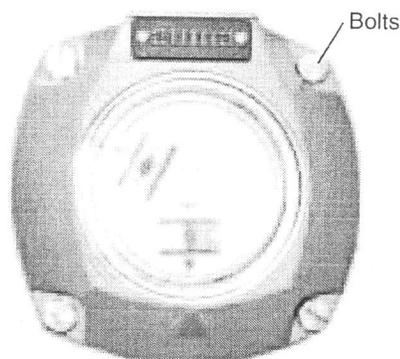
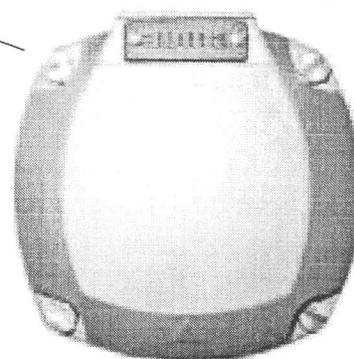


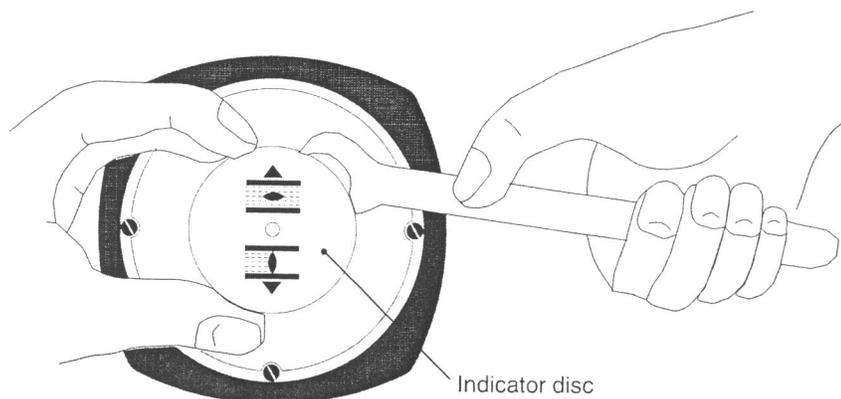
Fig. H-2: Cover without indicator glass



8.2 Pulling off the indicator disc (option)

- If installed, pull off indicator disc (figure J). Open end wrench may be used as lever.

Figure J: Pulling off the indicator disc

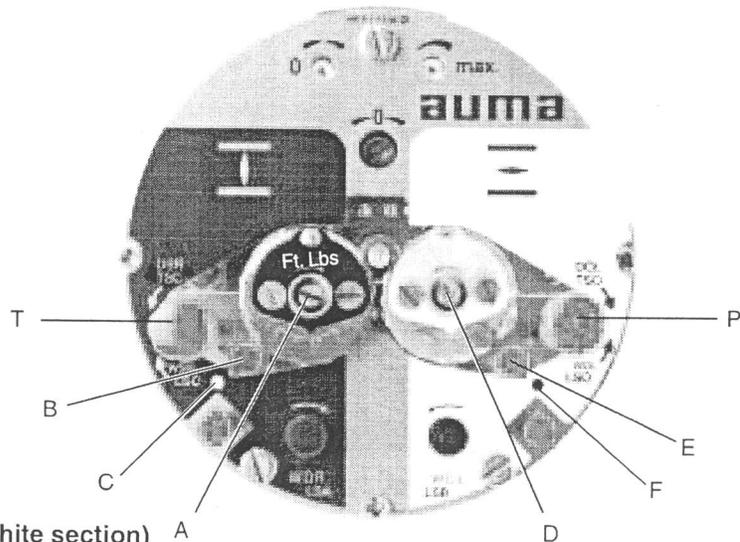


9. Setting the limit switching

9.1 Setting the end position CLOSED (black section)

- Turn handwheel clockwise until valve is closed.
- After having reached the end position, turn back handwheel by approximately $\frac{1}{2}$ a turn (overrun). During test run, check overrun and, if necessary, correct setting of the limit switching.
- **Press down** and turn setting spindle A (figure K-1) with a flat blade screw driver in direction of arrow, thereby observe pointer B. While a ratchet is felt and heard, the pointer B moves 90° every time. When pointer B is 90° from mark C, continue turning slowly. When pointer B has reached the mark C, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

Figure K-1: Control unit



9.2 Setting the end position OPEN (white section)

- Turn handwheel counterclockwise until valve is open, then turn back by approximately $\frac{1}{2}$ a turn.
- **Press down** and turn setting spindle D (figure K-1) with a flat blade screw driver in direction of arrow, thereby observe pointer E. While a ratchet is felt and heard, the pointer E moves 90° every time. When pointer E is 90° from mark F, continue turning slowly. When pointer E has reached the mark F, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

9.3 Checking the limit switches The red test buttons T and P (figure K-1) are used for manual operation of the limit switches.

- Turning T in direction of the arrow LSC (WSR) triggers limit switch CLOSED.
- Turning P in direction of the arrow LSO (WOL) triggers limit switch OPEN.

10. Setting the DUO limit switching (option)

Any application can be switched on or off via the two intermediate position switches.

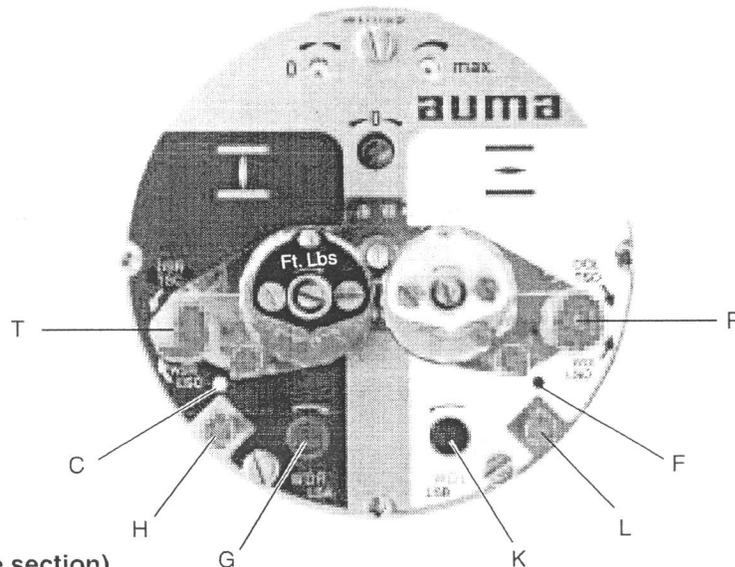


For setting, the switching point (intermediate position) must be approached from the same direction as later during electrical operation.

10.1 Setting the direction CLOSE (black section)

- Move valve to desired intermediate position.
- **Press down** and turn setting spindle G (figure K-2) with a flat blade screw driver in direction of arrow, thereby observe pointer H. While a ratchet is felt and heard, the pointer H moves 90° every time. When pointer H is 90° from mark C, continue turning slowly. When pointer H has reached the mark C, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

Figure K-2: Control unit



10.2 Setting the direction OPEN (white section)

- Move valve to desired intermediate position.
- **Press down** and turn setting spindle K (figure K-2) with a flat blade screw driver in direction of arrow, thereby observe pointer L. While a ratchet is felt and heard, the pointer L moves 90° every time. When pointer L is 90° from mark F, continue turning slowly. When pointer L has reached the mark F, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

10.3 Checking the DUO switches

The red test buttons T and P (Figure K-2) are used for manual operation of DUO limit switches.

- Turning T in direction of the arrow TSC (DSR) triggers DUO limit switch CLOSED. The torque switch CLOSED is actuated at the same time.
- Turning P in direction of the arrow TSO (DÖL) triggers DUO limit switch OPEN. The torque switch OPEN is actuated at the same time.

11. Setting the torque switching

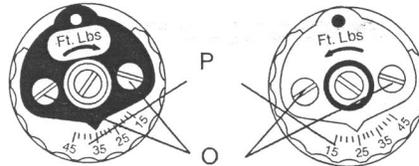
11.1 Setting



- The set torque must suit the valve!
- This setting should only be changed with the consent of the valve manufacturer!

Figure L: Torque switching heads indication in ft lbs

Setting CLOSED Setting OPEN



- Loosen both lock screws O at the torque dial (figure L).
- Turn torque dial P to set it to the required torque.

Examples:

Figure L shows the following setting:
35 ft lbs for direction CLOSE
25 ft lbs for direction OPEN

- Tighten lock screws O again



- The torque switches can also be operated in manual operation.
- The torque switching acts as overload protection over full travel, also when stopping in the end positions by limit switching.

11.2 Checking the torque switches

The red test buttons T and P (figure K-2) are used for manual operation of the torque switches:

- Turning T in direction of the arrow TSC (DSR) triggers torque switch CLOSED.
- Turning P in direction of the arrow TSO (DÖL) triggers torque switch OPEN.
- If a DUO limit switching (optional) is installed in the actuator, the intermediate position switches will be operated at the same time.

12. Test run

12.1 Check direction of rotation

- If provided, place indicator disc on shaft.
 The direction of rotation of the indicator disc (figure M-1) indicates the direction of rotation of the output drive.
- If there is no indicator disc, the direction of rotation can also be observed on the hollow shaft. For this, remove screw plug (no. 27) (figure M-2).

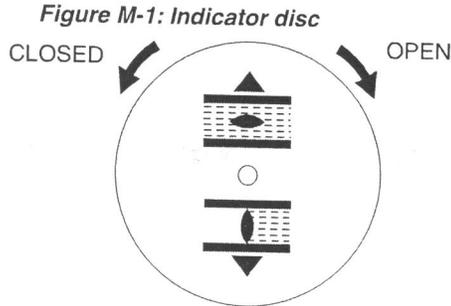
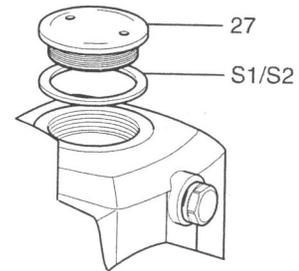


Figure M-2: Opening the hollow shaft



- Move actuator manually to intermediate position or to sufficient distance from end position.
- Switch on actuator in direction CLOSE and observe the direction of rotation:



If the direction of rotation is wrong, switch off immediately
 Then, correct phase sequence at motor connection. Repeat test run.

Table 6:

| | |
|---|---------|
| Direction of rotation of the indicator disc: | |
| counterclockwise | correct |
| Direction of rotation of the hollow shaft: | |
| clockwise | correct |

12.2 Check limit switching

- Move actuator manually into both end positions of the valve.
- Check if limit switching is set correctly. Hereby observe that the appropriate switch is tripped in each end position and released again after the direction of rotation is changed. If this is not the case, the limit switching must first be set, as described from page 15.

If no other options (sections 13. to 15.) require setting:

- Close switch compartment (see page 23, section 16.).

13. Setting the potentiometer (option)

– For remote indication –

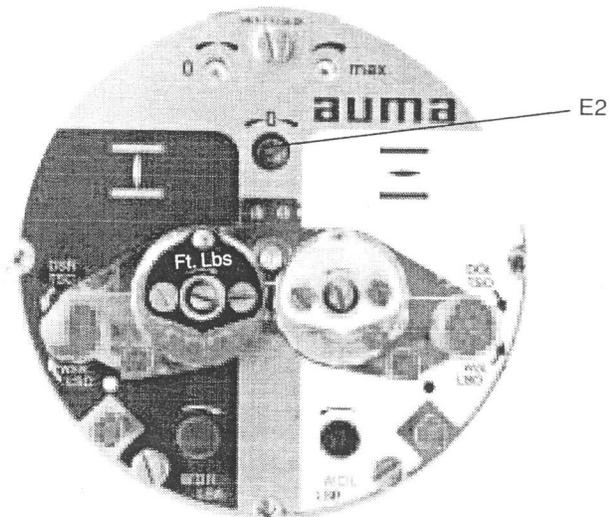
- Move valve to end position CLOSED.
- If installed, pull off indicator disc.
- Turn potentiometer (E2) clockwise until stop is felt.
End position CLOSED corresponds to 0 %, end position OPEN to 100 %.
- Turn potentiometer (E2) back a little.



Due to the ratio of the reduction gears for the position transmitter the complete resistance range is not always utilized for the whole travel. Therefore, an external possibility for adjustment (setting potentiometer) must be provided.

- Perform fine-tuning of the zero point at external setting potentiometer (for remote indication).

Figure N: Control unit



14. Setting the electronic position transmitter RWG (option)

– For remote indication or external controls –

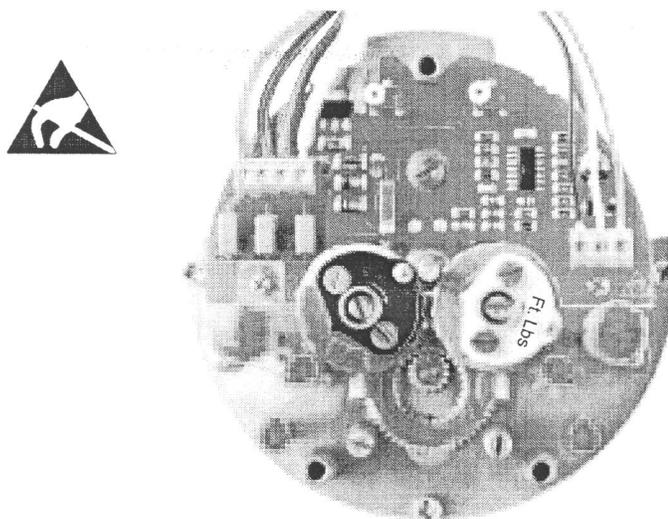
After mounting the multi-turn actuator to the valve, check setting by measuring the output current (see sections 14.1 or 14.2) and re-adjust, if necessary.

Table 7: Technical data RWG 4020

| Terminal plans | | KMS TP__ 4 / ___ | KMS TP _ 4 _ / ___ KMS TP _ 5 _ / ___ |
|--------------------|-------|-------------------------------|--|
| | | 3- or 4-wire system | 2-wire system |
| Output current | I_a | 0 – 20 mA, 4 – 20 mA | 4 – 20 mA |
| Power supply | U_v | 24 V DC, $\pm 15\%$ regulated | 14 V DC + ($I \times R_B$), max. 30 V |
| max. input current | I | 24 mA at 20 mA output current | 20 mA |
| max. load | R_B | 600 Ω | $(U_v - 14 V) / 20 \text{ mA}$ |

The position transmitter board (figure P-1) is located under the cover plate (figure P-2).

Figure P-1: Position transmitter board



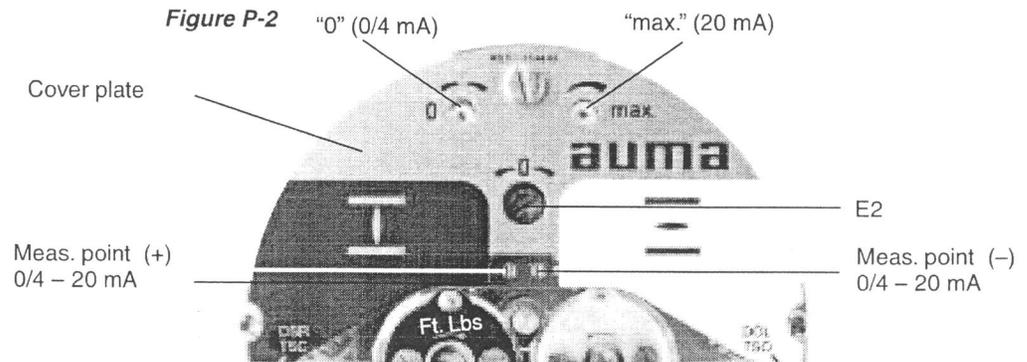
14.1 Setting for 2-wire system 4 – 20 mA and 3-/4-wire system 0 – 20 mA

- Connect voltage to electronic position transmitter.
- Move valve to **end position CLOSED**.
- If installed, pull off indicator disc.
- Connect ammeter for 0 – 20 mA to measuring points (figure P-2).



The circuit (external load) must be connected (max. load R_B), or the appropriate connections at the terminals (refer to terminal plan) must be jumpered, otherwise no value can be measured.

- Turn potentiometer (E2) clockwise to the stop.
- Turn potentiometer (E2) back a little.



- Turn potentiometer "0" clockwise until output current starts to increase.
- Turn potentiometer "0" back until the following value is reached:
 for 3- or 4-wire system: approx. 0.1 mA
 for 2-wire system: approx. 4.1 mA.
 This ensures that the signal remains above the dead and live zero point.
- Move valve to end position OPEN.
- Set potentiometer "max." to end value 20 mA.
- Approach end position CLOSED again and check minimum value (0.1 mA or 4.1 mA). If necessary, correct the setting.



If the maximum value cannot be reached, the selection of the reduction gearing must be checked.

14.2 Setting the 3-/4- wire system 4 – 20 mA

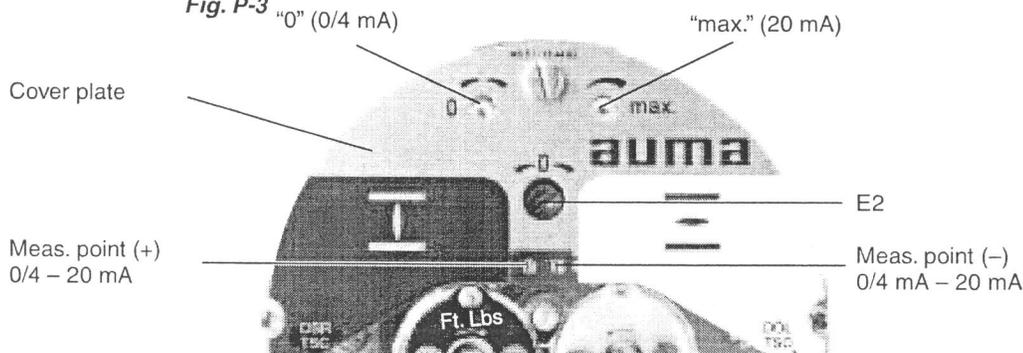
- Connect voltage to electronic position transmitter.
- Move valve to end position CLOSED.
- If installed, pull off indicator disc.
- Connect ammeter for 0 – 20 mA to measuring points (figure P-2).



The circuit (external load) must be connected (max. load R_B), or the appropriate connections at the terminals (refer to terminal plan) must be jumpered, otherwise no value can be measured.

- Turn potentiometer (E2) clockwise to the stop.
- Turn potentiometer (E2) back a little.

Fig. P-3 "0" (0/4 mA)



- Turn potentiometer "0" clockwise until output current starts to increase.
- Turn back potentiometer "0" until a residual current of approx. 0.1 mA is reached.
- Move valve to end position OPEN.
- Set potentiometer "max." to end value 16 mA.
- Move valve to end position CLOSED.
- Set potentiometer "0" from 0.1 mA to initial value 4 mA.
This results in a simultaneous shift of the end value by 4 mA, so that the range is now 4 – 20 mA.
- Approach both end positions again and check setting. If necessary, correct the setting.



If the maximum value cannot be reached, the selection of the reduction gearing must be checked.

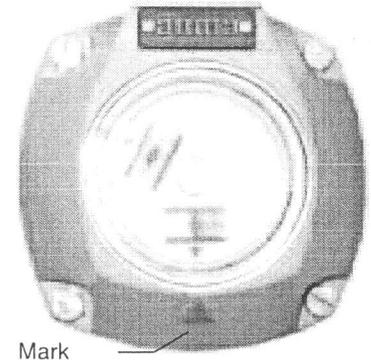
15. Setting the mechanical position indicator (option)

- Place indicator disc on shaft.
- Move valve to end position CLOSED.
- Turn lower indicator disc (figure Q1) until symbol  CLOSED is in alignment with the mark on the cover (figure Q-2).
- Move actuator to end position OPEN.
- Hold lower indicator disc CLOSED in position and turn upper disc with symbol  OPEN until it is in alignment with the mark on the cover.

Figure Q-1



Figure Q-2



Indicator disc rotates by approximately 180° to 230° at full travel from OPEN to CLOSED or vice versa.

A suitable reduction gearing was installed in our factory. If the turns per stroke are changed at a later date, the reduction gearing may have to be exchanged, too.

16. Closing the switch compartment

- Clean sealing faces of housing and cover
- Check whether O-ring is in good condition.
- Apply a thin film of non-acidic grease to the sealing faces.
- Replace cover on switch compartment and fasten bolts evenly crosswise.



After commissioning, check for damage to paint finish of multi-turn actuator. If damage to paint-finish has occurred after mounting, it has to be touched up to avoid corrosion.

17. Enclosure protection IP 68 (option)

Definition

According to EN 60 259, the conditions for meeting the requirements of enclosure protection IP 68 are to be agreed between manufacturer and user.

AUMA actuators and controls in enclosure protection IP 68 meet the following requirements according to AUMA:

- Duration of submersion in water max. 72 hours
- Head of water max. 6 m
- Up to 10 operations during submersion
- Modulating duty is not possible during submersion

Enclosure protection IP 68 refers to the interior of the actuators (motor, gearing, switch compartment, control, and terminal compartment).

For multi-turn actuators, the following has to be observed:

When using output drive types A and AF (stem nut), it cannot be prevented that water enters the hollow shaft along the valve stem during submersion. This leads to corrosion. The water also enters the thrust bearings of output drive type A, causing corrosion and damage of the bearings. The output drive types A and AF should therefore not be used.

Inspection

AUMA actuators and controls in enclosure protection IP 68 undergo a routine testing for tightness in the factory.

Cable glands

- For the entries of the motor and control cables appropriate, cable glands in enclosure protection IP 68 must be used. The size of the cable glands must be suitable for the outside diameter of the cables, refer to recommendations of the cable gland manufacturers.
- As standard, actuators and controls are delivered without cable glands. For delivery, the threads are sealed with plugs in the factory.
- When ordered, cable glands can also be supplied by AUMA at an additional charge. For this, it is necessary to state the outside diameter of the cables.
- The cable glands must be sealed against the housing at the thread with an O-ring.
- It is recommended to additionally apply a liquid sealing material (Loctite or similar).

Commissioning

When commissioning, the following should be observed:

- Sealing faces of housing and covers must be clean
- O-rings of the covers must not be damaged
- A thin film of non-acidic grease should be applied to sealing faces
- Covers should be tightened evenly and firmly

After submersion

- Check actuator.
- In case of ingress of water, dry actuator correctly and check for proper function.

18. Maintenance

After maintenance, check multi-turn actuator for damage to paint finish. If damage to paint-finish has occurred, it has to be touched up to avoid corrosion. Original paint in small quantities can be supplied by AUMA.

AUMA multi-turn actuators require low-level maintenance. Precondition for reliable service is correct commissioning.

Seals made of elastomers are subject to ageing and must therefore regularly be checked and, if necessary, exchanged.

It is also very important that the O-rings at the covers are placed correctly and cable glands tightened firmly to prevent ingress of dirt or water.

We recommend additionally:

- If rarely operated, perform a test run about every 6 months. This ensures that the actuator is always ready to operate.
- Approximately six months after commissioning and then every year, check bolts between actuator and valve/gearbox for tightness. If required, tighten applying the torques given in table 2, page 8.
- For multi-turn actuators with output drive type A: at intervals of approx. 6 months from commissioning press in Lithium soap EP multi-purpose grease on mineral oil base at the grease nipple with grease gun (quantity see table 3, page 9).

19. Lubrication

- The gear housing is filled with lubricant in the factory.
- A grease change is recommended after the following operation time:
 - If rarely operated, after 10 – 12 years
 - If operated frequently, after 6 – 8 years



Lubrication of the valve stem must be done separately.

20. Disposal and recycling

AUMA actuators have an extremely long lifetime. However, they have to be replaced at one point in time.

The actuators have a modular design and may therefore easily be disassembled, separated, and sorted according to materials, i.e.:

- electronic scrap
- various metals
- plastics
- greases and oils

The following generally applies:

- Collect greases and oils during disassembly. As a rule, these substances are hazardous to water and must not be released into the environment.
- Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
- Observe the regional regulations for waste disposal.

21. Service

AUMA offers extensive services such as maintenance and inspection for actuators.

The AUMA service department can be reached at:

phone: 724-743-AUMA (2862)

fax: 724-743-7411

email: mailbox@auma-usa.com

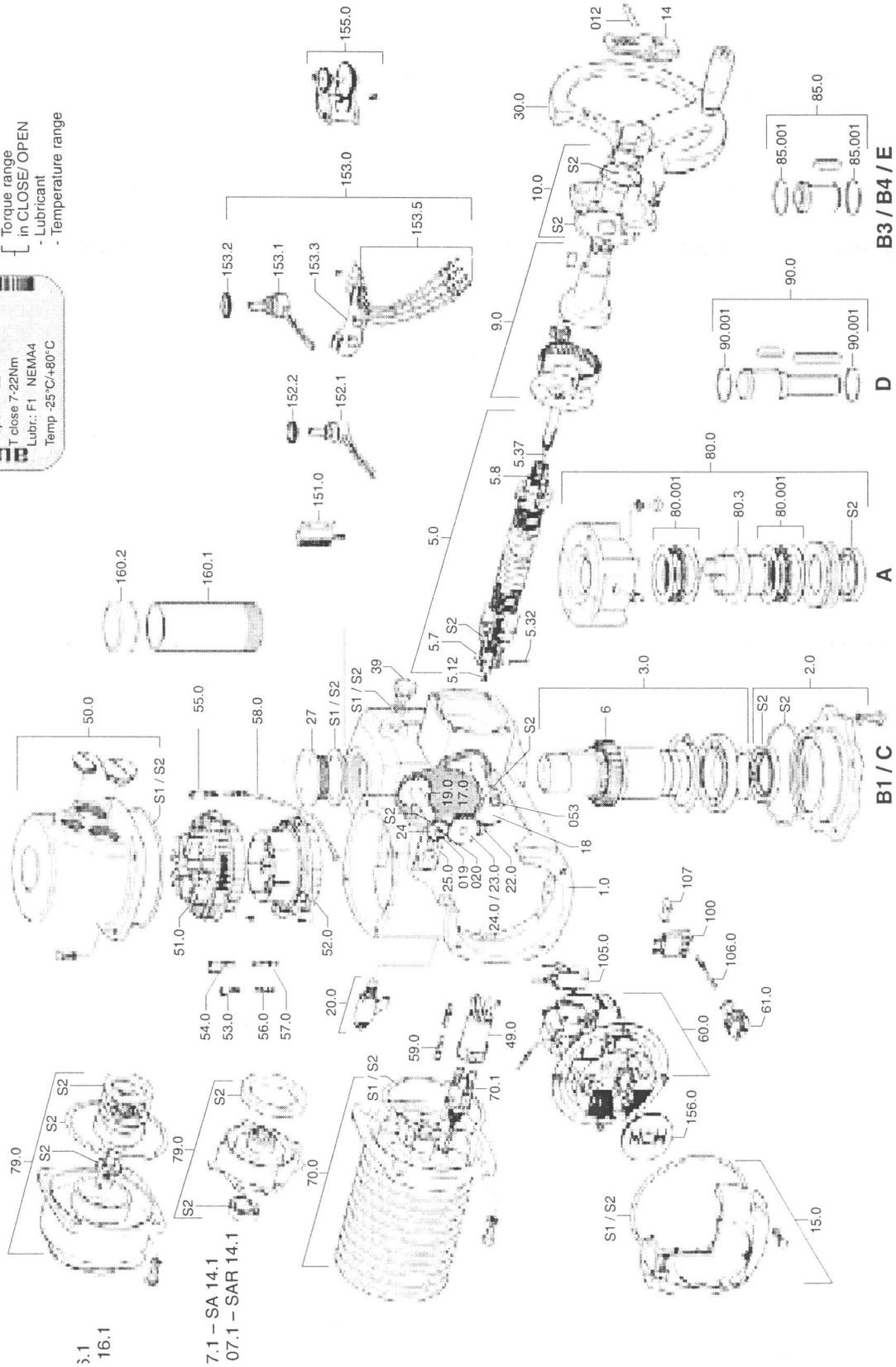
www.auma-usa.com or www.auma.com.

22. Spare parts list Multi-turn actuator SA(R) 07.1 – SA(R) 16.1 with plug/socket connector

Sample name plate



- Actuator type
- Commission number
- Comm./ sales order number
- Works/ Serial number
- Protection type
- Torque range
- in CLOSE/OPEN
- Lubricant
- Temperature range



Notes:

When placing orders for spare parts, it is essential to mention type of actuator and our commission number (refer to actuator name plate). Delivered spare parts may slightly vary from the representation in these instructions.

| No. | Type | Designation | No. | Type | Designation |
|--------------------|------|---|----------------------|------|---|
| 012 | E | Notched pin | 58.0 | B | Wire for protective earth |
| 019 | E | Cheese head screw | 59.0 ¹⁾ | B | Pin for motor and thermoswitch in motor plug |
| 020 | E | Clamping washer | | | |
| 053 | E | Countersunk screw | 60.0 | B | Control unit assly. (but without torque head, without switches) |
| 1.0 | B | Housing assly. | | | |
| 2.0 | B | Flange, bottom assly. | | | |
| 3.0 | B | Hollow shaft assly. (without worm wheel) | 70.0 | B | Motor |
| 5.0 | B | Worm shaft assly. | 70.1 ¹⁾ | B | Motor pin carrier (without pins) |
| 5.12 | E | Set screw | | | |
| 5.32 | E | Coupling pin | 79.0 ²⁾ | B | Planetary gearing for motor drive assly. |
| 5.37 | B | Pull rod assly. | 80.0 ³⁾ | B | Output drive form A assly. (without thread in stem nut) |
| 5.7 | E | Motor coupling | | | |
| 5.8 | B | Manual drive coupling assly. | 80.001 ³⁾ | E | Thrust bearing set |
| 6 | E | Worm wheel | 80.3 ³⁾ | E | Stem nut form A (without thread) |
| 9.0 | B | Planetary gear assly. for manual drive | 85.0 ³⁾ | B | Output drive B3 |
| 10.0 | B | Retaining flange assly. | 85.001 ³⁾ | E | Snap ring |
| 14 | E | Change-over lever | 90.0 ³⁾ | B | Output drive D |
| 15.0 | B | Cover for switch compartment assly. | 90.001 ³⁾ | E | Snap ring |
| 17.0 | B | Torque lever assly. | 100 | B | Switch for limit/ torque switching (including pins at wires) |
| 18 | E | Gear segment | | | |
| 19.0 | B | Crown wheel assly. | 105.0 | B | Blinker transmitter including pins at wires (without impulse disc and insulation plate) |
| 20.0 | B | Swing lever assly. | | | |
| 22.0 | B | Drive pinion II for torque switching assly. | 106.0 | B | Stud bolt for switches |
| 23.0 | B | Drive wheel for limit switching assly. | 107 | E | Spacer |
| 24 | E | Drive wheel for limit switching | 151.0 | B | Heater |
| 24.0 | B | Intermediate wheel for limit switching assly. | 152.1 ³⁾ | B | Potentiometer (without slip clutch) |
| 25.0 | E | Locking plate | 152.2 ³⁾ | B | Slip clutch for potentiometer |
| 27 | E | Screw plug | 153.0 ³⁾ | B | RWG assly. |
| 30.0 | B | Handwheel with ball handle assly. | 153.1 ³⁾ | B | Potentiometer for RWG (without slip clutch) |
| 39 | E | Screw plug | | | |
| 49.0 ¹⁾ | B | Motor plug, socket assly. | 153.2 ³⁾ | B | Slip clutch for RWG |
| 50.0 | B | Cover assly. | 153.3 ³⁾ | B | Electronic board RWG |
| 51.0 | B | Socket carrier assly. (with sockets) | 153.5 ³⁾ | B | Wires for RWG |
| 52.0 | B | Pin carrier (without pins) | 155.0 ³⁾ | B | Reduction gearing |
| 53.0 | B | Socket for control | 156.0 ³⁾ | B | Mechanical position indicator |
| 54.0 | B | Socket for motor | 160.1 ³⁾ | E | Protection tube(without cap) |
| 55.0 | B | Socket for protective earth | 160.2 ³⁾ | E | Cap for stem protection tube |
| 56.0 | B | Pin for control | S1 | S | Seal kit, small |
| 57.0 | B | Pin for motor | S2 | S | Seal kit, large |

1) SA 16.1 with output speeds of 32 to 216 rpm or SAR 16.1 with output speeds of 32 and 54 rpm without plug/ socket connector; motor directly wired to pin carrier (No. 52.0) .

2) not available for all output speeds

3) not included in basic equipment

Notes:

When placing orders for spare parts, it is essential to mention type of actuator and our commission number (refer to actuator name plate). Delivered spare parts may slightly vary from the representation in these instructions.

| No. | Type | Designation | No. | Type | Designation |
|--------|------|---|---------|---------|---|
| 1.026 | E | Quad ring / radial seal | 54.0 | B | Socket for motor |
| 1.038 | E | O-ring | 55.0 | B | Socket for protective earth |
| 1.1 | B | Housing assly. | 56.0 | B | Pin for control |
| 1.17 | B | Torque lever assly. | 57.0 | B | Pin for motor |
| 1.19 | B | Crown wheel assly. | 58.0 | B | Wire for protective earth |
| 1.22 | B | Drive pinion II for torque switching assly. | 61.0 | B | Torque switching head |
| 1.23 | B | Drive wheel for limit switching assly. | 80.0 * | B | Output drive form A assly. (without thread in stem nut) |
| 1.24 | B | Intermediate wheel for limit switching assly. | | 80.001* | S |
| 1.25 | E | Locking plate | 80.3 * | E | Stem nut form A (without thread) |
| 1.27 | E | Screw plug | 85.0 * | B | Output drive form B3 assly. |
| 1.28 | E | Bearing bush | 85.001* | E | Snap ring |
| 2.58 | B | Motor | 100 | B | Switch for limit/ torque switching (including pins at wires) |
| 2.59 ● | B | Planetary gear assly. for motor drive | | | |
| 3 | B | Drive shaft assly. | 105 | B | Blinker transmitter including pins at wires (without impulse disc and insulation plate) |
| 3.05 | E | Dowel pin | | | |
| 3.11 | B | Pull rod assly. | 106.0 | B | Stud bolts for switches |
| 3.6 | B | Worm wheel assly. | 107 | E | Spacer |
| 3.7 | E | Motor coupling | 151.0 | B | Heater |
| 3.8 | B | Manual drive coupling assly. | 152.1 * | B | Potentiometer (without slip clutch) |
| 4.2 | B | Flange, bottom assly. | 152.2 * | B | Slip clutch for potentiometer |
| 4.3 | B | Hollow shaft assly. | 153.0 * | B | RWG assly. |
| 5 | B | Planetary gear assly. for manual drive | 153.1 * | B | Potentiometer for RWG (without slip clutch) |
| 5.1 | E | Mounting flange | 153.2 * | B | Slip clutch for RWG |
| 5.2 | B | Hand wheel shaft assly. | 153.3 * | B | Printed board for RWG |
| 6 | B | Swing lever assly | 155.0 * | B | Reduction gearing |
| 7.012 | E | Notched pin | 156.0 * | B | Mechanical position indicator |
| 7.14 | E | Change-over lever | 160.1 * | E | Protection tube (without cap) |
| 7.50 | B | Handwheel with ball handle assly. | 160.2 * | E | Cap |
| 8.36 | B | Control unit assly. (but without torque head, without switches) | S1 | S | Seal kit (small) |
| | | | S2 | S | Seal kit (large) |
| 8.37 | B | Switch compartment cover | | | |
| 9.33 | B | Terminals for motor connection | | | |
| 9.51 | B | Protective earth connection | | | |
| 9.55 | B | Cover for motor connection compartment assly. | | | |
| | | | | | |
| 50.0 | B | Plug cover assly. | | | |
| 51.0 | B | Socket carrier assly. (with sockets) | | | |
| 52.0 | B | Pin carrier (without pins) | | | |
| 53.0 | B | Socket for control | | | |

● not available for all output speeds

* not included in basic equipment

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2005-06-27

auma[®]

OPERATION INSTRUCTIONS

MODEL SA 07.1 – SA 48.1

Multi-Turn Actuators

auma[®]

AUMA Actuators, Inc. USA

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This operation instruction is valid for the types: SA, SA(IP68), SAL, SAEL, SAH, SAR, SAFM, SARFM, SAEx, SAREx.

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Multi-turn actuators are high quality electro-mechanical devices. Possible damage can be avoided by observing the following items.

1. TRANSPORT AND STORAGE

- Transport to place of installation in sturdy packing.
- Do not lift the actuator by the handwheel.
- Store in well ventilated, dry room.
- Protect against humidity from the floor by storing on a shelf or on a wooden frame.
- Cover to protect against dust and dirt.
- Apply corrosion protection agent to machined surfaces.

2. SERVICE CONDITIONS

AUMA multi-turn actuators can be used at following ambient conditions:

| Model | Temperature |
|----------|----------------------------|
| SA | -20°F to +175°F (Standard) |
| SAL | -40°F to +140°F |
| SAH | +32°F to +250°F |
| SA(IP68) | -20°F to +175°F |
| SAR | -20°F to +140°F |

3. MOUNTING TO THE VALVE/GEARBOX

Mounting and operation can be in any position.

- Check whether output drive flange suits the valve/gearbox.

CAUTION: Spigot at flanges should be loose fit!

- For form A output drive the thread must correspond with thread of the valve stem. If not ordered explicitly with thread, the stem nut is supplied unbored or with pilot bore (*Figure C*). For machining the stem nut refer to Section 13.
- Form B output drives are normally supplied with bore and one keyway (*Figure D*).
- Check whether bore and keyway correspond with the input shaft of the valve or gearbox.
- Degrease mounting surfaces at actuator and valve/gearbox thoroughly.
- Apply lubricant to input shaft of the valve/gearbox.
- Place actuator on the valve/gearbox and use bolts with a minimum quality of 8.8 to fasten. Tighten diagonally.

4. MANUAL OPERATION

Engaging Handwheel (*Figure B*)

CAUTION: Manual operation should not be engaged if motor is running.

- Lift declutch lever in center of handwheel to fully extended position while slightly turning the handwheel.
- Release declutch lever, it must snap back to its original position; manual mode remains engaged.

Manual Operation

• WARNING •

DECLUTCH LEVER MUST BE FULLY RELEASED AND RETURNED TO UNENGAGED POSITION (90°) WHILE IN MANUAL HANDWHEEL OPERATION TO PREVENT PHYSICAL DAMAGE.

- If power tools are used, the permissible speed is 300 rpm.
- For two-inch nut or chainwheel operation refer to separate instructions.

Disengaging Manual Operation

- Manual drive disengages automatically when motor is started.

5. ELECTRICAL CONNECTIONS

CAUTION: Observe safety regulations. Check whether the power supply (voltage, phase and frequency) complies with the motor nameplate.

Terminal Access

- Take off the terminal compartment cover.
- Loosen cheese head screws inside the cover and remove multi socket carrier.

- Check the location of the terminal connections.
 - For SA 07.1 - SA 16.1 motor power is connected in center of socket carrier.
 - For SA 25.1 - SA 48.1 motor power is connected in separate conduit entry (*Figure A*).
 - For SA 07.1 - SA 48.1 control power is connected to sockets in socket carrier.
- Attach conduit to terminal compartment cover.

CAUTION: Appropriate conduit and sealing methods must be followed to ensure the type of enclosure furnished.

Wiring Connections - *Refer to drawing inside terminal compartment cover*

NOTE: The drawing contains the required information for correct actuator electrical connection. Typical customer controls are also shown.

- Connect motor wires to the designated terminals. Connect ground to designated terminal.
- Connect control wires to designated terminals in accordance with drawing.

CAUTION: The following must be considered when wiring an AUMA actuator:

- ◆ The time delay (i.e., from limit or torque switch tripping until the motor is switched off) should not exceed 20 ms. We strongly recommend switching off the motor directly by installing the corresponding switches in the control wiring to the contactor. This concern is especially important when using PLC's. Switch output to a PLC should be for indication only.
- ◆ Each switch has contacts which are not completely isolated and therefore are suitable only for the same voltage potential. (See drawing for detailed information.)
- ◆ The valve manufacturer decides whether switching off in the end position should be by limit switch (limit seating) or torque switch (torque seating).
- ◆ AUMA motors have 3 thermoswitches as standard equipment. These switches must be directly wired into the control circuit to protect the motor. If these are not connected, the warranty for the motor is not valid.

Completion of Electrical Connection

- Clean the sealing faces at plug or cover for terminal compartment, check to ensure that the O-ring is not damaged.

- Apply a thin film of non-acid grease (e.g., Vaseline) to sealing faces.
- Place cover and fasten the 4 bolts. Tighten diagonally.

CAUTION: NEMA 7 enclosures require that a conduit seal be placed as close as practicable to the conduit entries at the actuator.

6. TEST RUN (Figure E)

Remove cover to the control unit compartment (15.0) and, if provided, the MDPI disc (156.0).

- Bring the valve manually to an intermediate position.
- Check phase rotation.
- Run the actuator briefly in the open direction. If the direction of rotation is incorrect, switch off immediately and rewire motor connections U1 and W1.
- The red test knobs on the control unit provide a way to manually operate the limit and torque switches.

While running the actuator in the open direction, turn the red test knob OPEN toward the DOL arrow.

- ◆ If the motor stops, the control circuit is correct.
- ◆ If the motor does not stop, turn off the motor power immediately. Check control circuit and correct wiring.

Operating Direction for Test Knobs

| | Torque Switch | Limit Switch |
|-------|---------------|--------------|
| open | DOL Arrow | WOL Arrow |
| close | DSR Arrow | WSR Arrow |

- Determine overrun in both directions (overrun is turns/travel from switching off until the actuator movement stops).

The convention of "clockwise-to-close" has been used throughout this manual. A "clockwise-to-open" valve or damper configuration represents a reversal of limit and torque switch position (black area of face plate of the control unit represents open and white area represents closed.)

7. SETTING OF LIMIT SWITCHING (*Figure E*)

- Engage manual drive as explained in Section 4.

Setting of the CLOSED End Position (black area)

- Turn the handwheel clockwise until the valve is fully closed. Consider possible overrun as described in Section 6.
- Press down and turn spindle (A) in direction of the arrow. A ratchet will be felt and heard, the pointer (B) turns for every 90 degrees.

When pointer moves towards point (C), the spindle should not be turned any further. If the spindle has been turned beyond that point inadvertently, continue turning and approach the setting point again.

CAUTION: Make sure that spindle (A) springs up to its original position.

Setting of the OPEN End Position (white area)

- Turn the handwheel counter-clockwise until the valve is fully open. Consider possible overrun as determined in Section 6. Compensate overrun by backing off with the manual drive.
- Repeat setting procedure as described for the closed position using spindle (D), pointer (E) and point (F).

8. SETTING OF DUO COUNTER GEAR OR FOUR GEAR TRAIN LIMIT SWITCHING (optional) (*Figure E*)

CAUTION: The intermediate switching point should be approached for setting purposes in the same direction as in motor operation.

- Move valve to the required intermediate position.
- For switching in the direction CLOSED (LSA) use spindle (G), pointer (H) and point (C) as explained previously.
- For switching in the direction OPEN (LSB) use spindle (K), pointer (L) and point (F) as explained previously.

9. SETTING OF TORQUE SWITCHING (*Figure F*)

CAUTION: Adjusted torque must suit the valve! If the actuator has been supplied by a valve manufacturer, this setting was made during testing. This setting should only be changed with the consent of the valve manufacturer.

- Loosen both lock screws (O) at torque dial.
- Rotate torque dial (P) to the required setting (1 ft. lbs. equals 1.36 Nm).
- Fasten lock screw again.

NOTE: Torque switching works in both manual and electrical mode. The torque switching acts as overload protection over full travel as well as at the end positions.

- Clean sealing surfaces at the housing and the switch compartment cover (3.2). Check the O-ring for possible damage. Apply thin film of non-acid grease (e.g. Vaseline) to sealing faces.
- Place the cover and fasten the hexagonal bolts. Tighten diagonally.

10. SETTING OF MECHANICAL DIAL POSITION INDICATOR - optional (*Figure G*)

The indicator disc rotates approximately 180 degrees at full travel from OPEN to CLOSE or vice versa.

A suitable reduction gearing was installed in our factory. If turns per stroke are changed subsequently, the reduction gearing may have to be exchanged, too.

- Run actuator to the CLOSED end position.
- Turn dial $\overline{\text{P}}$ CLOSED until the arrow is in alignment with the mark on the indicator glass.
- Run Actuator to the OPEN end position.
- Turn dial $\overline{\text{O}}$ OPEN while holding the other dial in position until the arrow is in alignment with the mark.

11. SETTING OF THE POTENTIOMETER (optional) (*Figure E*)

- Operate valve to the CLOSED position.

Set the potentiometer to the initial position (minimum resistance) by turning spindle (R2).

12. SETTING OF THE CURRENT TRANSMITTER RWG (optional) (Figure E)

Adjustments for 4 mA to close and 20 mA to open

- Run the actuator to the full closed position, and adjust the feedback potentiometer (R2) to the full clockwise end position. (Note: counter-clockwise for counter-clockwise-to-close actuators).
- Adjust zero adj. potentiometer (L) clockwise until the desired current output for the closed position is obtained (normally 4 mA). Turn potentiometer clockwise to increase current output, counter-clockwise to decrease.
- Run actuator to the full open position.
- Adjust max adj. potentiometer (M) until the desired current output for the open position is obtained (normally 20 mA). Turn potentiometer clockwise to increase current output, counter-clockwise to decrease.
- Run actuator to the full closed position to check the closed position current output.
- If necessary, readjust the zero adj. potentiometer to the value obtained in Step 3 and repeat Steps 4 through 6. Otherwise, the procedure is complete.

NOTE: The adjustment of the zero adj. and max adj. potentiometers is an interactive process and may require that the potentiometers are adjusted a number of times.

NOTE: For other settings, please refer to separate setting instructions.

13. MACHINING OF STEM NUT, FORM A OUTPUT DRIVE (Figure C)

Mounting flange does not need to be taken off the actuator.

- Remove the bearing lock nut (80.2) using a wrench or similar tool.
- Take off the stem nut (80.3), thrust bearing (80.01) and thrust bearing races (80.02).
- Remove the thrust bearing and races from stem nut.
- Drill and bore the stem nut, cut the thread.

CAUTION: When fixing in the chuck make sure the stem nut runs true.

- Clean the machined stem nut.
- Apply ball bearing grease to the thrust bearing and races and place them on the stem nut.
- Put the stem nut into the mounting flange. Be careful that the dogs are placed correctly in the slots of the hollow shaft.

- Screw in the bearing lock nut until it is firm against the shoulder.
- The A drive housing is provided with a grease nipple for lubrication. Ensure that an adequate amount of grease is provided for proper operation. Frequency of lubrication must be determined according to usage. Contact the factory for further information on output drives.

14. MAINTENANCE

AUMA Actuators need little maintenance. A precondition for reliable service is correct commissioning and start up. It is also very important that the O-rings for the covers are placed correctly, and conduit entries are fastened firmly to prevent the ingress of dirt or water.

We recommend:

- If operated very seldom, perform a test run every six (6) months. This assures that the actuator is always ready to operate.
- Approximately six (6) months after start-up and then every year check the bolts between the actuator and the valve/gearbox for tightness. If required, retighten.
- Multi-turn actuators with Form A output drive must be lubricated at intervals of approximately six (6) months, using the grease nipple.

CAUTION: Lubrication of the valve stem must be done separately.

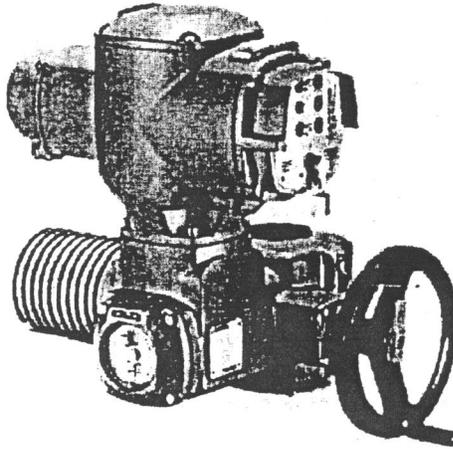
This operation instruction has been prepared to the best of our knowledge in order to inform our customers. It is the result of our practical experience and extensive testing.

Our multi-turn actuators were designed principally for the operation of valves. Before using them for other purposes, we recommend examining whether our products perform the functions desired. Further knowledge about their suitability may be obtained by tests. We are prepared to assist in the performance of these tests.

For special applications please consult factory.

When using our multi-turn actuators for applications not intended by us, we cannot be held responsible. Necessary precautions to prevent injury to persons or damage to materials are the sole responsibility of the user.

auma matic



Actuators* with the BASIC COMPACT and AUMA MATIC contain pilot devices and complete motor controls. The controls are contained in a sealed housing, which is mounted directly to actuators of the version, AUMA NORM.

Electrical connections between the BASIC COMPACT or AUMA MATIC unit and actuator are made by plug/socket. This enables the BASIC COMPACT or AUMA MATIC unit to be fitted to the type AUMA Norm actuators already installed.

*Available in sizes SA 07.01 — SA 16.1

For professional start-up and reliable service in the field, AUMA has specialists in the factory for:

- Shipping of original spare parts
- Commissioning
- Maintenance/repair
- Trouble-shooting assistance

Before calling for our support, please have the following information:

1) For Parts:

- Original S.O. Number or Serial Number of Actuator (on name tag)
- Part Number (on exploded view)

2) For Service:

- Original S.O. Number or Serial Number of Actuator
- Brief Description of Problem

Contacts:

Factory: AUMA Actuators, Inc.
4 Zesta Drive
Pittsburgh, Pennsylvania 15205
Phone: (412) 787-1340
Fax: (412) 787-1223
E-mail: mailbox@auma-usa.com
Web site: www.auma-usa.com

All information is subject to change without notice.



DEPARTMENT OF THE ARMY

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
VALLEY RESIDENT OFFICE
2021 Jefferson Blvd.
West Sacramento, California 95691

May 18, 2010

C-0027

Contract No. W91238-07-C-0016, ARWP, Mayhew Levee Raise/Drain Closure,
Sacramento, CA

Subject: "Beneficial Occupancy of Mayhew Closure Structure"

FCI Constructors Inc.
2100 Goodyear Road
Benicia, California 94510

Gentlemen,

Construction of Mayhew Closure Structure was inspected and accepted on May 14, 2010, with outstanding deficiencies. A list of the outstanding deficiencies was sent to your office in the "Final Acceptance Inspection" letter (C-0025) dated April 30, 2010. All outstanding deficiencies were corrected and confirmed by my staff on May 17, 2010.

This is to inform you that, in the event it should become necessary to implement any of the warranty clauses of this contract, the government will notify you. A prompt reply is expected to any request for repairs necessary under the warranty provisions of your contract.

Sincerely,

A handwritten signature in black ink, appearing to read "Cathy Wise".

Cathy Wise, P.E., CCM
Administrative Contracting Officer

MAYHEW DRAIN CLOSURE STRUCTURE SACRAMENTO COUNTY, CA

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**MAYHEW DRAIN CLOSURE STRUCTURE
SACRAMENTO COUNTY, CA**

**SECTION 35 20 17
SLUICE – FLAP GATES**

**OPERATION, MAINTENANCE,
AND INSTALLATION MANUAL**

**CONTRACTOR:
FCI CONSTRUCTORS, INC.
2100 GOODYEAR ROAD
BENICIA, CA 94510
PHONE: (707) 742-8000
FAX: (707) 746-0949**

**MANUFACTURER:
GOLDEN HARVEST, INC.
PO BOX 287
BURLINGTON, WA 98233
360-757-4334
FAX: 360-757-1135
ghi@goldenharvestinc.com**

GHI NO: 07-0764

SEPTEMBER / 2008

INTRODUCTION

Golden Harvest, Inc., Golden Gates™ has developed a complete line of aluminum and stainless steel gates for distribution worldwide. These products, based on extensive experience in all types of environments, are the results of intensive research, computer, lab, field testing and analysis.

Golden Harvest, Inc.'s, Golden Gate's, Operation and Maintenance Manual, was created, to give information to all personnel, (engineers, contractors, operators, and installers) who will be affected with the operating, maintaining and installing of this equipment.

Every precaution is taken at the factory to insure that superior quality equipment is shipped. However, we cannot be accountable for damage caused by vandalism or negligence after shipping or improper installation of the equipment. Therefore, the information in this manual is Golden Harvest, Inc., Golden Gates™ recommended procedures for handling, storage, installation, adjustment, and initial operation for the related equipment and operating mechanisms to be used in conjunction with the approved installation drawings furnished by Golden Harvest, Inc. If appropriate care and accuracy are observed in the field when installing Golden Harvest, Inc., Golden Gates™, they will operate as designed at optimum efficiency.

WARRANTY

LIMITED WARRANTY

Golden Harvest, Inc., warrants its gates against defects in material and workmanship for one full year from date of acceptance by owner and such warranty can only be enforced by the original purchaser. During the warranty period, the gates will be repaired or replaced at **GOLDEN HARVEST, INC.'S** option and at no cost to the purchaser. Measure of damage is the original purchase price of the defective material only. Any claim for defects in material and/or workmanship shall be in writing and within ten (10) days of the inspected defect. No charges for labor or expense required to remove or replace defective material or for any consequential damages will be allowed.

AUTHORIZED SERVICE

For service and/or warranty repair, please contact:

Golden Harvest, Inc
PO Box 287
Burlington, WA 98233

Phone: (360) 757-4334
Fax: (360) 757-1135

Please reference the Golden Harvest Job # 07-0764 in all correspondence regarding this job

RECEIVING SHIPMENT

All individually shipped parts, assemblies, and equipment are listed on a packing list. These should be inspected and counted immediately upon arrival. Should a deficiency occur notify Golden Harvest, Inc. immediately. We cannot be responsible for any shortages reported more than 30 days after receipt of shipment. Special attention should be taken in counting and safely storing all bolts, nuts, and other small items which are often misplaced or lost at job sites.

Unless your contract with Golden Harvest, Inc. states otherwise, all parts and equipment are shipped F.O.B. factory. Therefore, any equipment or parts that have been damaged in transit, become the purchaser's responsibility for filing claims with the transportation company. For help in filing any claim and/or replacing equipment, please contact Golden Harvest, Inc. 1-800-338-6238.

STORAGE AND HANDLING

All Golden Harvest, Inc., Golden Gates'™ equipment and parts are durably constructed. However, there are precision machined seats and surfaces which require special attention when handling, storing, and installing. Although all equipment and parts are of sturdy design, it is possible to warp frames, heads, stems, and other parts and equipment.

To avoid these problems we recommend the following:

DO NOT DISASSEMBLE FOR STORAGE OR INSTALLATION.

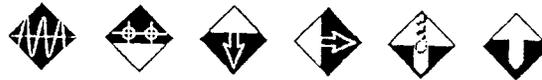
1. Always brace, taking precautions not to harm the stem threads.
 2. Warehouse equipment on a flat, clean, dry surface to prevent distortion.
 3. Do not stack equipment without proper bracing and covering.
 4. Handle all equipment and parts like you would any other precision machinery.
-

INSTALLATION OF ANCHOR BOLTS

Golden Harvest, Inc. furnishes type 304-316 stainless steel anchor studs as required for the project. Adhesive is the responsibility of the contractor. Golden Harvest Inc.'s anchor bolt design calculations are based on the Ramset Epcon series adhesive.

EPCON™ A7 SERIES

GENERAL INFORMATION



Product

Epcon A7 Series is a chemical anchor system based on acrylic mortar. The two parts are dispensed and mixed in one action through a static mixing nozzle, which allows accurate mixing with no mess.



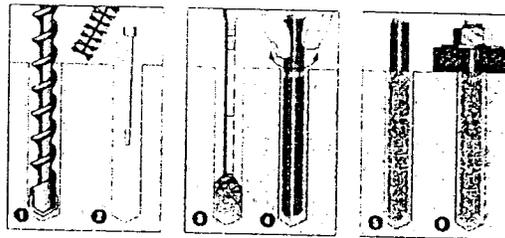
Features

- High strength in shallow embedment.
- Close to edge, stress free anchoring.
- Close anchor spacing.
- No prewarming of cartridge required in cold environments.
- Suitable for use with zinc plated, hot dipped galvanised or stainless steel Chemset Anchor Studs.
- Resistant to cyclic loading and vibration.
- High strength with grade 5.8 steel Chemset Anchor Studs.

Principal Applications

- Structural beams and columns.
- Bottom plate and batten fixing.
- Installing signs, handrails, balustrades and gates.
- Racking.
- Safety barriers.
- Stadium seating.
- Machinery and heavy plant hold down.

Installation



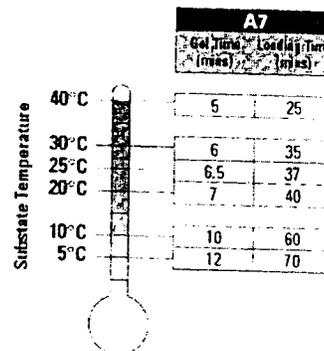
1. Drill recommended diameter and depth hole.
2. Clean hole with hole cleaning brush. Remove all debris using hole blower. Hole must be dry.
3. Insert mixing nozzle to bottom of hole. Fill hole to 3/4 the hole depth slowly, ensuring no air pockets form.
4. Insert Ramset Chemset Anchor Stud/rebar to bottom of hole while turning.
5. Epcon A7 to cure as per setting times.
6. Attach fixture.

Installation temperature limits:

- Substrate: -20°C to 40°C
- Mortar: 0°C to 40°C.

Load should not be applied to anchor until the chemical has sufficiently cured as specified.

Approximate Setting Times





7 Epcon™ A7 Series

Installation and Working Load Limit performance details:
Epcon™ A7 Series and Chemset™ Anchor Studs

| Anchor Size | Minimum Embedment | | Minimum Spacing | | | | Minimum Edge Distance | | | | |
|-------------|-------------------|------------|-----------------|------------|----------|------------|-----------------------|------------|----------|------------|------|
| | Vertical | Horizontal | Vertical | Horizontal | Vertical | Horizontal | Vertical | Horizontal | Vertical | Horizontal | |
| M8 | 10 | 10 | 80 | 10 | 30 | 50 | 100 | 5.3 | 6.5 | 6.5 | 6.5 |
| M10 | 12 | 12 | 90 | 20 | 40 | 60 | 120 | 7.1 | 7.7 | 8.9 | 9.5 |
| M12 | 14 | 15 | 110 | 40 | 50 | 70 | 140 | 10.5 | 11.3 | 12.9 | 13.9 |
| M16 | 18 | 19 | 125 | 95 | 65 | 100 | 160 | 19.9 | 15.3 | 17.6 | 18.8 |
| M20 | 24 | 24 | 150 | 180 | 80 | 120 | 190 | 30.0 | 22.0 | 25.3 | 27.1 |
| | | | 170 | | | | 220 | 30.0 | 26.6 | 30.6 | 32.7 |
| M24 | 36 | 26 | 160 | 315 | 95 | 145 | 200 | 43.4 | 26.1 | 30.0 | 32.1 |
| | | | 210 | | | | 270 | 43.4 | 39.2 | 45.1 | 48.3 |

* Note: For shear loads acting towards an edge or where these minimum dimensions are not achievable, please use the simplified strength limit state design process to verify capacity.

7.2

DESCRIPTION AND PART NUMBERS

| Part Description | Capacity (kN) | Part Number |
|------------------|---------------|-------------|
| A7-28 Cartridge | 825 ml | A7-28 |
| A7-28 Nozzles | - | A50 |
| A7-8 Cartridge | 235 ml | A7-8 |
| A7-8 Nozzles | - | A24 |

Effective depth, h (mm)

Preferred $h = h_n$ otherwise,

$$h = L_e - t$$

$$h \geq 6 \cdot d_h$$

t = total thickness of material(s) being fastened.

7.3

ENGINEERING PROPERTIES

Refer to "Engineering Properties" for Chemset Anchor Studs on page 7.

ADJUSTMENT OF GATES WITH P-SEALS

ADJUSTING:

Check the clearance between the seal and the head following installation with a .002 feeler gauge. Gauge should not pass at any point around the seal perimeter.

SPECIAL INSTALLATION NOTE:

Any dual operated or wide (60" or over) weir or slide gate 'P' seals are to be adjusted after installation of gate to wall.

TO ADJUST P-SEAL:

1. Loosen P-Seal retainer bolts.
2. Force P-Seal retainer and P-Seal against head.
3. Tighten P-Seal retainer bolts.

REPLACEMENT OF P-SEALS:

To replace worn or damaged P-Seal's

1. Remove P-Seal retainer bolts.
2. Remove P-Seal retainer and P-Seal.
3. Place new P-Seal on spigot.
4. Place P-Seal retainer over P-seal tail.
5. Replace P-Seal retainer bolts.
6. Force P-Seal retainer and P-Seal against gate head and tighten P-Seal retainer bolts.

PROCEDURE FOR INSTALLING WALL THIMBLES

1. The front face is marked on the vertical centerline of all Golden Gate's thimbles.
2. Bracing "when necessary for handling" is installed on Golden Harvest, Inc. thimbles.
3. Wall thimbles should be set with the top mark up and top and bottom centerline marks plumb.
4. After being set at the proper elevation, the wall thimble must be internally braced to carry the weight of the concrete. Care should be used in placement of the braces so as not to distort the wall thimble. Gate attaching holes and hardware will not be in alignment if the wall thimble is distorted. The "shipping" bracing may be removed so as to not interfere with the "installation bracing".
5. The wall thimble should be firmly supported on the form. Forms should be supported and stiffened against movement. If forms move they will distort the wall thimble mounting flange, and the sluice gate will leak.
6. Unless otherwise shown or noted the gate mounting flange should be flush with the wall.
7. After the concrete has hardened and the forms removed, the front surface of the wall thimble should be thoroughly cleaned. Make sure to remove any concrete that has flowed onto the surface from the edges.

INSTALLATION OF FABRICATED SLUICE GATES TO CONCRETE WALL

NOTE FIRST:

The most critical aspect for ensuring a proper sluice gate installation: Be sure sluice gate frames are installed plumb and straight. Failure to do so will impair smooth operation and cause excessive leakage.

ATTACH TO WALL

1. Secure all anchor bolts in the proper position on the concrete wall, (using frame rail for template). For proper size, projection and anchor type see installation drawings. Wedge or epoxy type anchors are normally provided. For installing anchor bolts, see section, "Installation of Anchor Bolts", for manufacturer's recommended installation procedure.
2. Two nuts are provided per bolt. Place one nut on bolt allowing for approximately 1" of grout (or as shown on the drawings) between gate frame and concrete wall. Place the gate frame into position on the anchor bolts. Install second nut on each anchor bolt. Align the gate frame by adjusting the front and back nuts. Be sure that both frame rails are parallel and plumb, as an improperly aligned or warped gate frame will cause excessive leakage and impair smooth operation of the gate.
3. After guide frame is mounted plumb and straight and nuts are tightened, fill the void between gate frame and concrete wall with a non-shrink grout.

MOUNTING SLUICE GATES

INSTALLATION ON WALL THIMBLES:

1. The face of the wall thimble and the mounting flange of the sluice gate should be thoroughly cleaned.
2. Wall thimble studs should be in place.
3. A rubber gasket is provided and is placed between the surface of the thimble and the mounting flange of the sluice gate. Two beads of Bostik 1000 urethane sealant should be placed on both sides of the gasket.
4. The gate can now be lifted and set over the studs and nuts put in place and tightened.
5. Trim off any exposed gasket.

UPPER GATE FRAME ANCHOR BOLTS:

Anchor bolts are required to support the upper frame members. These anchor bolts are provided with double nuts so that upper gate frame members can be clamped in position.

ADJUSTMENT OF SLUICE GATES

ADJUSTING STAINLESS STEEL SLUICE GATES

WEDGE BAR BOLTS

1. Make sure gate head is in fully closed position.
2. Loosen lock nuts on all adjusting bolts.
3. Turn each bolt until it just contacts pressure bar.
4. Tighten each bolt exactly one half (1/2) turn. Set lock nuts.

TOP WEDGES

1. Adjust wedge pads until they contact mating surfaces on gate head.
2. Tighten each nut one full turn.

If, after both tightening procedures are completed, gate leakage exceeds specified allowable rate: Repeat procedure increasing turns on each wedge bar bolt by 50%, and the wedge by 25%.

INSTALLATION OF PEDESTAL AND OPERATOR ON OPERATING FLOOR

IMPORTANT: After assembling stem be sure to screw bottom stop nut onto stem.

1. Place a nut on each anchor bolt and run down to operating floor.
2. Lower pedestal over stem and onto anchor bolts to approximately one inch from floor.
3. Carefully lower the lift unit over the upper threaded portion of stem engaging the threads of the lift unit and stem.
4. Turn the crank or handwheel to lower the lift onto the base of pedestal, align operator and pedestal mounting holes. Use bolts and nuts provided to secure lift to pedestal platform.
5. Using the leveling nuts under the base of the pedestal for adjustment, align center line of lift nut until it is parallel with the center line of the stem. Tighten top nuts on anchor bolts and grout void under pedestal.

INSTALLATION OF ELECTRIC LIFTS

NOTE: During wiring installation, should it become necessary to leave the unit for a period of time, close and tighten switch compartment and any open conduit taps so that electrical components are not left exposed to the elements.

1. Install the electrical operator the same as the manual operator described in section, "Installation of Pedestal and Operator on Operating Floor".
IMPORTANT: Alignment of operator and stem is imperative. (Reexamine all segments, stem, stem guides, brackets, pedestal, operator, etc.)
2. Operate the unit by handwheel ONLY when initially setting the limit switches. Before using the electrical controls, manually open the gate a minimum of 4 inches. Carefully check for correct motor rotation direction. If the motor is driving the gate in the wrong direction, interchange any two leads on three phase motors or switch the armature leads on D.C. and single phase motors.
3. Use protective plastic stem cover. Check gate stem travel and clearance before mounting cover on rising stem.
4. Replace all molded plastic conduit and top protectors (installed for shipping purposes only) with pipe plugs when installation wiring is complete.
5. Set up periodic operating schedule for infrequently used gates.
6. Keep the gate stem clean and lubricated.
7. Do not force the declutch lever into motor operation. LEVER WILL AUTOMATICALLY RETURN TO MOTOR OPERATION WHEN MOTOR IS ENERGIZED.
8. Do not force the declutch lever into hand operation. If the clutch does not easily engage, rotate handwheel slowly while operating the declutch lever.

CAUTION: Shut off incoming power before opening switch compartment.

MOUNTING WALL BRACKETS AND STEM GUIDES

1. Place anchor bolts for wall brackets and stem guides as shown on installation drawings.
 2. Check for proper alignment of wall brackets, stem guides, and gate.
 3. Place wall brackets and stem guide brackets on anchor bolts and tighten nuts. Top surface of brackets must be aligned perpendicular with stem and stem must be near the center of stem slot.
 4. Install stem guide bushings on stem guide brackets with the stainless steel bolts provided. If a base plate stem guide is required be sure to insert it between wall bracket and pedestal base.
-

INSTALLATION OF STEMS

Installing stems

1. When required, stems are shipped with thrust nuts and stem couplings attached.
2. After gate has been mounted, lower proper stem section through the stem guide on top of gate yoke.
3. When a thrust nut is used, place it in the stem pocket. Thread or place the stem into the thrust nut until the stem is flush with bottom of nut. Tighten set screws or place bolts thru holes in stem block and stem. When an aluminum or stainless steel stem pocket is used instead of a thrust nut, place stem in pocket and place bolts thru the angles and stem and attach nuts.
4. If stems are in more than one piece, stems must be installed in their proper order from bottom to top. The end of each stem section and stem coupler are match marked to insure correct installation.

INSTALLATION OF STOP NUTS

IMPORTANT: If bottom stop nut is required it must be ran down on the stem prior to mounting operator.

1. After lift installation and gate is in the fully closed position and wedges adjusted (if required), run stop nut down on the top of the projecting stem until firm contact is made with the top of the lift nut. Mark stem with set screw, back stop nut off and drill stem 1/8" deep. Reposition collar and tighten stop nut set screw.
 2. With gate in full open position place bottom stop nut (if required) against the upward stop. Mark stem with set screw and drill as described above.
-

INSTALLATION OF STEM COVERS

IMPORTANT: Clear plastic stem covers have drilled vent holes make sure this end is up.

1. When clear plastic stem covers are used care must be taken not to scratch or break cover. Covers are marked to match gate. Check to make sure cover is approximately 6" longer than gate height.
 2. A threaded PVC adaptor is provided. Sealant (Bostik 1000 provided) should be used on threads. Screw adaptor into receiver on top of lift housing. Place a bead of sealant (Bostik 1000 provided) into the receiving end of the adaptor. Be sure stem cover is plum. Place a bead of sealant (Bostik 1000 provided) in the top cap and install on the top end of stem cover.
-

ATTACHING MYLAR INDICATORS TO CLEAR PLASTIC STEM COVERS

After lift and stem cover has been properly installed, the gate adjusted for proper seating, and the stop nuts are set and locked, the calibrated indicator must be installed.

1. Clean plastic stem cover.
2. Graduated, self-adhesive mylar tape is provided to indicate gate position.
3. Indicate on plastic stem cover where top of stem comes when gate is in closed position.
4. Remove protective coating from the mylar tape and smoothly apply to plastic stem cover.

SLUICE GATE INSTALLATION CHECK LIST AND INITIAL OPERATING INSTRUCTIONS

1. Make sure all foreign material is removed from seating surfaces of the sluice gate.
2. Check to make sure that stem guides and brackets are securely fastened.
3. Clean and lubricate stem.
4. Adjust stop nut to within 1/16" of the top of lift nut and lock in place.
5. Install stem cover if required.
6. The sluice gate should be operated to the fully opened and fully closed position slowly to check for any misalignment or problems in operation.
7. If operation becomes difficult. **EXCESSIVE FORCE SHOULD NOT BE APPLIED** to crank or hand wheel. Check **SLUICE GATE TROUBLE SHOOTING SECTION** for remedy.

FLAP GATE INSTALLATION CHECK LIST AND INITIAL OPERATING INSTRUCTIONS

AFTER INSTALLING FLAP GATE AND BEFORE INITIAL OPERATION CHECK THE FOLLOWING:

1. Check guide frame for proper alignment.
2. Clean the gate slide, guides, seals and invert of all foreign material.
3. If P-seals, are used, clean contact area and adjust seal.
4. Install stem cover if required.
5. If gate does not operate smoothly or shows excess leakage, see FLAP GATE TROUBLE SHOOTING SECTION for remedy.

FLAP GATE TROUBLE SHOOTING

| <u>PROBLEM</u> | <u>REASON</u> | <u>SOLUTION</u> |
|--------------------------|------------------------------------|--|
| HARD TO OPERATE | Warped or distorted guides | Loosen anchor bolt nuts, shim gate to true plane. Place non-shrink grout between guide and wall |
| LEAKAGE – SIDES | Guides warped or distorted | Loosen anchor bolt nuts, shim gate to true plane, place non-shrink grout between guides and wall |
| LEAKAGE – BOTTON OF GATE | Foreign material on or around seal | Remove foreign material |

FLAP GATE MAINTENANCE

No maintenance other than periodic cleaning and operation of the flap gates is required. (Gates should be operated every three months.

STAINLESS STEEL SLUICE GATE TROUBLE SHOOTING

| <u>PROBLEM</u> | <u>REASON</u> | <u>SOLUTION</u> |
|--------------------------|--|--|
| HARD TO OPERATE | Warped or distorted guides | Loosen anchor bolt nuts, shim gate to true plane. Place non-shrink grout between guides and wall. |
| | Foreign material in guide grooves | Remove foreign material from guide grooves. |
| | Dry or dirty stem threads | Clean threads and grease with recommended lubricant. |
| | Gates with dual stems: Head operating unevenly | Disconnect couplings on interconnecting shaft. Rotate hoist until gate head is level. Reconnect couplings. |
| LEAKAGE – GENERAL | Wedge bar bolts/top wedge loose | See "Adjusting Sluice Gates" |
| LEAKAGE – SIDES | Guides warped or distorted | Loosen anchor bolts nuts, shim gate to true plane, place non-shrink grout between guides and wall. |
| | Foreign material wedged between head and guide | Remove foreign material from guides. |
| LEAKAGE – BOTTOM OF GATE | Foreign material on or around seal | Remove foreign material. |
| LEAKAGE – TOP OF GATE | Over tightening operator in closed position | Limit operator, force to 40 lbs of pull. Make sure stop nut is properly installed. |
| BOWING STEM | Loosen stem guides | Tighten stem guide anchor bolts and stem guide bushing bolts. |
| | Stem guides not installed per installation drawings. | Install stem guides per drawings. |
| | Excessive operator output | Limit input to crank or hand wheel to 40 lbs. |

LUBRICATION

OPERATORS:

At least twice a year all grease fittings on manual operators should be lubricated with a small amount of heavy duty grease. (See lubrication chart).

OPERATING STEM:

To insure proper operation and life of operating stems and lift nuts, it is very **IMPORTANT THAT OPERATING STEMS ARE CLEANED AND GREASED EVERY SIX MONTHS**. To help keep stem and lift nuts clean, the use of stem covers are recommended. (For recommended grease see lubrication chart).

LUBRICATION CHART

OPERATORS:

Mobilgrease Special*

Lubriplate #630-AA*

Chevron R.M.P. Heavy Duty Grease EPNLGI2*

Unocal Megaplex XD-2*

STEMS:

Lubriplate #630-2*

Shell Alvania 2-EP*

Mobilox 2-EP*

Valvoline Val-Lith 2-EP*

Chevron Ultra Duty Grease EP-2*

Unocal Unoba EP-2*

*If food grade grease is required use high quality food grade grease intended for use in potable water

OPERATOR SAFETY

Golden Harvest Inc. does not have specific instructions beyond basic plant safety practices for its products.

SPARE PARTS LIST

Golden Harvest Inc. doesn't have any "high wear" parts on this equipment, therefore, no spare parts are recommended.

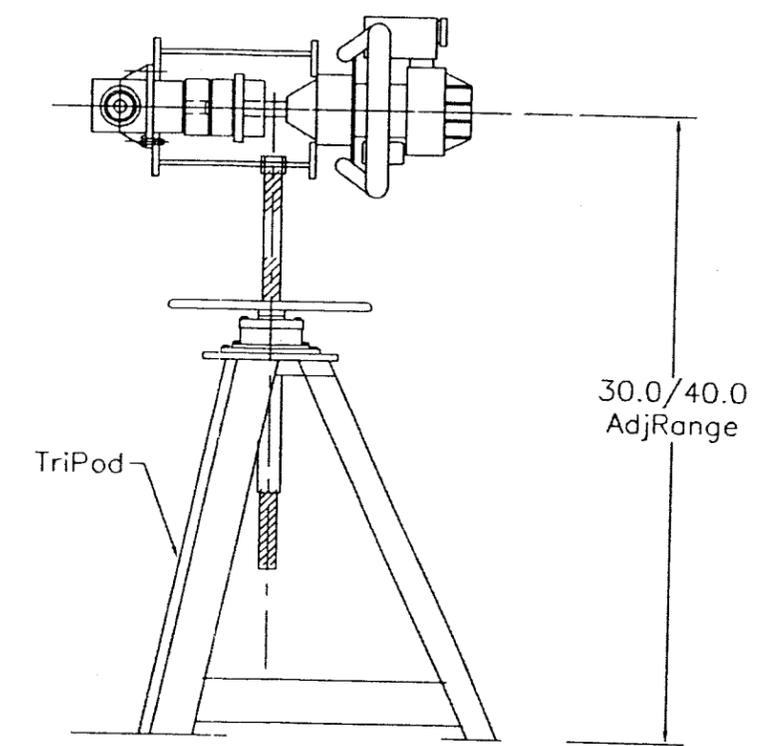
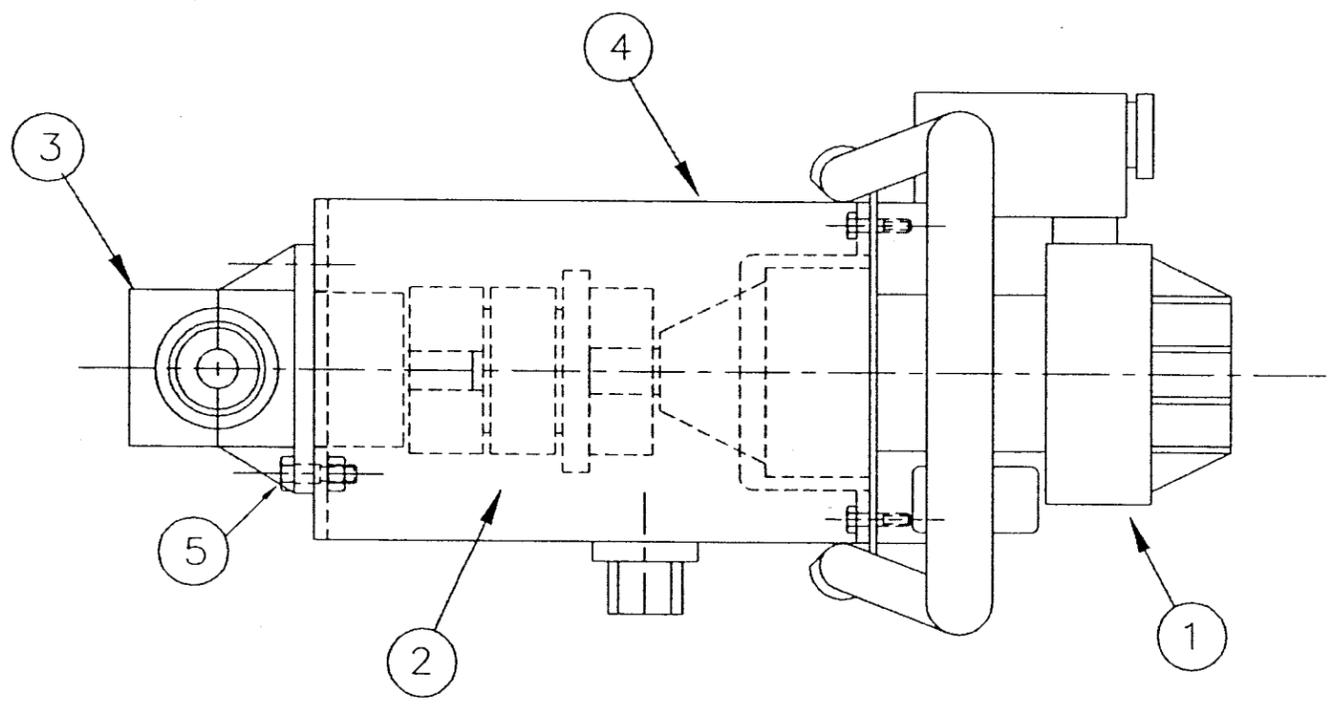
PARTS LIST

The parts list for each gate is located on the corresponding drawing.

SPECIAL TOOLS

No special tools are required to install or maintain Golden Harvest gates.

| BILL OF MATERIAL | | | |
|------------------|-----|-----------------------|-----------|
| ITEM | QTY | DESCRIPTION | MATERIAL |
| 1 | 1 | Gas Powered Driver | E 43 |
| 2 | 1 | Torque Limit Clutch | R & W |
| 3 | 1 | Rt Angle Gear Box | Model 175 |
| 4 | 1 | Support Housing | ALUM 5052 |
| 5 | 4 | 1/4x1.25 SSTL HXHDBLT | COML |
| | | | |
| | | | |
| | 1 | Tripod | Alum/Sstl |



(1) REQUIRED

| | | | | |
|---|--|--------|-----------------|-----------------|
| GOLDEN HARVEST GOLDEN GATES P.O. BOX 287 1-800-338-6238 Burlington, WA 98233 | | | Date Drawn: | 02-19-08 |
| | | | Revision: | |
| PORTABLE GAS OPERATOR | | | Revision: | |
| | | | Revision: | |
| | | | G.H. Drawing #: | 3 |
| Drawn By: | | Scale: | Job No.: | Contract Sht #: |
| MK | | NTS | 07-0764 | |



Golden Harvest, Inc

Golden Gates™

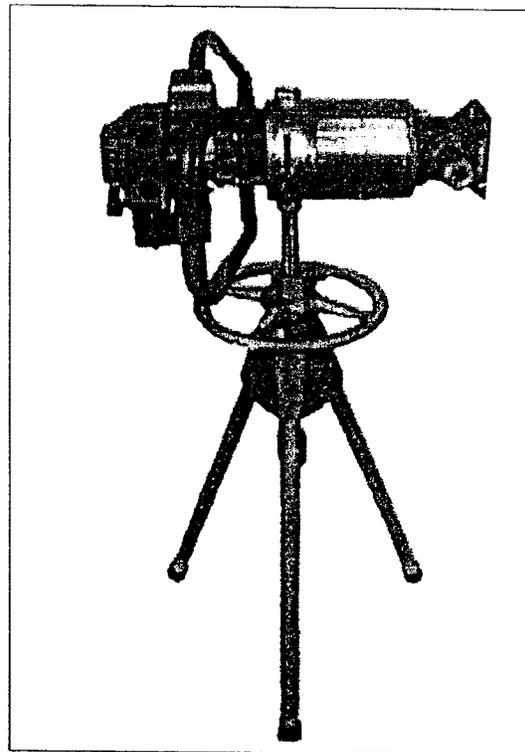
GH-1100 GASOLINE POWERED PORTABLE VALVE ACTUATOR

GOLDEN HARVEST, INC. GH-1100 "UNIVERSAL" GASOLINE POWERED PORTABLE VALVE ACTUATOR

Introducing the Golden Harvest, Inc. "Universal" Portable Valve Actuator driven by a powerful gasoline engine. The Universal actuator is designed to rotate input shafts on a variety of valve types including butterfly, gate plug, ball, sluice and slide, regardless of brand. By simply rotating the unit 180 degrees, a clockwise or counterclockwise output can be generated, allowing either opening or closing functions.

The Universal GH-1100 actuator can include a "64 spline to 3/4 square" coupler for interchanging between the two output shafts. Adapters can be included for use with almost any input, including 2" square, half round, or a variety of square shaft sizes.

The GH-1100 actuator is available with an optional all aluminum tripod cart for ease of operation. The unit may also be used with an optional single leg steadyrest or be hand held.



MODEL GH-1100 GASOLINE POWERED PORTABLE ACTUATOR

TYPICAL SPECIFICATION

A portable, two-cycle, gasoline engine actuator shall be furnished with all the necessary adaptors to drive the gates and valves specified.

Maximum output torque shall be less than 80 foot pounds. Drive unit shall incorporate a direct drive design only. (Belt and chain drive mechanisms are unacceptable.) The unit shall drive the operators using a (T-drive) gear box. Reverse operation is achieved by rotating the drive unit 180 degrees. A safety clutch must be supplied with any unit that exceeds 80 foot pounds of output torque. The entire unit shall weigh less than 40 pounds. The actuator shall be Model GH-1100 as manufactured by Golden Harvest, Inc. or an approved equal.

INSTRUCTIONS FOR THE OPERATION AND MAINTENANCE OF MODEL GH-100 GAS POWERED OPERATOR

READ PRIOR TO OPERATING

OPERATION:

The gasoline powered portable operator is designed to rotate the stem shaft of slide gates or sluice gates.

The portable operator is capable of rotating the stem CW or CCW.

This is accomplished by utilizing the proper operator output.

The operator will include a spline to 2"sq drive adapter or a spline to ¾" sq coupler and an extension shaft with a 2"sq nut driver.

The adapters may be used at either operator drive location.

WARNING

Do not carry the operator while the engine is running.

- a. Use the butterfly handles only for carrying the operator.
- b. Use of the Tri-pod stand or peg-leg will reduce the risk of manpower fatigue.
- c. Continual clutch slippage will cause over heating of the clutch shoes and reduce its ability to transfer torque.
- d. For extremely cold weather operation; store the operator in a cool dry place when not in use. The transfer of the operator from a warm location to a cold location can form harmful condensation.

MAINTENANCE:

1. Read the engine operating manual and follow the instructions for type of fuel, starting technique and general operation.
2. The engine should be operated for two hours or more before it is "broken in" for the best results. All units are tested at the factory but are not operated for the full break-in period.
3. Clutch slippage may occur during its break-in. The clutch unit should be kept free of oil or other moisture for efficient operation.
4. The output shaft and coupler should not rotate when the engine is idling. The coupler or shaft should begin to rotate when the engine RPM is brought up.
5. The red gear case has 4oz. of grease inserted at the factory. Check twice yearly and add only when needed, DO NOT overfill.

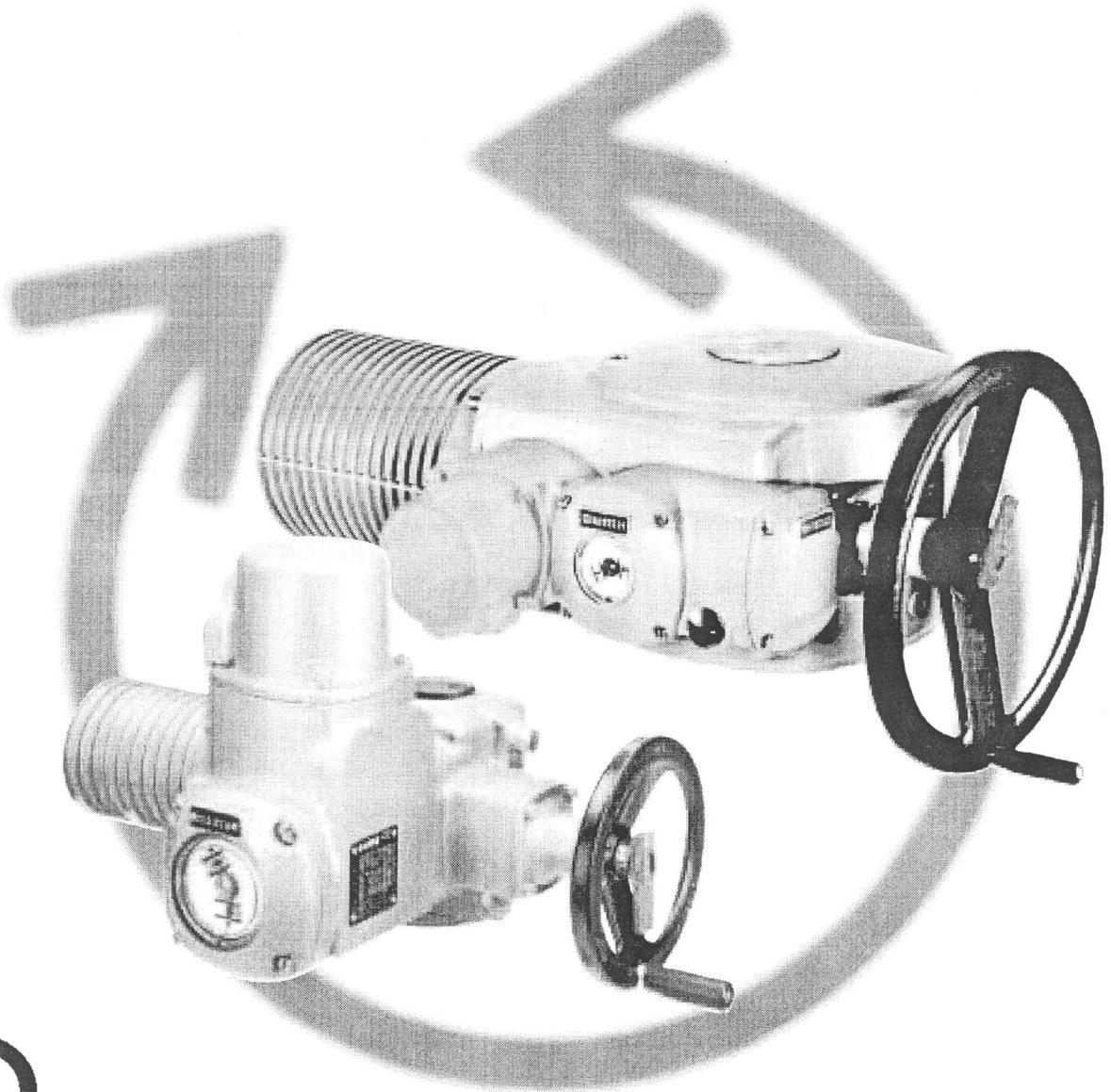
WARRANTY:

The gas engine is warranted by the engine manufacturer in a separate warranty, for a period of two years. All parts of this operator assembly are warranted for 90 days.

auma®

Electric multi-turn actuators

SA 07.1 – SA 48.1
SAR 07.1 – SAR 30.1
AUMA NORM
for flanges type FA



AUMA Actuators, Inc.
Registered to ISO 9001
Certificate No. A4682

Operation instructions

Scope of these instructions: These instructions are valid for multi-turn actuators of the type range SA 07.1 – SA 48.1 and SAR 07.1 – SAR 30.1 in version AUMA NORM. These operation instructions are only valid for “clockwise closing”, i.e. driven shaft turns clockwise to close the valve.

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1. Safety instructions

- 1.1 Range of application** AUMA actuators are designed for the operation of industrial valves, e.g. globe valves, gate valves, butterfly valves and ball valves. For other applications, please consult us. The manufacturer is not liable for any possible damage resulting from use in other than the designated applications. Such risk lies entirely with the user. Observance of these operation instructions is considered as part of the actuator's designated use.
- 1.2 Commissioning (electrical connection)** During electrical operation, certain parts inevitably carry lethal voltages. Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.
- 1.3 Maintenance** The maintenance instructions (refer to page 25) must be observed, otherwise a safe operation of the actuator is no longer guaranteed.
- 1.4 Warnings and notes** Non-observance of the warnings and notes may lead to serious injuries or damage. Qualified personnel must be thoroughly familiar with all warnings and notes in these operation instructions. Correct transport, proper storage, mounting, and installation, as well as careful commissioning are essential to ensure a trouble-free and safe operation. During operation, the multi-turn actuator warms up and surface temperatures > 140 °F may occur. Check the surface temperature prior to contact in order to avoid burns. The following references draw special attention to safety-relevant procedures in these operation instructions. Each is marked by the appropriate pictograph.



This pictograph means: Note!

“Note” marks activities or procedures which have major influence on the correct operation. Non-observance of these notes may lead to consequential damage.



This pictograph means: Electrostatically endangered parts!

If this pictograph is attached to a printed circuit board, it contains parts which may be damaged or destroyed by electrostatic discharges. If the boards need to be touched during setting, measurement, or for exchange, it must be assured that immediately before a discharge through contact with an earthed metallic surface (e.g. the housing) has taken place.



This pictograph means: Warning!

“Warning” marks activities or procedures which, if not carried out correctly, can affect the safety of persons or material.

2. Short description

AUMA multi-turn actuators type SA 07.1 – SA 48.1 and SAR 07.1 – SAR 30.1 have a modular design. The limitation of travel is realized via limit switches in both end positions. Torque seating is also possible in both end positions. The type of seating is determined by the valve manufacturer.

3. Technical data

Table 1: Multi-turn actuator SA 07.1 – SA 48.1 / SAR 07.1 – SAR 30.1

| | |
|---|---|
| Multi-turn actuators AUMA NORM require electric controls. AUMA offers the controls AUMA MATIC AM or AUMATIC AC for the sizes SA(R) 07.1 - SA(R) 16.1. These can also easily be mounted to the actuator at a later date. | |
| Features and functions | |
| Type of duty ¹⁾ | Standard: SA Short time duty S2 - 15 min SAR Intermittent duty S4 - 25 % Option: SA Short time duty S2 - 30 min SAR Intermittent duty S4 - 50 % Intermittent duty S5 - 25 % |
| Motors | Standard: 3-ph AC asynchronous motor, type IM B9 according to IEC 34 Options: 1-ph AC motor, type IM B14 according to IEC 34 DC shunt motor, type IM B14 according to IEC 34 DC compound motor, type IM B14 according to IEC 34 Special motors |
| Insulation class | Standard: F, tropicalized Option: H, tropicalized |
| Motor protection | Standard: Thermostats (NC) Option: PTC thermistors (according to DIN 44082) |
| Supply voltage | Refer to motor nameplate |
| Self-locking | yes; for output speeds from 4,8 to 108 rpm and from size SA 35.1 for output speeds from 4,8 to 26 rpm |
| Limit switching | Counter gear mechanism for end positions CLOSED and OPEN for 1 to 500 turns per stroke (optional for 1 to 5,000 turns per stroke) Standard: Tandem switch (2 NC and 2 NO) for each end position; switches galvanically isolated Options: Single switch (1 NC and 1 NO) for each end position Triple switch (3 NC and 3 NO) for each end position, switches galvanically isolated Intermediate position switch (DUO limit switching) |
| Torque switching | adjustable torque switching for direction OPEN and CLOSE Standard: Single switch (1 NC and 1 NO) for each direction Options: Tandem switch (2 NC and 2 NO) for each direction, switches galvanically isolated |
| Non-intrusive setting (option) | Magnetic limit and torque transmitter MWG for the sizes SA 07.1 – SA 48.1 (only possible in combination with actuator controls AUMATIC) for 1 to 500 turns per stroke or for 10 to 5,000 turns per stroke |
| Position feedback signal, analogue (options) | Potentiometer or 0/4 – 20 mA For further details see separate data sheet |
| Torque feedback signal, analogue (option) | Only in combination with magnetic limit and torque transmitter MWG and actuator controls AUMATIC |
| Mechanical position indicator (option) | Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED |
| Running indication (option) | Blinker transmitter |
| Heater in switch compartment | Standard: self-regulating PTC heater, 5 – 20 W, 110 – 250 V DC/AC Options: 24 – 48 V DC/AC or 380 – 400 V AC A resistance type heater (5 W, 24 V DC) is installed in the actuator in combination with the actuator controls AUMA MATIC or AUMATIC. |
| Motor heater (option) | SA(R) 07.1 – 10.1: 12.5 W SA(R) 14.1 – 16.1: 25 W SA(R) 25.1 – 30.1: 50 W SA 35.1 – 48.1: 50 W |
| Manual operation | Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation. Option: Handwheel lockable |
| Electrical connections | Standard: SA(R) 07.1 – 16.1: AUMA plug/socket connector with screw type connection, SA(R) 25.1 – 48.1: Control connections on AUMA plug/socket connector, motor connection via terminals Option: for special motors: Motor connection directly via terminal board at the motor |
| Threads for cable glands | Standard: NPT-threads Options: Pg-threads, G-threads |
| Terminal plan | Terminal plan according to commission number included in delivery |
| 1) Based on 68 °F ambient temperature and at an average load with running torque according to Technical data SA(R). | |

| Service conditions | |
|---|--|
| Output drive types | A, B1, B2, B3, B4 according ISO 5210 (A, B2, B4 according to MSS SP-102) A, B, D, E according to DIN 3210 C according to DIN 3338 Special output drives: AF, AK, AG, IB1, IB3 |
| Enclosure protection according to EN 60 529 ²⁾ | Standard: IP 67 Options: IP 68 IP 67-DS (Double Sealed) IP 68-DS (Double Sealed) (Double Sealed = additional protection of the interior of the housing against ingress of dust and dirt when removing the plug) |
| Corrosion protection | Standard: KN Suitable for installation in industrial units, in water or power plants with a low pollutant concentration Options: KS Suitable for installation in occasionally or permanently aggressive atmosphere with a moderate pollutant concentration (e.g. in wastewater treatment plants, chemical industry) KX Suitable for installation in extremely aggressive atmosphere with high humidity and high pollutant concentration KX-G Same as KX, however aluminium-free version (outer parts) |
| Finish coating | Standard: Two part acrylic polyurethane |
| Color | Standard: Dark grey (DB 702, similar to RAL 9007) Option: Other colours are possible on request |
| Ambient temperature ³⁾ | Standard: SA – 20 to + 80 °C/ – 20 to + 175 °F SAR – 25 to + 60 °C/ – 20 to + 140 °F Options: SA – 40 to + 60 °C/ – 40 to + 140 °F (low temperature) – 50 to + 60 °C/ – 58 to + 140 °F (extreme low temperature) – 60 to + 60 °C/ – 75 to + 140 °F (extreme low temperature) – 0 to + 120 °C/ + 32 to + 250 °F (high temperature) SAR – 40 to + 60 °C/ – 40 to + 140 °F (low temperature) |
| Vibration resistance according to IEC 60068-2-6 | 2 g, for 10 to 200 Hz (only for sizes SA(R) 07.1 – SA(R) 16.1 without controls) Resistant to vibrations during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Valid for multi-turn actuators in version AUMA NORM (with AUMA plug/socket connector, without actuator controls). Not valid in combination with gearboxes |
| Lifetime ⁴⁾ | SA 07.1 – SA 10.1 20,000 operating cycles (OPEN - CLOSE - OPEN) with 30 turns per stroke SA 14.1 – SA 16.1 15,000 operating cycles SA 25.1 – SA 30.1 10,000 operating cycles SA 35.1 – SA 48.1 5,000 operating cycles SAR 07.1 – SAR 10.1 ⁴⁾ 5 million starts SAR 14.1 – SAR 16.1 ⁴⁾ 3.5 million starts SAR 25.1 – SAR 30.1 ⁴⁾ 2.5 million starts |
| Other information | |
| Reference documents | Product description “Electric multi-turn actuators SA” Dimension sheets SA(R) Electrical data sheets SA/SAR Technical data sheets SA/SAR |
| <p>2) For 3-phase asynchronous motors in enclosure protection IP 68, higher corrosion protection KS or KX is strongly recommended. Additionally, for enclosure protection IP 68, we recommend to use the double sealed terminal compartment DS. For 1-phase AC motors, DC motors, or special motors, the enclosure protection according to the name plate applies.</p> <p>3) Versions with RWG up to max. to + 158 °F</p> <p>4) The lifetime depends on the load and the number of starts. A high starting frequency will rarely improve the modulating accuracy. To reach the longest possible maintenance and fault-free operation time, the number of starts per hour chosen should be as low as permissible for the process.</p> | |

4. Transport, storage and packaging

4.1 Transport

- For transport to place of installation, use sturdy packaging.
- Do not attach ropes or hooks to the handwheel for the purpose of lifting by hoist.
- If multi-turn actuator is mounted on valve, attach ropes or hooks for the purpose of lifting by hoist to valve and not to multi-turn actuator.

Fitting the handwheel:

For transport purposes, handwheels from a diameter of 400 mm (1 inch corresponds to 25.4 mm) are supplied separately.



Engage manual operation prior to mounting the handwheel! If the manual operation is not engaged, damages can occur at the change-over mechanism.

- Engage manual operation (figure A-1):
Manually lift the red change-over lever while slightly turning the shaft back and forth until manual operation engages. The manual operation is correctly engaged if the change-over lever can be lifted by approx. 85°.



Manual force is sufficient for operating the change-over lever. It is not necessary to use an extension. Excessive force may damage the change-over mechanism.

- Install the hand wheel over the red change-over lever on to the shaft (figure A-2).
- Secure handwheel using the snapping supplied.

Figure A-1

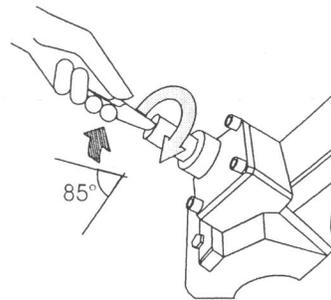
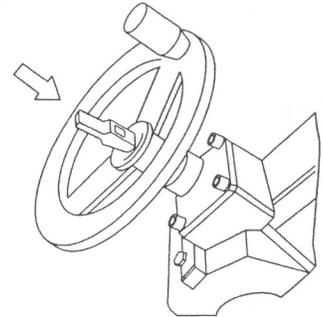


Figure A-2



4.2 Storage

- Store in well-ventilated, dry room.
- Protect against floor dampness by storage on a shelf or on a wooden pallet.
- Cover to protect against dust and dirt.
- Apply suitable corrosion protection agent to uncoated surfaces.

If multi-turn actuators are to be stored for a long time (more than 6 months), in addition, the following points must imperatively be observed :

- Prior to storage: Protect uncoated surfaces, in particular the output drive parts and mounting surface, with long-term corrosion protection agent.
- Check for corrosion approximately every 6 months. If first signs of corrosion show, apply new corrosion protection.



After mounting, connect actuator immediately to electrical system, so that the heater prevents condensation.

4.3 Packaging

Our products are protected by special packaging for the transport ex works. The packaging consists of environmentally friendly materials which can easily be separated and recycled.

We use the following packaging materials: wood, cardboard, paper and Polyurethane foam. For the disposal of the packaging material, we recommend recycling and collection centers.

5. Mounting to valve/gearbox



- Prior to mounting the multi-turn actuator must be checked for damage. Damaged parts must be replaced by original spare parts.
- After mounting, check multi-turn actuator for damage to paint finish. If damage to paint-finish has occurred after mounting, it has to be touched up to avoid corrosion.

Mounting is most easily done with the valve shaft/gearbox shaft pointing vertically upward. But mounting is also possible in any other position. The multi-turn actuator leaves the factory in position CLOSED (limit switch CLOSED tripped).

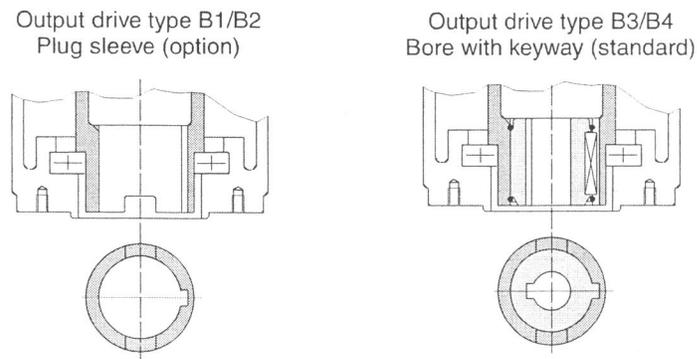
- Check if mounting flange fits the valve/gearbox.



Spigot at flanges should be loose fit!

The output drive types B1, B2, B3 or B4 (figure A-3) are delivered with bore and keyway (usually according to ISO 5210) and are sometimes shipped with bore and keyway according to customer request.

Figure A-3



For output drive type A (figure B-1), the internal thread of the stem nut must match the thread of the valve stem. If not ordered explicitly with thread, the stem nut is unbored or with pilot bore when delivered. For finish machining of stem nut refer to next page.

- Check whether bore and keyway match the input shaft of valve/gearbox.
- Thoroughly degrease mounting faces at multi-turn actuator and valve/gearbox.
- Apply a small quantity of grease to input shaft of valve/gearbox.
- Place actuator on valve/gearbox and fasten. Fasten bolts (quality grade 5, refer to table 2) evenly crosswise.

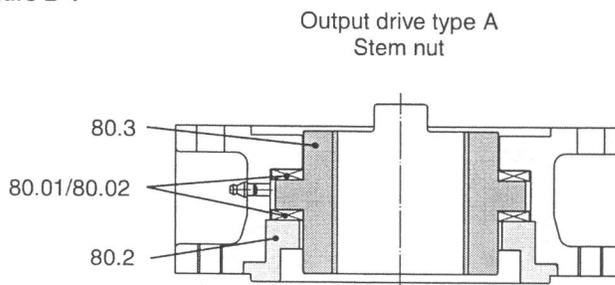
Table 2: Standard dry fastening torques for bolts

| UNC threads | T _A (ft lbs) |
|-------------|-------------------------|
| 5/16 - 18 | 19 |
| 3/8 - 16 | 33 |
| 1/2 - 13 | 78 |
| 5/8 - 11 | 155 |
| 3/4 - 10 | 255 |
| 1 - 8 | 590 |
| 1 1/4 - 7 | 1,200 |

Conversion factor: 1 Nm corresponds to 1.3529 ft lbs.

Finish machining of stem nut (output drive type A):

Figure B-1



The output drive flange does not have to be removed from the actuator.

- Remove spigot ring (80.2, figure B-1) from mounting flange.
- Take off stem nut (80.3) together with thrust bearing (80.01) and thrust bearing races (80.02).
- Remove thrust bearing and thrust bearing races from stem nut.
- Drill and bore stem nut and cut thread.
When fixing in the chuck, make sure stem nut runs true!
- Clean the machined stem nut.
- Apply Lithium soap EP multi-purpose grease to thrust bearing and races, then place them on stem nut.
- Re-insert stem nut with thrust bearings into the mounting flange. Ensure that dogs are placed correctly in the slots of the hollow shaft.
- Screw in spigot ring until it is firm against the shoulder.
- Press Lithium soap EP multi-purpose grease on mineral oil base into the grease nipple with a grease gun (for quantities, refer to table below):

Table 3: Grease quantities for lubricating bearings

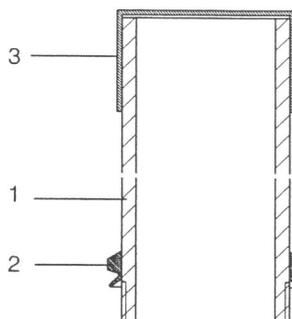
| Output drive | A 07.2 | A 10.2 | A 14.2 | A 16.2 | A 25.2 | A 30.2 | A 35.2 | A 40.2 | A 48.2 |
|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Qty ¹⁾ in g | 1.5 g | 2 g | 3 g | 5 g | 10 g | 14 g | 20 g | 25 g | 30 g |

1) For grease with a density $\rho = 900 \text{ g/dm}^3$; conversion factor: 1 oz corresponds to 28.35 g

Protection tube for rising valve stem

- Protection tubes may be supplied loose. Seal thread with hemp, Teflon tape, or thread sealing material.
- Screw protection tube (1) into thread (figure B-2) and tighten it firmly.
- Push down the sealing (2) to the housing.
- Check whether cap (3) is available and without damage.

Figure B-2: Protection tube for rising valve stem



6. Manual operation

The actuator may be operated manually for purposes of setting and commissioning, and in case of motor failure or power failure. Manual operation is engaged by an internal change-over mechanism.

- Engaging manual operation:**
- Lift up change-over lever in the center of the handwheel to approx. 85°, while slightly turning the handwheel back and forth until manual operation engages (figure C).

Figure C

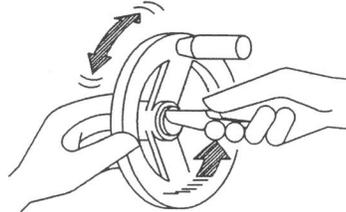


Figure D



Manual force is sufficient for operating the change-over lever. It is not necessary to use an extension. Excessive force may damage the change-over mechanism.

- Release change-over lever (should snap back into initial position by spring action, figure D), if necessary, push it back manually.



Operating the change-over lever while the motor is running (figure E) can lead to increased wear at the change-over mechanism.

Figure E

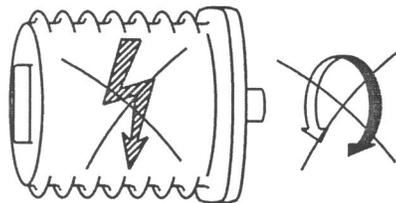
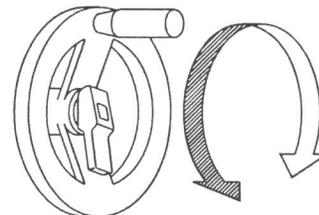


Figure F



- Turn handwheel in desired direction (figure F).

Disengaging manual operation:

Manual operation is automatically disengaged when the motor is started again. The handwheel does not rotate during motor operation.

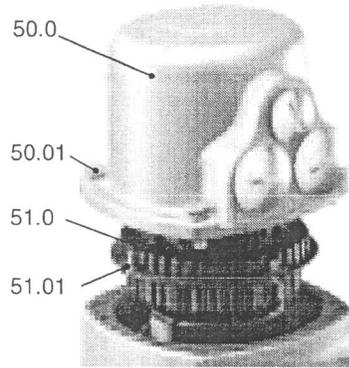
7. Electrical connection



Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

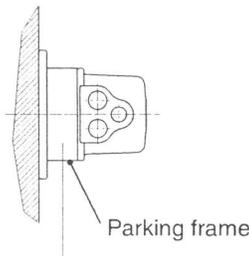
7.1 Connection with AUMA plug/socket connector

Figure G-1: Connection



- Check whether type of current, supply voltage, and frequency correspond to motor data (refer to name plate at motor).
- Loosen bolts (50.01) (figure G-1) and remove plug cover.
- Loosen screws (51.01) and remove socket carrier (51.0) from plug cover (50.0).
- Insert cable glands or conduit fittings suitable for connecting cables. (The enclosure protection stated on the name plate is only ensured if properly sealed connections are made).
- Seal cable entries which are not used with sealed threaded plugs.
- Connect cables according to order-related terminal plan.
- The terminal plan applicable to the actuator is placed inside the terminal compartment, the operation instructions are attached to the handwheel in a weather-proof bag.

Figure G-2: Parking frame (accessory)



A special parking frame (figure G-2) for protection against touching the bare contacts and against environmental influences is available.

Table 4: Technical data AUMA plug/socket connectors

| Technical data | Power terminals ¹⁾ | Protective earth | Control pins |
|-------------------------------|-------------------------------|----------------------------|---|
| No. of contacts max. | 6 (3 are used) | 1 (leading contact) | 50 pins/sockets |
| Marking | U1, V1, W1, U2, V2, W2 | according to VDE | 1 to 50 |
| Voltage max. | 750 V | – | 250 V |
| Nominal current max. | 25 A | – | 16 A |
| Type of customer connection | Screws | Screw for ring lug | Screws |
| Cross section max. | 6 mm ² (10 AWG) | 6 mm ² (10 AWG) | 2.5 mm ² (12 AWG) |
| Material: Pin/ socket carrier | Polyamide | Polyamide | Polyamide |
| Contacts | Brass (Ms) | Brass (Ms) | Brass, tin plated or gold plated (option) |

1) Suitable for copper wires. For aluminium wires it is necessary to contact AUMA.
From size SA(R) 25.1, the motor connection is realised via a separate terminal board

7.2 Motor connection for the sizes SA(R) 25.1/SAR 30.1 – SA 48.1.

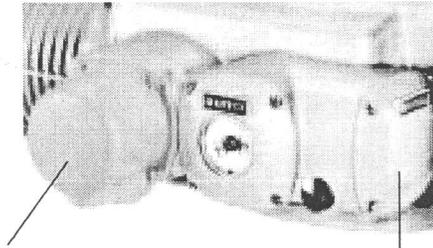
From the size SA(R) 25.1, the power for the motor is connected to separate terminals. For this, the cover at the motor connection compartment has to be removed.

The control contacts are connected to the AUMA plug/socket connector.

Cross section motor terminals:

16 mm² to 70 mm² (6 to 2/0 AWG), depending on the actuator size

Figure G-3: Connection to SA(R) 25.1



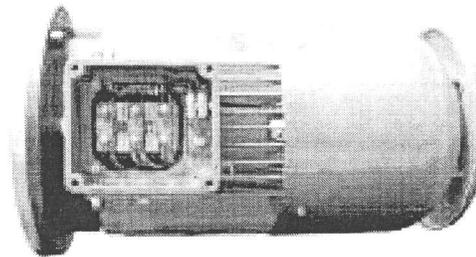
AUMA plug/socket connector

Cover motor connection compartment

7.3 Motor connection for special motors

For versions with special motors (e.g. DC motors), the connection is performed directly at the motor (figure G-4).

Figure G-4: Connection special motor



7.4 Delay time

The delay time is the time from the tripping of the limit or torque switches to the motor power being removed. To protect the valve and the actuator, we recommend a delay time < 50 ms. Longer delay times are possible provided the output speed, output drive type, valve type, and the type of installation are taken into consideration.

We recommend to switch off the corresponding contactor directly by the limit or torque switch.

7.5 Controls made by AUMA

In case the required reversing contactors are not to be installed in the control cabinet, the controls AUMA MATIC or AUMATIC for the sizes SA(R) 07.1 – SA(R) 16.1 can be easily mounted to the actuator at a later date.

For enquiries and more information, please state our commission no. (refer to actuator name plate).

7.6 Heater

AUMA multi-turn actuators have a heater installed as standard. To prevent condensation, the heater must be connected.

7.7 Motor protection

In order to protect against overheating and extreme high temperatures at the actuator, PTC thermistors or thermostats are embedded in the motor winding. The thermostat is tripped as soon as the max. permissible winding temperature has been reached.

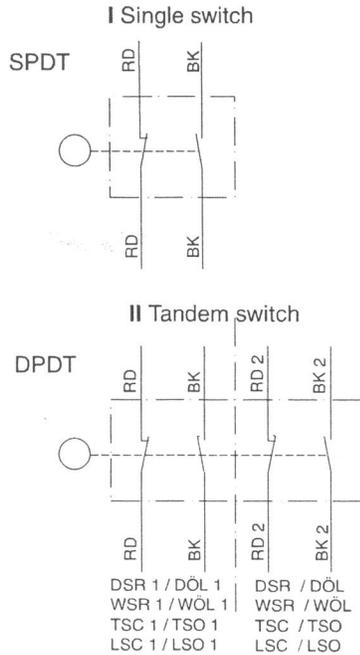
Failure to integrate PTC thermistors or thermostats into the control circuit voids the warranty for the motor.

7.8 Remote position transmitter

For the connection of remote position transmitters (potentiometer, RWG) shielded cables must be used.

7.9 Limit and torque switches

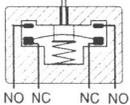
Figure G-5



Only the same potential can be switched on the two circuits (NC/NO contact) of a limit or torque switch. If different potentials are to be switched simultaneously, tandem switches are required.

To ensure correct actuator indications, the leading contacts of the tandem switches must be used for that purpose and the lagging contacts for motor switching off.

Table 5: Technical data for limit and torque switches

|  | Mechanical lifetime = 2 x 10 ⁶ starts | | |
|---|---|--------------------------------|-------|
| | Type of current | Switch rating I _{max} | |
| | 30 V | 125 V | 250 V |
| 1-phase AC (ind. load) cos phi = 0,8 | 5 A | 5 A | 5 A |
| DC (resistive load) | 2 A | 0,5 A | 0.4 A |
| with gold plated contacts | min. 5 V, max. 50 V | | |
| Current | min. 4 mA, max. 400 mA | | |

7.10 Fitting of the cover

After connection:

- Insert the socket carrier (51.0) into the plug cover (50.0) and fasten it with screws (51.01).
- Clean sealing faces at the plug cover and the housing.
- Check whether O-ring is in good condition.
- Apply a thin film of non-acidic grease (e.g. Vaseline) to the sealing faces.
- Replace plug cover (50.0) and fasten bolts (50.01) evenly crosswise.
- Fasten conduit connections with the specified torque to ensure the required enclosure protection.

8. Opening the switch compartment

To be able to carry out the following settings (sections 9. to 15.), the switch compartment must be opened and, if installed, the indicator disc must be removed.

These settings are only valid for “clockwise closing”, i.e. driven shaft turns clockwise to close the valve.



Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

8.1 Removing the switch compartment cover

- Loosen 4 bolts and take off the cover at the switch compartment (figures H).

Fig. H-1: Cover with indicator glass

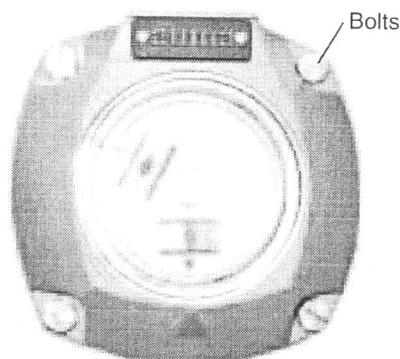
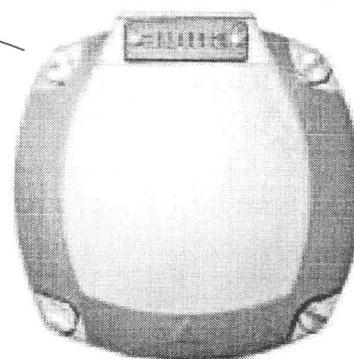


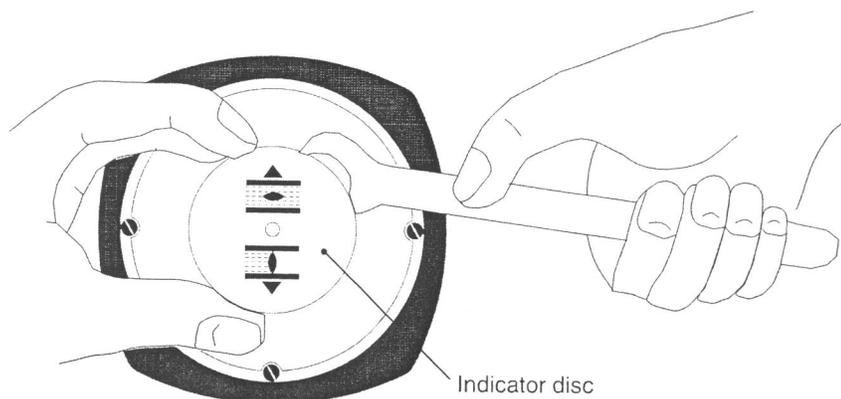
Fig. H-2: Cover without indicator glass



8.2 Pulling off the indicator disc (option)

- If installed, pull off indicator disc (figure J). Open end wrench may be used as lever.

Figure J: Pulling off the indicator disc

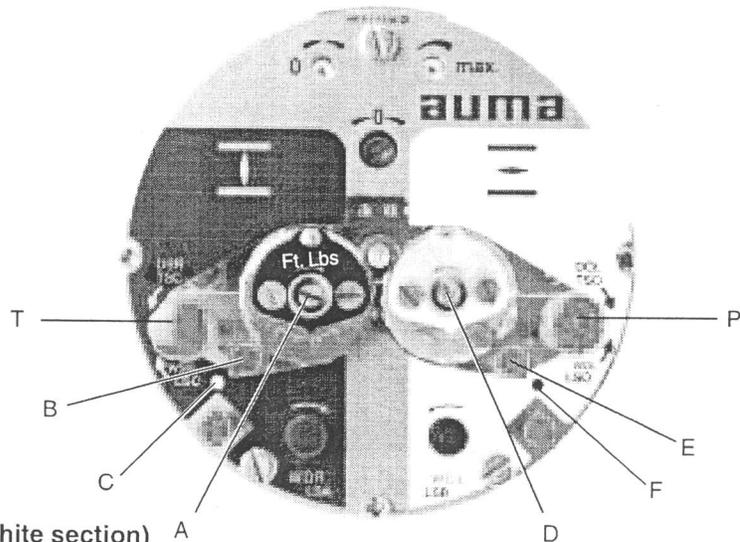


9. Setting the limit switching

9.1 Setting the end position CLOSED (black section)

- Turn handwheel clockwise until valve is closed.
- After having reached the end position, turn back handwheel by approximately $\frac{1}{2}$ a turn (overrun). During test run, check overrun and, if necessary, correct setting of the limit switching.
- **Press down** and turn setting spindle A (figure K-1) with a flat blade screw driver in direction of arrow, thereby observe pointer B. While a ratchet is felt and heard, the pointer B moves 90° every time. When pointer B is 90° from mark C, continue turning slowly. When pointer B has reached the mark C, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

Figure K-1: Control unit



9.2 Setting the end position OPEN (white section)

- Turn handwheel counterclockwise until valve is open, then turn back by approximately $\frac{1}{2}$ a turn.
- **Press down** and turn setting spindle D (figure K-1) with a flat blade screw driver in direction of arrow, thereby observe pointer E. While a ratchet is felt and heard, the pointer E moves 90° every time. When pointer E is 90° from mark F, continue turning slowly. When pointer E has reached the mark F, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

9.3 Checking the limit switches The red test buttons T and P (figure K-1) are used for manual operation of the limit switches.

- Turning T in direction of the arrow LSC (WSR) triggers limit switch CLOSED.
- Turning P in direction of the arrow LSO (WOL) triggers limit switch OPEN.

10. Setting the DUO limit switching (option)

Any application can be switched on or off via the two intermediate position switches.

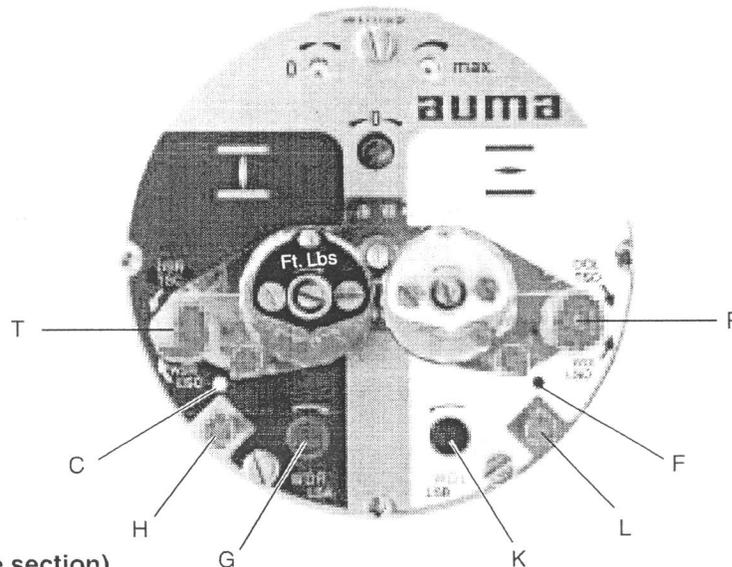


For setting, the switching point (intermediate position) must be approached from the same direction as later during electrical operation.

10.1 Setting the direction CLOSE (black section)

- Move valve to desired intermediate position.
- **Press down** and turn setting spindle G (figure K-2) with a flat blade screw driver in direction of arrow, thereby observe pointer H. While a ratchet is felt and heard, the pointer H moves 90° every time. When pointer H is 90° from mark C, continue turning slowly. When pointer H has reached the mark C, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

Figure K-2: Control unit



10.2 Setting the direction OPEN (white section)

- Move valve to desired intermediate position.
- **Press down** and turn setting spindle K (figure K-2) with a flat blade screw driver in direction of arrow, thereby observe pointer L. While a ratchet is felt and heard, the pointer L moves 90° every time. When pointer L is 90° from mark F, continue turning slowly. When pointer L has reached the mark F, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

10.3 Checking the DUO switches

The red test buttons T and P (Figure K-2) are used for manual operation of DUO limit switches.

- Turning T in direction of the arrow TSC (DSR) triggers DUO limit switch CLOSED. The torque switch CLOSED is actuated at the same time.
- Turning P in direction of the arrow TSO (DÖL) triggers DUO limit switch OPEN. The torque switch OPEN is actuated at the same time.

11. Setting the torque switching

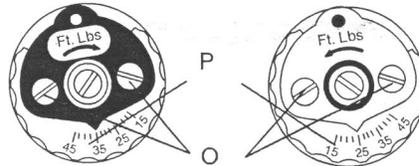
11.1 Setting



- The set torque must suit the valve!
- This setting should only be changed with the consent of the valve manufacturer!

Figure L: Torque switching heads indication in ft lbs

Setting CLOSED Setting OPEN



- Loosen both lock screws O at the torque dial (figure L).
- Turn torque dial P to set it to the required torque.

Examples:

Figure L shows the following setting:
35 ft lbs for direction CLOSE
25 ft lbs for direction OPEN

- Tighten lock screws O again



- The torque switches can also be operated in manual operation.
- The torque switching acts as overload protection over full travel, also when stopping in the end positions by limit switching.

11.2 Checking the torque switches

The red test buttons T and P (figure K-2) are used for manual operation of the torque switches:

- Turning T in direction of the arrow TSC (DSR) triggers torque switch CLOSED.
- Turning P in direction of the arrow TSO (DÖL) triggers torque switch OPEN.
- If a DUO limit switching (optional) is installed in the actuator, the intermediate position switches will be operated at the same time.

12. Test run

12.1 Check direction of rotation

- If provided, place indicator disc on shaft.
 The direction of rotation of the indicator disc (figure M-1) indicates the direction of rotation of the output drive.
- If there is no indicator disc, the direction of rotation can also be observed on the hollow shaft. For this, remove screw plug (no. 27) (figure M-2).

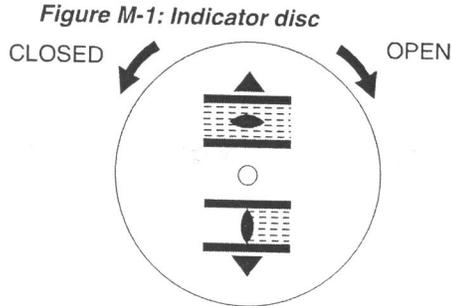
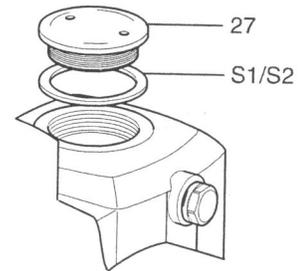


Figure M-2: Opening the hollow shaft



- Move actuator manually to intermediate position or to sufficient distance from end position.
- Switch on actuator in direction CLOSE and observe the direction of rotation:



If the direction of rotation is wrong, switch off immediately
 Then, correct phase sequence at motor connection. Repeat test run.

Table 6:

| | |
|---|---------|
| Direction of rotation of the indicator disc: | |
| counterclockwise | correct |
| Direction of rotation of the hollow shaft: | |
| clockwise | correct |

12.2 Check limit switching

- Move actuator manually into both end positions of the valve.
- Check if limit switching is set correctly. Hereby observe that the appropriate switch is tripped in each end position and released again after the direction of rotation is changed. If this is not the case, the limit switching must first be set, as described from page 15.

If no other options (sections 13. to 15.) require setting:

- Close switch compartment (see page 23, section 16.).

13. Setting the potentiometer (option)

– For remote indication –

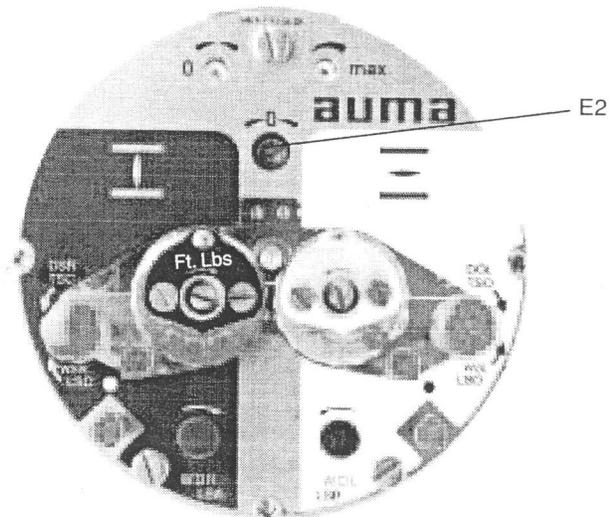
- Move valve to end position CLOSED.
- If installed, pull off indicator disc.
- Turn potentiometer (E2) clockwise until stop is felt.
End position CLOSED corresponds to 0 %, end position OPEN to 100 %.
- Turn potentiometer (E2) back a little.



Due to the ratio of the reduction gears for the position transmitter the complete resistance range is not always utilized for the whole travel. Therefore, an external possibility for adjustment (setting potentiometer) must be provided.

- Perform fine-tuning of the zero point at external setting potentiometer (for remote indication).

Figure N: Control unit



14. Setting the electronic position transmitter RWG (option)

– For remote indication or external controls –

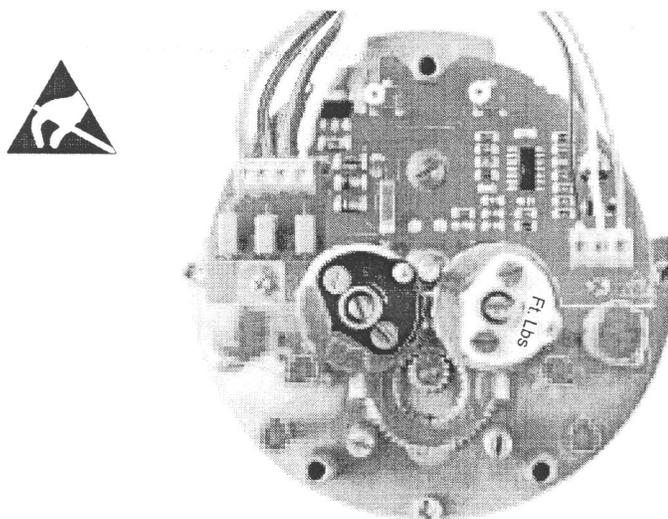
After mounting the multi-turn actuator to the valve, check setting by measuring the output current (see sections 14.1 or 14.2) and re-adjust, if necessary.

Table 7: Technical data RWG 4020

| Terminal plans | | KMS TP__ 4 / ___ | KMS TP _ 4 _ / ___ KMS TP _ 5 _ / ___ |
|--------------------|-------|-------------------------------|--|
| | | 3- or 4-wire system | 2-wire system |
| Output current | I_a | 0 – 20 mA, 4 – 20 mA | 4 – 20 mA |
| Power supply | U_v | 24 V DC, $\pm 15\%$ regulated | 14 V DC + ($I \times R_B$), max. 30 V |
| max. input current | I | 24 mA at 20 mA output current | 20 mA |
| max. load | R_B | 600 Ω | $(U_v - 14 V) / 20 \text{ mA}$ |

The position transmitter board (figure P-1) is located under the cover plate (figure P-2).

Figure P-1: Position transmitter board



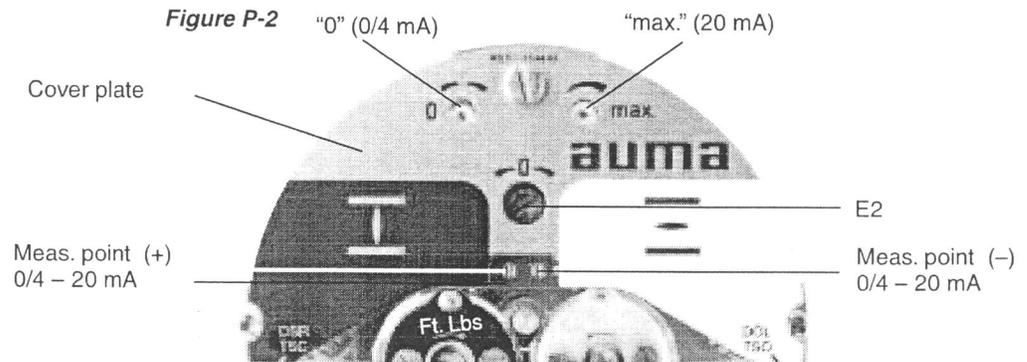
14.1 Setting for 2-wire system 4 – 20 mA and 3-/4-wire system 0 – 20 mA

- Connect voltage to electronic position transmitter.
- Move valve to **end position CLOSED**.
- If installed, pull off indicator disc.
- Connect ammeter for 0 – 20 mA to measuring points (figure P-2).



The circuit (external load) must be connected (max. load R_B), or the appropriate connections at the terminals (refer to terminal plan) must be jumpered, otherwise no value can be measured.

- Turn potentiometer (E2) clockwise to the stop.
- Turn potentiometer (E2) back a little.



- Turn potentiometer "0" clockwise until output current starts to increase.
- Turn potentiometer "0" back until the following value is reached:
for 3- or 4-wire system: approx. 0.1 mA
for 2-wire system: approx. 4.1 mA.
This ensures that the signal remains above the dead and live zero point.
- Move valve to end position OPEN.
- Set potentiometer "max." to end value 20 mA.
- Approach end position CLOSED again and check minimum value (0.1 mA or 4.1 mA). If necessary, correct the setting.



If the maximum value cannot be reached, the selection of the reduction gearing must be checked.

14.2 Setting the 3-/4- wire system 4 – 20 mA

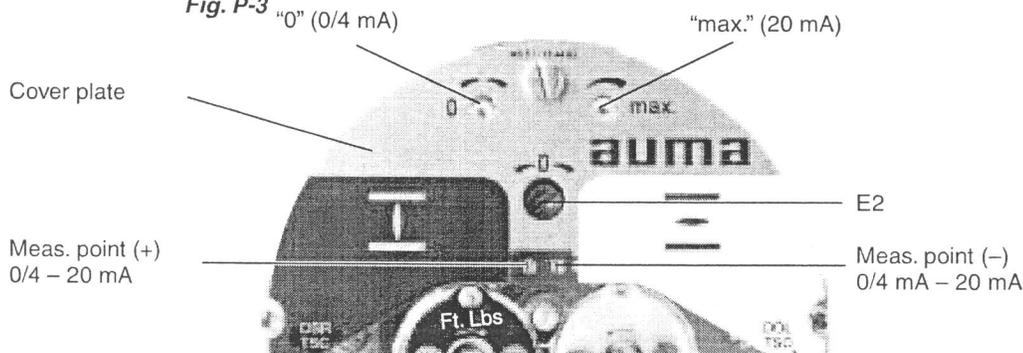
- Connect voltage to electronic position transmitter.
- Move valve to end position CLOSED.
- If installed, pull off indicator disc.
- Connect ammeter for 0 – 20 mA to measuring points (figure P-2).



The circuit (external load) must be connected (max. load R_B), or the appropriate connections at the terminals (refer to terminal plan) must be jumpered, otherwise no value can be measured.

- Turn potentiometer (E2) clockwise to the stop.
- Turn potentiometer (E2) back a little.

Fig. P-3 "0" (0/4 mA)



- Turn potentiometer "0" clockwise until output current starts to increase.
- Turn back potentiometer "0" until a residual current of approx. 0.1 mA is reached.
- Move valve to end position OPEN.
- Set potentiometer "max." to end value 16 mA.
- Move valve to end position CLOSED.
- Set potentiometer "0" from 0.1 mA to initial value 4 mA.
This results in a simultaneous shift of the end value by 4 mA, so that the range is now 4 – 20 mA.
- Approach both end positions again and check setting. If necessary, correct the setting.



If the maximum value cannot be reached, the selection of the reduction gearing must be checked.

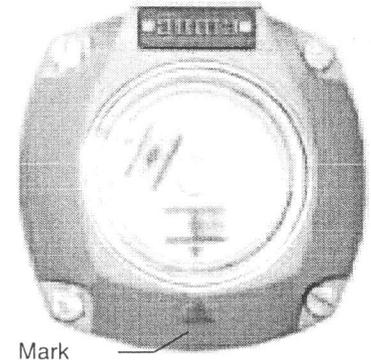
15. Setting the mechanical position indicator (option)

- Place indicator disc on shaft.
- Move valve to end position CLOSED.
- Turn lower indicator disc (figure Q1) until symbol  CLOSED is in alignment with the mark on the cover (figure Q-2).
- Move actuator to end position OPEN.
- Hold lower indicator disc CLOSED in position and turn upper disc with symbol  OPEN until it is in alignment with the mark on the cover.

Figure Q-1



Figure Q-2



Indicator disc rotates by approximately 180° to 230° at full travel from OPEN to CLOSED or vice versa.

A suitable reduction gearing was installed in our factory. If the turns per stroke are changed at a later date, the reduction gearing may have to be exchanged, too.

16. Closing the switch compartment

- Clean sealing faces of housing and cover
- Check whether O-ring is in good condition.
- Apply a thin film of non-acidic grease to the sealing faces.
- Replace cover on switch compartment and fasten bolts evenly crosswise.



After commissioning, check for damage to paint finish of multi-turn actuator. If damage to paint-finish has occurred after mounting, it has to be touched up to avoid corrosion.

17. Enclosure protection IP 68 (option)

Definition

According to EN 60 259, the conditions for meeting the requirements of enclosure protection IP 68 are to be agreed between manufacturer and user.

AUMA actuators and controls in enclosure protection IP 68 meet the following requirements according to AUMA:

- Duration of submersion in water max. 72 hours
- Head of water max. 6 m
- Up to 10 operations during submersion
- Modulating duty is not possible during submersion

Enclosure protection IP 68 refers to the interior of the actuators (motor, gearing, switch compartment, control, and terminal compartment).

For multi-turn actuators, the following has to be observed:

When using output drive types A and AF (stem nut), it cannot be prevented that water enters the hollow shaft along the valve stem during submersion. This leads to corrosion. The water also enters the thrust bearings of output drive type A, causing corrosion and damage of the bearings. The output drive types A and AF should therefore not be used.

Inspection

AUMA actuators and controls in enclosure protection IP 68 undergo a routine testing for tightness in the factory.

Cable glands

- For the entries of the motor and control cables appropriate, cable glands in enclosure protection IP 68 must be used. The size of the cable glands must be suitable for the outside diameter of the cables, refer to recommendations of the cable gland manufacturers.
- As standard, actuators and controls are delivered without cable glands. For delivery, the threads are sealed with plugs in the factory.
- When ordered, cable glands can also be supplied by AUMA at an additional charge. For this, it is necessary to state the outside diameter of the cables.
- The cable glands must be sealed against the housing at the thread with an O-ring.
- It is recommended to additionally apply a liquid sealing material (Loctite or similar).

Commissioning

When commissioning, the following should be observed:

- Sealing faces of housing and covers must be clean
- O-rings of the covers must not be damaged
- A thin film of non-acidic grease should be applied to sealing faces
- Covers should be tightened evenly and firmly

After submersion

- Check actuator.
- In case of ingress of water, dry actuator correctly and check for proper function.

18. Maintenance

After maintenance, check multi-turn actuator for damage to paint finish. If damage to paint-finish has occurred, it has to be touched up to avoid corrosion. Original paint in small quantities can be supplied by AUMA.

AUMA multi-turn actuators require low-level maintenance. Precondition for reliable service is correct commissioning.

Seals made of elastomers are subject to ageing and must therefore regularly be checked and, if necessary, exchanged.

It is also very important that the O-rings at the covers are placed correctly and cable glands tightened firmly to prevent ingress of dirt or water.

We recommend additionally:

- If rarely operated, perform a test run about every 6 months. This ensures that the actuator is always ready to operate.
- Approximately six months after commissioning and then every year, check bolts between actuator and valve/gearbox for tightness. If required, tighten applying the torques given in table 2, page 8.
- For multi-turn actuators with output drive type A: at intervals of approx. 6 months from commissioning press in Lithium soap EP multi-purpose grease on mineral oil base at the grease nipple with grease gun (quantity see table 3, page 9).

19. Lubrication

- The gear housing is filled with lubricant in the factory.
- A grease change is recommended after the following operation time:
 - If rarely operated, after 10 – 12 years
 - If operated frequently, after 6 – 8 years



Lubrication of the valve stem must be done separately.

20. Disposal and recycling

AUMA actuators have an extremely long lifetime. However, they have to be replaced at one point in time.

The actuators have a modular design and may therefore easily be disassembled, separated, and sorted according to materials, i.e.:

- electronic scrap
- various metals
- plastics
- greases and oils

The following generally applies:

- Collect greases and oils during disassembly. As a rule, these substances are hazardous to water and must not be released into the environment.
- Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
- Observe the regional regulations for waste disposal.

21. Service

AUMA offers extensive services such as maintenance and inspection for actuators.

The AUMA service department can be reached at:

phone: 724-743-AUMA (2862)

fax: 724-743-7411

email: mailbox@auma-usa.com

www.auma-usa.com or www.auma.com.

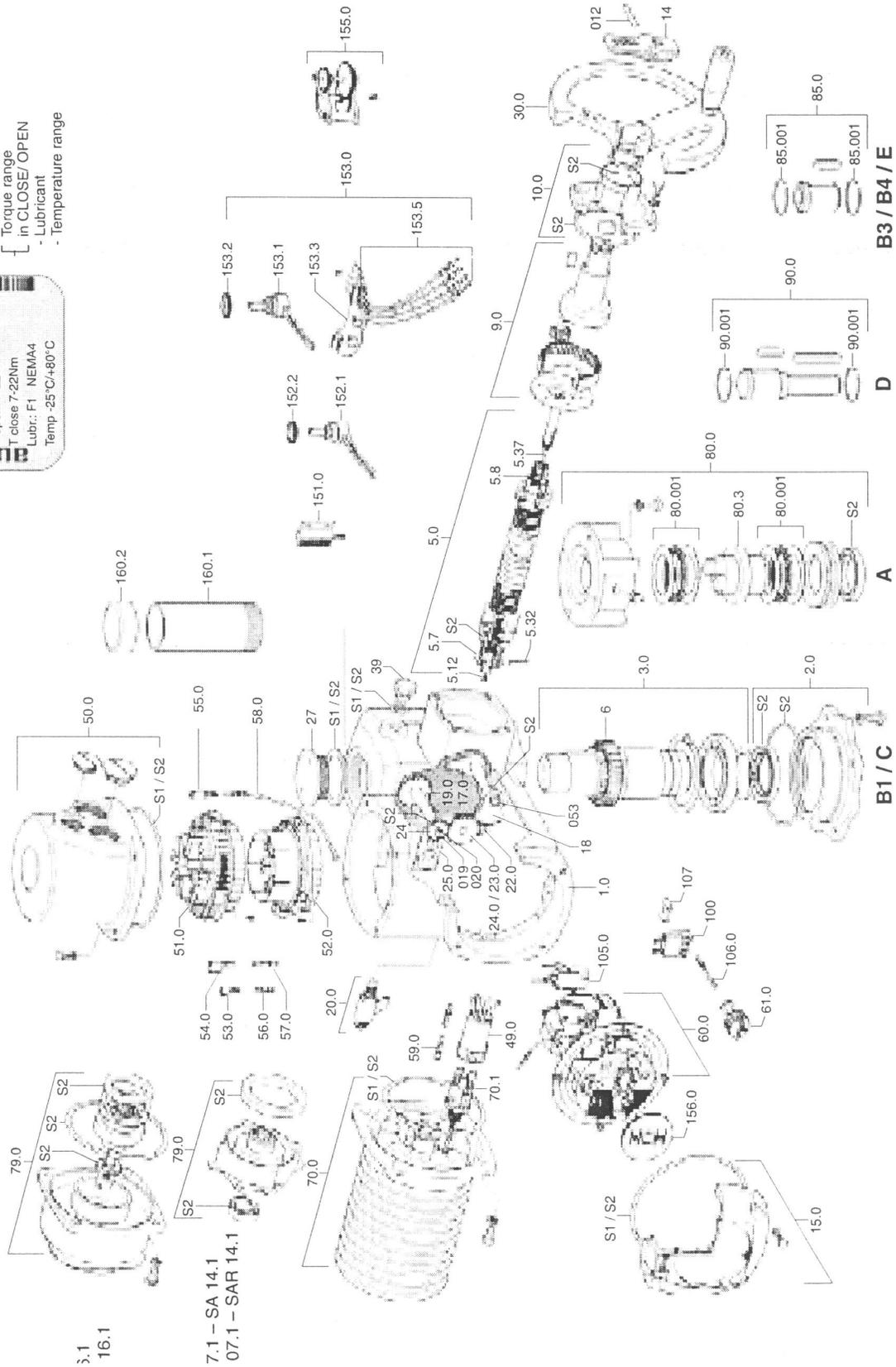
Operation instructions

22. Spare parts list Multi-turn actuator SA(R) 07.1 – SA(R) 16.1 with plug/socket connector

Sample name plate



- Actuator type
- Commission number
- Comm./ sales order number
- Works/ Serial number
- Protection type
- Torque range
- in CLOSE/OPEN
- Lubricant
- Temperature range



Notes:

When placing orders for spare parts, it is essential to mention type of actuator and our commission number (refer to actuator name plate). Delivered spare parts may slightly vary from the representation in these instructions.

| No. | Type | Designation | No. | Type | Designation |
|--------------------|------|---|----------------------|------|---|
| 012 | E | Notched pin | 58.0 | B | Wire for protective earth |
| 019 | E | Cheese head screw | 59.0 ¹⁾ | B | Pin for motor and thermoswitch in motor plug |
| 020 | E | Clamping washer | | | |
| 053 | E | Countersunk screw | 60.0 | B | Control unit assly. (but without torque head, without switches) |
| 1.0 | B | Housing assly. | | | |
| 2.0 | B | Flange, bottom assly. | | | |
| 3.0 | B | Hollow shaft assly. (without worm wheel) | 70.0 | B | Motor |
| 5.0 | B | Worm shaft assly. | 70.1 ¹⁾ | B | Motor pin carrier (without pins) |
| 5.12 | E | Set screw | | | |
| 5.32 | E | Coupling pin | 79.0 ²⁾ | B | Planetary gearing for motor drive assly. |
| 5.37 | B | Pull rod assly. | 80.0 ³⁾ | B | Output drive form A assly. (without thread in stem nut) |
| 5.7 | E | Motor coupling | | | |
| 5.8 | B | Manual drive coupling assly. | 80.001 ³⁾ | E | Thrust bearing set |
| 6 | E | Worm wheel | 80.3 ³⁾ | E | Stem nut form A (without thread) |
| 9.0 | B | Planetary gear assly. for manual drive | 85.0 ³⁾ | B | Output drive B3 |
| 10.0 | B | Retaining flange assly. | 85.001 ³⁾ | E | Snap ring |
| 14 | E | Change-over lever | 90.0 ³⁾ | B | Output drive D |
| 15.0 | B | Cover for switch compartment assly. | 90.001 ³⁾ | E | Snap ring |
| 17.0 | B | Torque lever assly. | 100 | B | Switch for limit/ torque switching (including pins at wires) |
| 18 | E | Gear segment | | | |
| 19.0 | B | Crown wheel assly. | 105.0 | B | Blinker transmitter including pins at wires (without impulse disc and insulation plate) |
| 20.0 | B | Swing lever assly. | | | |
| 22.0 | B | Drive pinion II for torque switching assly. | 106.0 | B | Stud bolt for switches |
| 23.0 | B | Drive wheel for limit switching assly. | 107 | E | Spacer |
| 24 | E | Drive wheel for limit switching | 151.0 | B | Heater |
| 24.0 | B | Intermediate wheel for limit switching assly. | 152.1 ³⁾ | B | Potentiometer (without slip clutch) |
| 25.0 | E | Locking plate | 152.2 ³⁾ | B | Slip clutch for potentiometer |
| 27 | E | Screw plug | 153.0 ³⁾ | B | RWG assly. |
| 30.0 | B | Handwheel with ball handle assly. | 153.1 ³⁾ | B | Potentiometer for RWG (without slip clutch) |
| 39 | E | Screw plug | | | |
| 49.0 ¹⁾ | B | Motor plug, socket assly. | 153.2 ³⁾ | B | Slip clutch for RWG |
| 50.0 | B | Cover assly. | 153.3 ³⁾ | B | Electronic board RWG |
| 51.0 | B | Socket carrier assly. (with sockets) | 153.5 ³⁾ | B | Wires for RWG |
| 52.0 | B | Pin carrier (without pins) | 155.0 ³⁾ | B | Reduction gearing |
| 53.0 | B | Socket for control | 156.0 ³⁾ | B | Mechanical position indicator |
| 54.0 | B | Socket for motor | 160.1 ³⁾ | E | Protection tube(without cap) |
| 55.0 | B | Socket for protective earth | 160.2 ³⁾ | E | Cap for stem protection tube |
| 56.0 | B | Pin for control | S1 | S | Seal kit, small |
| 57.0 | B | Pin for motor | S2 | S | Seal kit, large |

1) SA 16.1 with output speeds of 32 to 216 rpm or SAR 16.1 with output speeds of 32 and 54 rpm without plug/ socket connector; motor directly wired to pin carrier (No. 52.0) .

2) not available for all output speeds

3) not included in basic equipment

Notes:

When placing orders for spare parts, it is essential to mention type of actuator and our commission number (refer to actuator name plate). Delivered spare parts may slightly vary from the representation in these instructions.

| No. | Type | Designation | No. | Type | Designation |
|--------|------|---|---------|---------|---|
| 1.026 | E | Quad ring / radial seal | 54.0 | B | Socket for motor |
| 1.038 | E | O-ring | 55.0 | B | Socket for protective earth |
| 1.1 | B | Housing assly. | 56.0 | B | Pin for control |
| 1.17 | B | Torque lever assly. | 57.0 | B | Pin for motor |
| 1.19 | B | Crown wheel assly. | 58.0 | B | Wire for protective earth |
| 1.22 | B | Drive pinion II for torque switching assly. | 61.0 | B | Torque switching head |
| 1.23 | B | Drive wheel for limit switching assly. | 80.0 * | B | Output drive form A assly. (without thread in stem nut) |
| 1.24 | B | Intermediate wheel for limit switching assly. | | 80.001* | S |
| 1.25 | E | Locking plate | 80.3 * | E | Stem nut form A (without thread) |
| 1.27 | E | Screw plug | 85.0 * | B | Output drive form B3 assly. |
| 1.28 | E | Bearing bush | 85.001* | E | Snap ring |
| 2.58 | B | Motor | 100 | B | Switch for limit/ torque switching (including pins at wires) |
| 2.59 ● | B | Planetary gear assly. for motor drive | | | |
| 3 | B | Drive shaft assly. | 105 | B | Blinker transmitter including pins at wires (without impulse disc and insulation plate) |
| 3.05 | E | Dowel pin | | | |
| 3.11 | B | Pull rod assly. | 106.0 | B | Stud bolts for switches |
| 3.6 | B | Worm wheel assly. | 107 | E | Spacer |
| 3.7 | E | Motor coupling | 151.0 | B | Heater |
| 3.8 | B | Manual drive coupling assly. | 152.1 * | B | Potentiometer (without slip clutch) |
| 4.2 | B | Flange, bottom assly. | 152.2 * | B | Slip clutch for potentiometer |
| 4.3 | B | Hollow shaft assly. | 153.0 * | B | RWG assly. |
| 5 | B | Planetary gear assly. for manual drive | 153.1 * | B | Potentiometer for RWG (without slip clutch) |
| 5.1 | E | Mounting flange | 153.2 * | B | Slip clutch for RWG |
| 5.2 | B | Hand wheel shaft assly. | 153.3 * | B | Printed board for RWG |
| 6 | B | Swing lever assly | 155.0 * | B | Reduction gearing |
| 7.012 | E | Notched pin | 156.0 * | B | Mechanical position indicator |
| 7.14 | E | Change-over lever | 160.1 * | E | Protection tube (without cap) |
| 7.50 | B | Handwheel with ball handle assly. | 160.2 * | E | Cap |
| 8.36 | B | Control unit assly. (but without torque head, without switches) | S1 | S | Seal kit (small) |
| | | | S2 | S | Seal kit (large) |
| 8.37 | B | Switch compartment cover | | | |
| 9.33 | B | Terminals for motor connection | | | |
| 9.51 | B | Protective earth connection | | | |
| 9.55 | B | Cover for motor connection compartment assly. | | | |
| | | | | | |
| 50.0 | B | Plug cover assly. | | | |
| 51.0 | B | Socket carrier assly. (with sockets) | | | |
| 52.0 | B | Pin carrier (without pins) | | | |
| 53.0 | B | Socket for control | | | |

● not available for all output speeds

* not included in basic equipment

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For the name and phone number of the office nearest you, call us at 724-743-2862 or visit our website at www.auma-usa.com/saleserv.htm

2005-06-27

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OPERATION INSTRUCTIONS

MODEL SA 07.1 – SA 48.1

Multi-Turn Actuators

auma[®]

AUMA Actuators, Inc. USA

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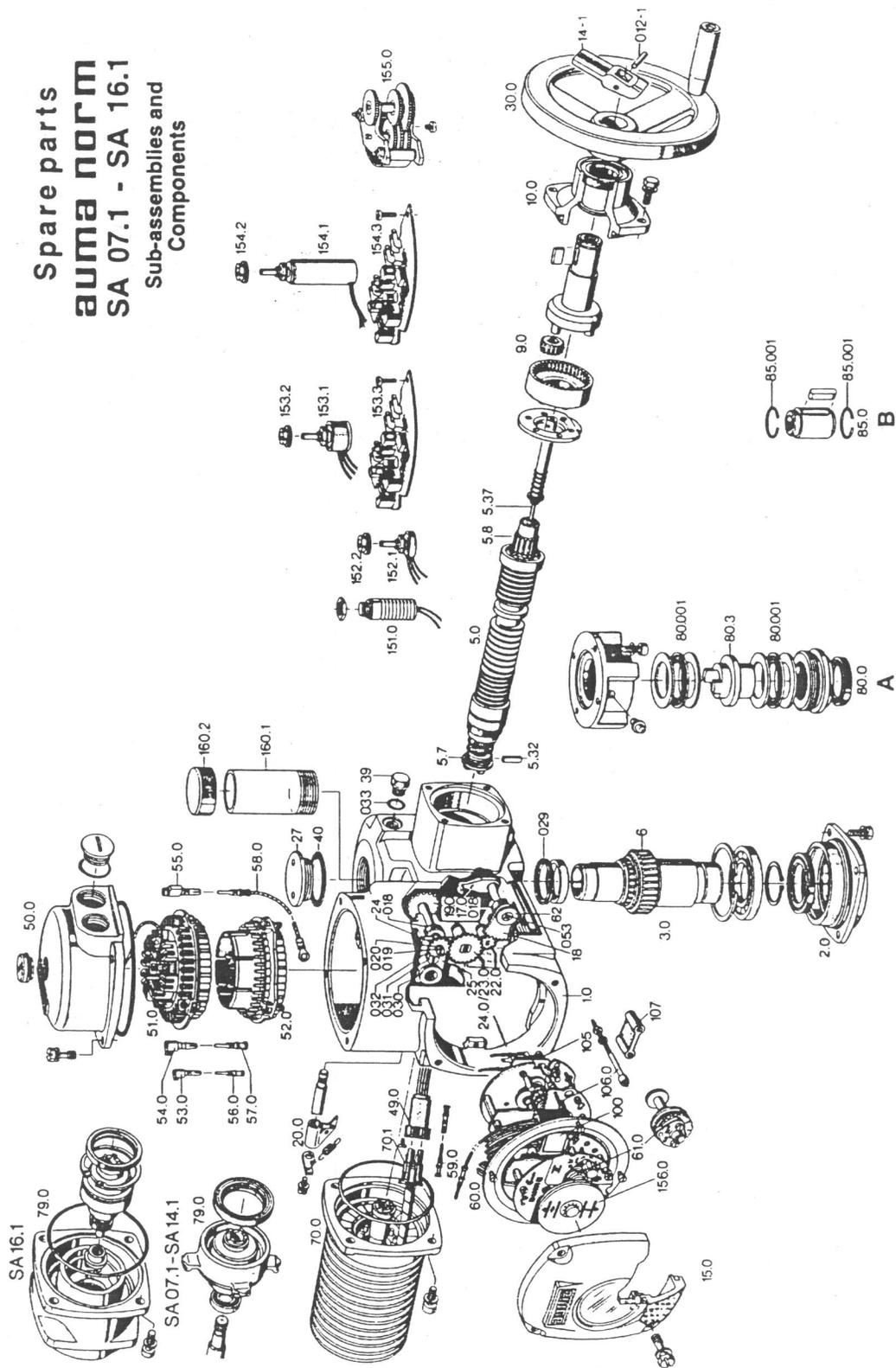
email: mailbox@uma-usa.com

This operation instruction is valid for the types: SA, SA(IP68), SAL, SAEL, SAH, SAR, SAFM, SARFM, SAEx, SAREx.

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Spare parts
auma norm
SA 07.1 - SA 16.1
Sub-assemblies and
Components



Note: Refer to separate parts lists for SA 25.1 - SA 48.1

Multi-turn actuators are high quality electro-mechanical devices. Possible damage can be avoided by observing the following items.

1. TRANSPORT AND STORAGE

- Transport to place of installation in sturdy packing.
- Do not lift the actuator by the handwheel.
- Store in well ventilated, dry room.
- Protect against humidity from the floor by storing on a shelf or on a wooden frame.
- Cover to protect against dust and dirt.
- Apply corrosion protection agent to machined surfaces.

2. SERVICE CONDITIONS

AUMA multi-turn actuators can be used at following ambient conditions:

| Model | Temperature |
|----------|----------------------------|
| SA | -20°F to +175°F (Standard) |
| SAL | -40°F to +140°F |
| SAH | +32°F to +250°F |
| SA(IP68) | -20°F to +175°F |
| SAR | -20°F to +140°F |

3. MOUNTING TO THE VALVE/GEARBOX

Mounting and operation can be in any position.

- Check whether output drive flange suits the valve/gearbox.

CAUTION: Spigot at flanges should be loose fit!

- For form A output drive the thread must correspond with thread of the valve stem. If not ordered explicitly with thread, the stem nut is supplied unbored or with pilot bore (*Figure C*). For machining the stem nut refer to Section 13.
- Form B output drives are normally supplied with bore and one keyway (*Figure D*).
- Check whether bore and keyway correspond with the input shaft of the valve or gearbox.
- Degrease mounting surfaces at actuator and valve/gearbox thoroughly.
- Apply lubricant to input shaft of the valve/gearbox.
- Place actuator on the valve/gearbox and use bolts with a minimum quality of 8.8 to fasten. Tighten diagonally.

4. MANUAL OPERATION

Engaging Handwheel (*Figure B*)

CAUTION: Manual operation should not be engaged if motor is running.

- Lift declutch lever in center of handwheel to fully extended position while slightly turning the handwheel.
- Release declutch lever, it must snap back to its original position; manual mode remains engaged.

Manual Operation

• WARNING •

DECLUTCH LEVER MUST BE FULLY RELEASED AND RETURNED TO UNENGAGED POSITION (90°) WHILE IN MANUAL HANDWHEEL OPERATION TO PREVENT PHYSICAL DAMAGE.

- If power tools are used, the permissible speed is 300 rpm.
- For two-inch nut or chainwheel operation refer to separate instructions.

Disengaging Manual Operation

- Manual drive disengages automatically when motor is started.

5. ELECTRICAL CONNECTIONS

CAUTION: Observe safety regulations. Check whether the power supply (voltage, phase and frequency) complies with the motor nameplate.

Terminal Access

- Take off the terminal compartment cover.
- Loosen cheese head screws inside the cover and remove multi socket carrier.

- Check the location of the terminal connections.
 - For SA 07.1 - SA 16.1 motor power is connected in center of socket carrier.
 - For SA 25.1 - SA 48.1 motor power is connected in separate conduit entry (*Figure A*).
 - For SA 07.1 - SA 48.1 control power is connected to sockets in socket carrier.
- Attach conduit to terminal compartment cover.

CAUTION: Appropriate conduit and sealing methods must be followed to ensure the type of enclosure furnished.

Wiring Connections - *Refer to drawing inside terminal compartment cover*

NOTE: The drawing contains the required information for correct actuator electrical connection. Typical customer controls are also shown.

- Connect motor wires to the designated terminals. Connect ground to designated terminal.
- Connect control wires to designated terminals in accordance with drawing.

CAUTION: The following must be considered when wiring an AUMA actuator:

- ◆ The time delay (i.e., from limit or torque switch tripping until the motor is switched off) should not exceed 20 ms. We strongly recommend switching off the motor directly by installing the corresponding switches in the control wiring to the contactor. This concern is especially important when using PLC's. Switch output to a PLC should be for indication only.
- ◆ Each switch has contacts which are not completely isolated and therefore are suitable only for the same voltage potential. (See drawing for detailed information.)
- ◆ The valve manufacturer decides whether switching off in the end position should be by limit switch (limit seating) or torque switch (torque seating).
- ◆ AUMA motors have 3 thermoswitches as standard equipment. These switches must be directly wired into the control circuit to protect the motor. If these are not connected, the warranty for the motor is not valid.

Completion of Electrical Connection

- Clean the sealing faces at plug or cover for terminal compartment, check to ensure that the O-ring is not damaged.

- Apply a thin film of non-acid grease (e.g., Vaseline) to sealing faces.
- Place cover and fasten the 4 bolts. Tighten diagonally.

CAUTION: NEMA 7 enclosures require that a conduit seal be placed as close as practicable to the conduit entries at the actuator.

6. TEST RUN (Figure E)

Remove cover to the control unit compartment (15.0) and, if provided, the MDPI disc (156.0).

- Bring the valve manually to an intermediate position.
- Check phase rotation.
- Run the actuator briefly in the open direction. If the direction of rotation is incorrect, switch off immediately and rewire motor connections U1 and W1.
- The red test knobs on the control unit provide a way to manually operate the limit and torque switches.

While running the actuator in the open direction, turn the red test knob OPEN toward the DOL arrow.

- ◆ If the motor stops, the control circuit is correct.
- ◆ If the motor does not stop, turn off the motor power immediately. Check control circuit and correct wiring.

Operating Direction for Test Knobs

| | Torque Switch | Limit Switch |
|-------|---------------|--------------|
| open | DOL Arrow | WOL Arrow |
| close | DSR Arrow | WSR Arrow |

- Determine overrun in both directions (overrun is turns/travel from switching off until the actuator movement stops).

The convention of "clockwise-to-close" has been used throughout this manual. A "clockwise-to-open" valve or damper configuration represents a reversal of limit and torque switch position (black area of face plate of the control unit represents open and white area represents closed.)

7. SETTING OF LIMIT SWITCHING (*Figure E*)

- Engage manual drive as explained in Section 4.

Setting of the CLOSED End Position (black area)

- Turn the handwheel clockwise until the valve is fully closed. Consider possible overrun as described in Section 6.
- Press down and turn spindle (A) in direction of the arrow. A ratchet will be felt and heard, the pointer (B) turns for every 90 degrees.

When pointer moves towards point (C), the spindle should not be turned any further. If the spindle has been turned beyond that point inadvertently, continue turning and approach the setting point again.

CAUTION: Make sure that spindle (A) springs up to its original position.

Setting of the OPEN End Position (white area)

- Turn the handwheel counter-clockwise until the valve is fully open. Consider possible overrun as determined in Section 6. Compensate overrun by backing off with the manual drive.
- Repeat setting procedure as described for the closed position using spindle (D), pointer (E) and point (F).

8. SETTING OF DUO COUNTER GEAR OR FOUR GEAR TRAIN LIMIT SWITCHING (optional) (*Figure E*)

CAUTION: The intermediate switching point should be approached for setting purposes in the same direction as in motor operation.

- Move valve to the required intermediate position.
- For switching in the direction CLOSED (LSA) use spindle (G), pointer (H) and point (C) as explained previously.
- For switching in the direction OPEN (LSB) use spindle (K), pointer (L) and point (F) as explained previously.

9. SETTING OF TORQUE SWITCHING (*Figure F*)

CAUTION: Adjusted torque must suit the valve! If the actuator has been supplied by a valve manufacturer, this setting was made during testing. This setting should only be changed with the consent of the valve manufacturer.

- Loosen both lock screws (O) at torque dial.
- Rotate torque dial (P) to the required setting (1 ft. lbs. equals 1.36 Nm).
- Fasten lock screw again.

NOTE: Torque switching works in both manual and electrical mode. The torque switching acts as overload protection over full travel as well as at the end positions.

- Clean sealing surfaces at the housing and the switch compartment cover (3.2). Check the O-ring for possible damage. Apply thin film of non-acid grease (e.g. Vaseline) to sealing faces.
- Place the cover and fasten the hexagonal bolts. Tighten diagonally.

10. SETTING OF MECHANICAL DIAL POSITION INDICATOR - optional (*Figure G*)

The indicator disc rotates approximately 180 degrees at full travel from OPEN to CLOSE or vice versa.

A suitable reduction gearing was installed in our factory. If turns per stroke are changed subsequently, the reduction gearing may have to be exchanged, too.

- Run actuator to the CLOSED end position.
- Turn dial $\overline{\text{P}}$ CLOSED until the arrow is in alignment with the mark on the indicator glass.
- Run Actuator to the OPEN end position.
- Turn dial $\overline{\text{O}}$ OPEN while holding the other dial in position until the arrow is in alignment with the mark.

11. SETTING OF THE POTENTIOMETER (optional) (*Figure E*)

- Operate valve to the CLOSED position.

Set the potentiometer to the initial position (minimum resistance) by turning spindle (R2).

12. SETTING OF THE CURRENT TRANSMITTER RWG (optional) (Figure E)

Adjustments for 4 mA to close and 20 mA to open

- Run the actuator to the full closed position, and adjust the feedback potentiometer (R2) to the full clockwise end position. (Note: counter-clockwise for counter-clockwise-to-close actuators).
- Adjust zero adj. potentiometer (L) clockwise until the desired current output for the closed position is obtained (normally 4 mA). Turn potentiometer clockwise to increase current output, counter-clockwise to decrease.
- Run actuator to the full open position.
- Adjust max adj. potentiometer (M) until the desired current output for the open position is obtained (normally 20 mA). Turn potentiometer clockwise to increase current output, counter-clockwise to decrease.
- Run actuator to the full closed position to check the closed position current output.
- If necessary, readjust the zero adj. potentiometer to the value obtained in Step 3 and repeat Steps 4 through 6. Otherwise, the procedure is complete.

NOTE: The adjustment of the zero adj. and max adj. potentiometers is an interactive process and may require that the potentiometers are adjusted a number of times.

NOTE: For other settings, please refer to separate setting instructions.

13. MACHINING OF STEM NUT, FORM A OUTPUT DRIVE (Figure C)

Mounting flange does not need to be taken off the actuator.

- Remove the bearing lock nut (80.2) using a wrench or similar tool.
- Take off the stem nut (80.3), thrust bearing (80.01) and thrust bearing races (80.02).
- Remove the thrust bearing and races from stem nut.
- Drill and bore the stem nut, cut the thread.

CAUTION: When fixing in the chuck make sure the stem nut runs true.

- Clean the machined stem nut.
- Apply ball bearing grease to the thrust bearing and races and place them on the stem nut.
- Put the stem nut into the mounting flange. Be careful that the dogs are placed correctly in the slots of the hollow shaft.

- Screw in the bearing lock nut until it is firm against the shoulder.
- The A drive housing is provided with a grease nipple for lubrication. Ensure that an adequate amount of grease is provided for proper operation. Frequency of lubrication must be determined according to usage. Contact the factory for further information on output drives.

14. MAINTENANCE

AUMA Actuators need little maintenance. A precondition for reliable service is correct commissioning and start up. It is also very important that the O-rings for the covers are placed correctly, and conduit entries are fastened firmly to prevent the ingress of dirt or water.

We recommend:

- If operated very seldom, perform a test run every six (6) months. This assures that the actuator is always ready to operate.
- Approximately six (6) months after start-up and then every year check the bolts between the actuator and the valve/gearbox for tightness. If required, retighten.
- Multi-turn actuators with Form A output drive must be lubricated at intervals of approximately six (6) months, using the grease nipple.

CAUTION: Lubrication of the valve stem must be done separately.

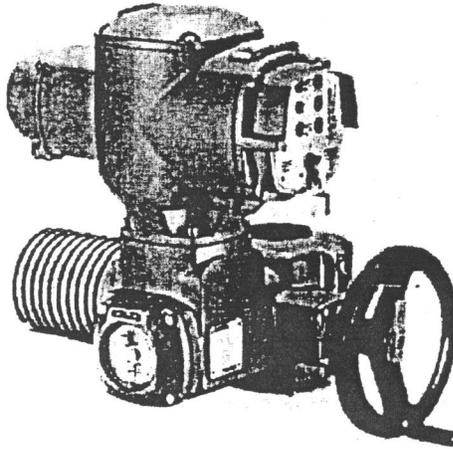
This operation instruction has been prepared to the best of our knowledge in order to inform our customers. It is the result of our practical experience and extensive testing.

Our multi-turn actuators were designed principally for the operation of valves. Before using them for other purposes, we recommend examining whether our products perform the functions desired. Further knowledge about their suitability may be obtained by tests. We are prepared to assist in the performance of these tests.

For special applications please consult factory.

When using our multi-turn actuators for applications not intended by us, we cannot be held responsible. Necessary precautions to prevent injury to persons or damage to materials are the sole responsibility of the user.

auma matic



Actuators* with the BASIC COMPACT and AUMA MATIC contain pilot devices and complete motor controls. The controls are contained in a sealed housing, which is mounted directly to actuators of the version, AUMA NORM.

Electrical connections between the BASIC COMPACT or AUMA MATIC unit and actuator are made by plug/socket. This enables the BASIC COMPACT or AUMA MATIC unit to be fitted to the type AUMA Norm actuators already installed.

*Available in sizes SA 07.01 — SA 16.1

For professional start-up and reliable service in the field, AUMA has specialists in the factory for:

- Shipping of original spare parts
- Commissioning
- Maintenance/repair
- Trouble-shooting assistance

Before calling for our support, please have the following information:

1) For Parts:

- Original S.O. Number or Serial Number of Actuator (on name tag)
- Part Number (on exploded view)

2) For Service:

- Original S.O. Number or Serial Number of Actuator
- Brief Description of Problem

Contacts:

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Fax: (412) 787-1223
E-mail: mailbox@auma-usa.com
Web site: www.auma-usa.com

All information is subject to change without notice.

EXHIBIT C

“AS CONSTRUCTED”
DRAWINGS

See separate folder for the following drawings:

| <u>File No.</u> | <u>Title</u> |
|-----------------|--|
| AM-04-514 | American River Watershed Project, Common Features, Left Bank Lower American River, Mayhew Drain Closure Structure |

Additional drawings of cross-sections, structures, and miscellaneous facilities are available in the Office of the District Engineer.

| <u>File No.</u> | <u>Title</u> |
|-----------------|--|
| 50-4-4118 | Bank protection various locations left bank Sacramento and American river, right and left banks Feather River and Elder Creek, in 12 sheets. |
| 50-4-3702 | Levee Rehabilitation and Patrol Roads, Vicinity of Sacramento, California, in 3 sheets. |
| 50-4-4283 | Bank Protection, Various Locations, Right and Left Banks, Sacramento River and Georgiana Slough, in 34 sheets. |
| 50-4-5130 | Bank Protection, Various Locations, Right and Left Banks, Sacramento River Mile 60.0 to Mile 110.0, in 41 sheets. |



US Army Corps
of Engineers
Sacramento District

AMERICAN RIVER COMMON FEATURES (COMMON FEATURES) WRDA 99 LOWER AMERICAN RIVER MAYHEW DRAIN CLOSURE STRUCTURE

AMERICAN RIVER CALIFORNIA

FY 2007

AS-BUILT

CONTR. NO. W91238-07-C-0016

This project was designed by the Sacramento District of the U. S. Army Corps of Engineers. The initials or signatures and registration designations of individuals appear on these project documents within the scope of their employment as required by ER 1110-1-8152

Approved
THOMAS E. TRAINER, P.E. 6/8/07
Date: 6/8/07
Chief, Engineering Division
Prepared Under the Direction of
COL RONALD N. LIGHT
District Engineer
Col, Corps of Engineers

Designed by:
S.R.S. Review by: M.S.B.
Draw by: Design File No:
Spec. No. AM-04-514
1555

Approved Functional Adequacy
RICK FÖEPELMAN 6/8/07
Date: 6/8/07
Chief, Civil Design Br
Prepared by:
**SACRAMENTO DISTRICT
CIVIL DESIGN BRANCH**
S.R.S. Design File No:
PETER VALENTINE 6/8/07
Date: 6/8/07
Chief, Civil Design, Sec. A

AMERICAN RIVER CALIFORNIA
AMERICAN RIVER COMMON FEATURES
(COMMON FEATURES) WRDA 99
LOWER AMERICAN RIVER
MAYHEW DRAIN CLOSURE STRUCTURE
TITLE SHEET

Sheet
reference
number:
G-001

| Rev. | Date | Description |
|----------|------|-------------|
| AS-BUILT | | |

| | | |
|----------------------------|---------------|--------|
| Designed by: | Date: | 6/8/07 |
| Dwn by: | Spec No.: | |
| Reviewed by: | Drawing Code: | |
| Submittal by: | File name: | |
| Chief Civil Design Sec. A: | Plot scale: | |

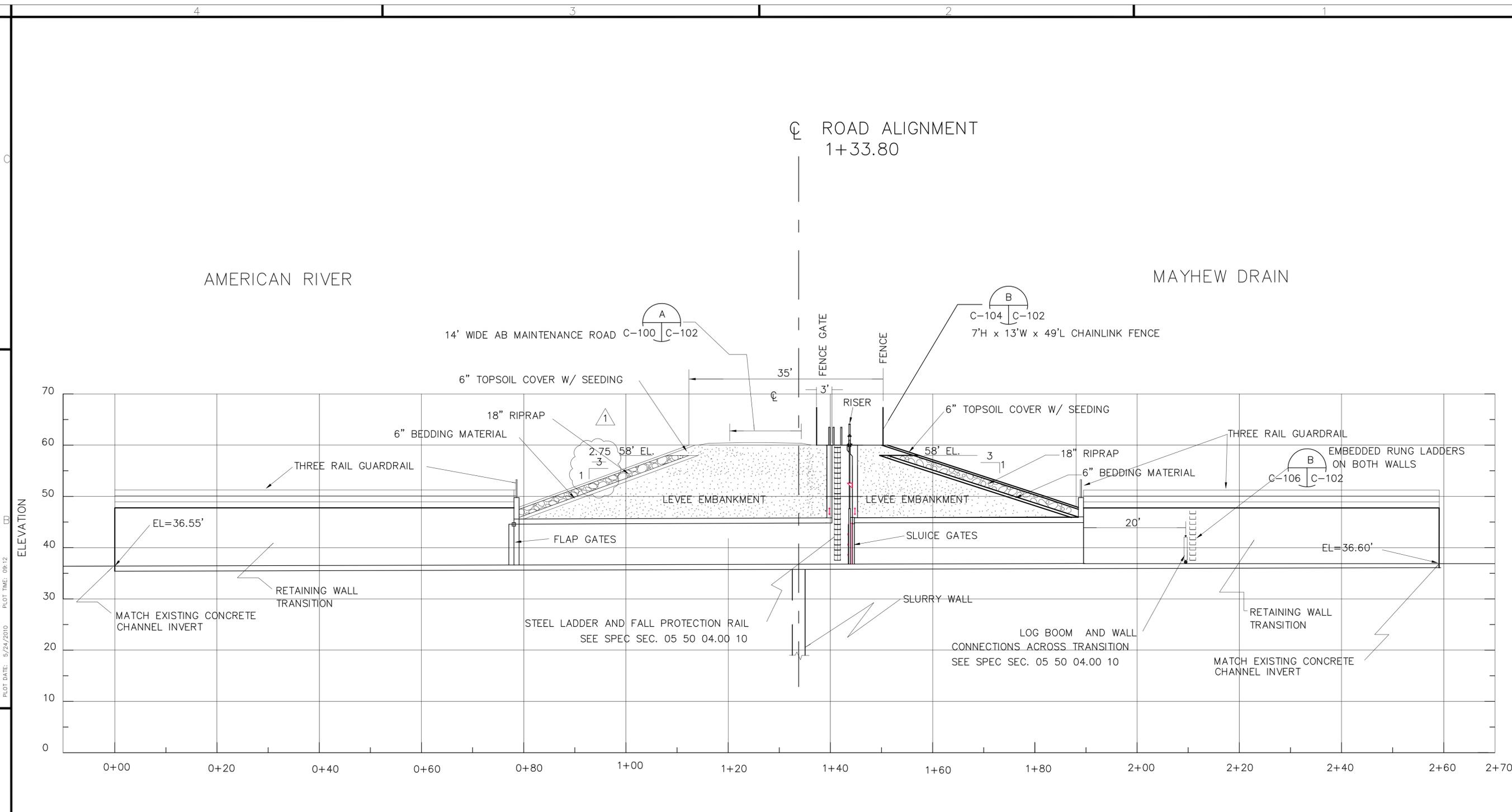
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

SACRAMENTO DISTRICT
IN-HOUSE DESIGN
1325 J STREET
SACRAMENTO, CA 95814-2922

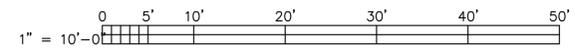
CALIFORNIA
AMERICAN RIVER COMMON FEATURES
(COMMON FEATURES) NRDA 99
LOWER AMERICAN RIVER

MAYHEW DRAIN CLOSURE STRUCTURE
PROFILE

Sheet reference number:
C-102



CLOSURE STRUCTURE PROFILE @ DRAIN ALIGNMENT

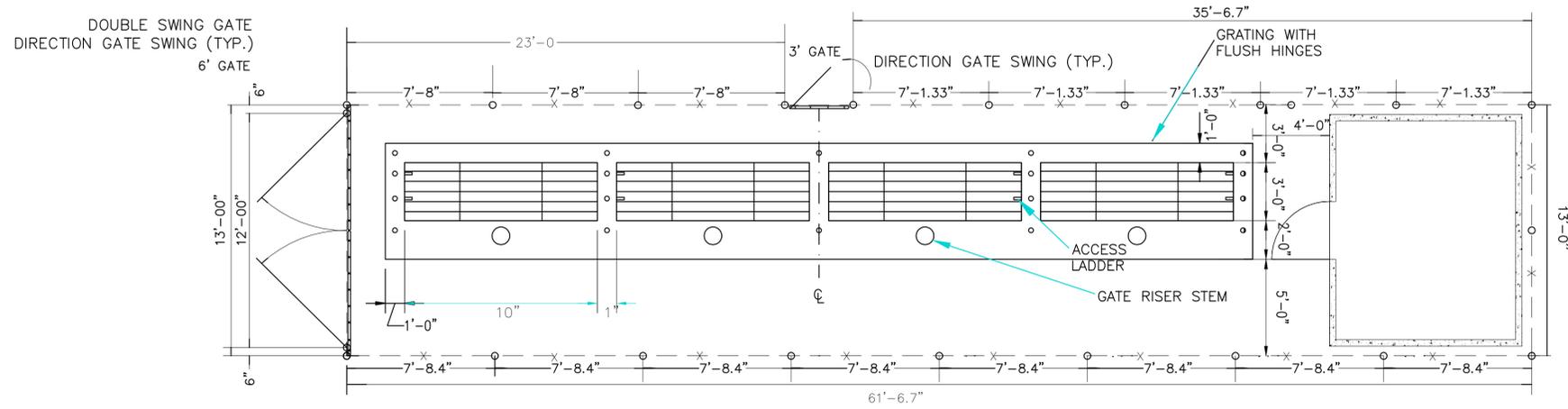


AS-BUILT

PLOT DATE: 5/24/2010 PLOT TIME: 09:12

NOTE:

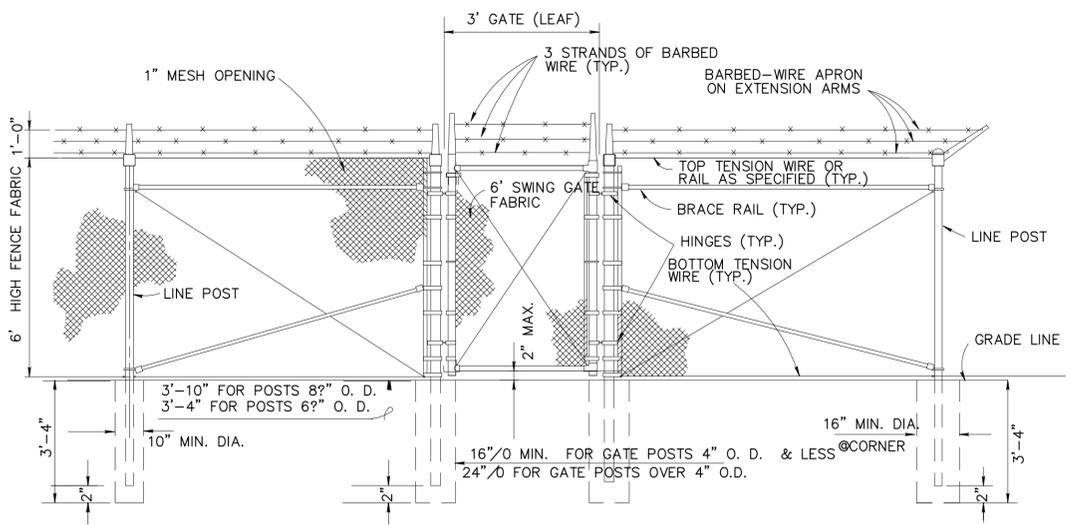
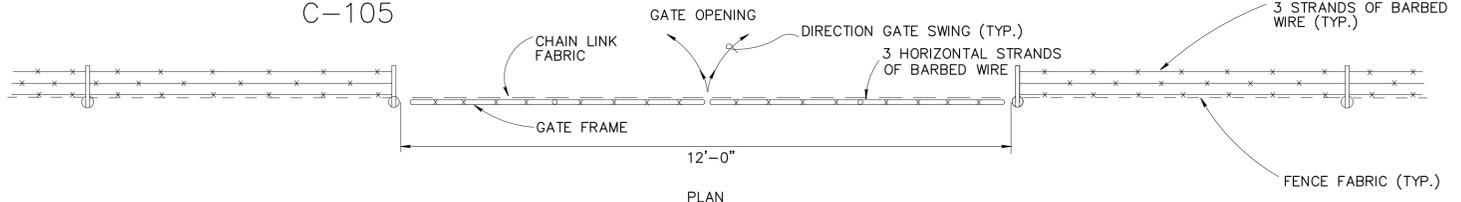
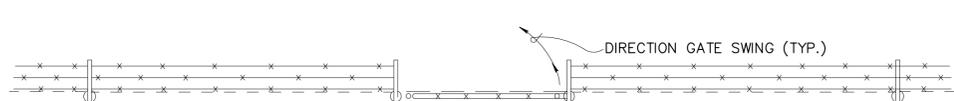
1. SEE FENCING SPECS 02 82 10. EMPHASIS IS ON COUNTY OF SACRAMENTO STANDARD CONSTRUCTION (CSSS) THAT IS 6' FABRIC HEIGHT WITH 1" MESH OPENING.
2. SEE SHEET S-100 FOR BUILDING SLAB DIMENSIONS AND REINFORCEMENT.



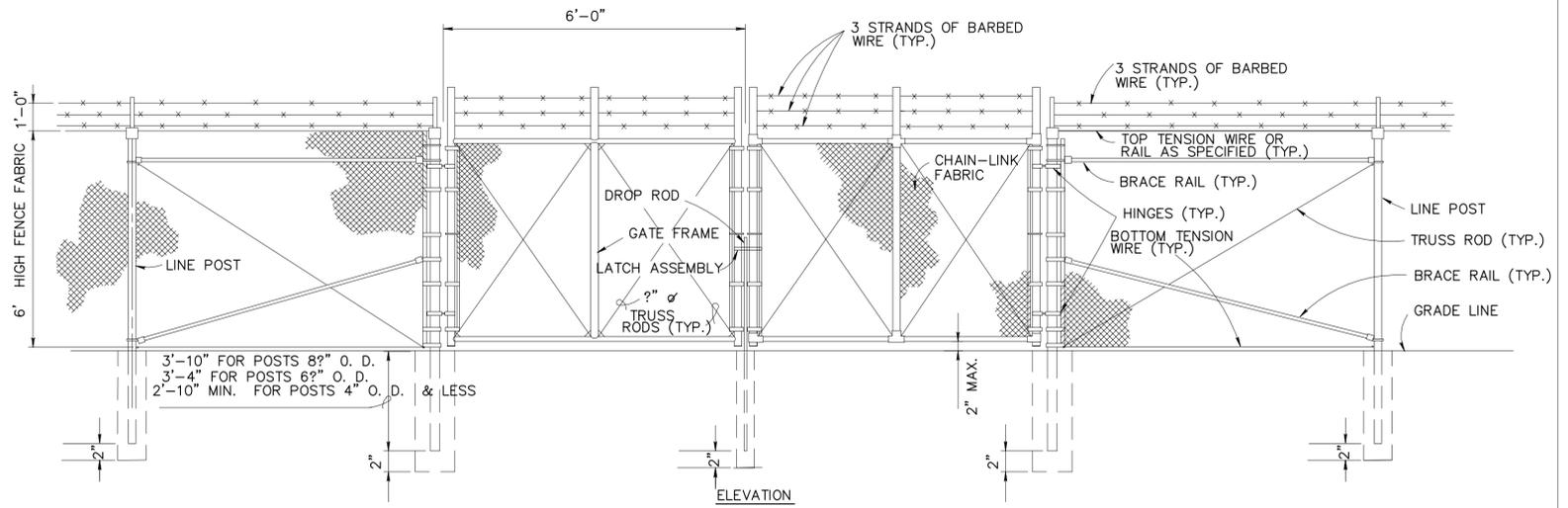
PLAN FOR FENCE CONSTRUCTION

N.T.S.

B
C-100 C-104
C-102
C-105



SINGLE SWING GATE
N.T.S.



DOUBLE SWING GATE
N.T.S.

| Symbol | Description | Date | Approved |
|--------|--------------------|--------|----------|
| A | MODIFY SHEET C-104 | 2-4-08 | |

| | | | |
|---------------------------|-----------------|------------------|-----------|
| Designed by: | S.R.S. | Date: | 6/9/07 |
| Dwn By: | S.R.S. | Design file no.: | AM-04-514 |
| Spec No.: | 1555 | Drawing Code: | |
| Reviewed by: | M.S.B. | File name: | |
| Submittal by: | PETER VALENTINE | Plot scale: | |
| DATE: DIAL DESIGN SEC. 1. | | | |

CALIFORNIA
AMERICAN RIVER COMMON FEATURES
(COMMON FEATURES) WRDA 99
LOWER AMERICAN RIVER
MAYHEW DRAIN STRUCTURE
FENCING DETAILS

Sheet reference number:
C-104

THIS DRAWING REPLACES ORIGINAL CONTRACT DRAWING C-104; UPDATED FEB 4, 2008.

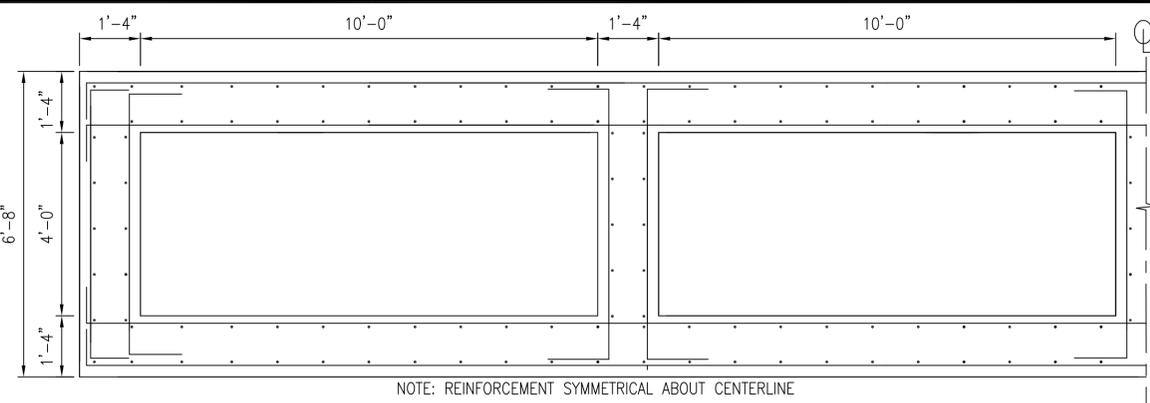
AS-BUILT

4

3

2

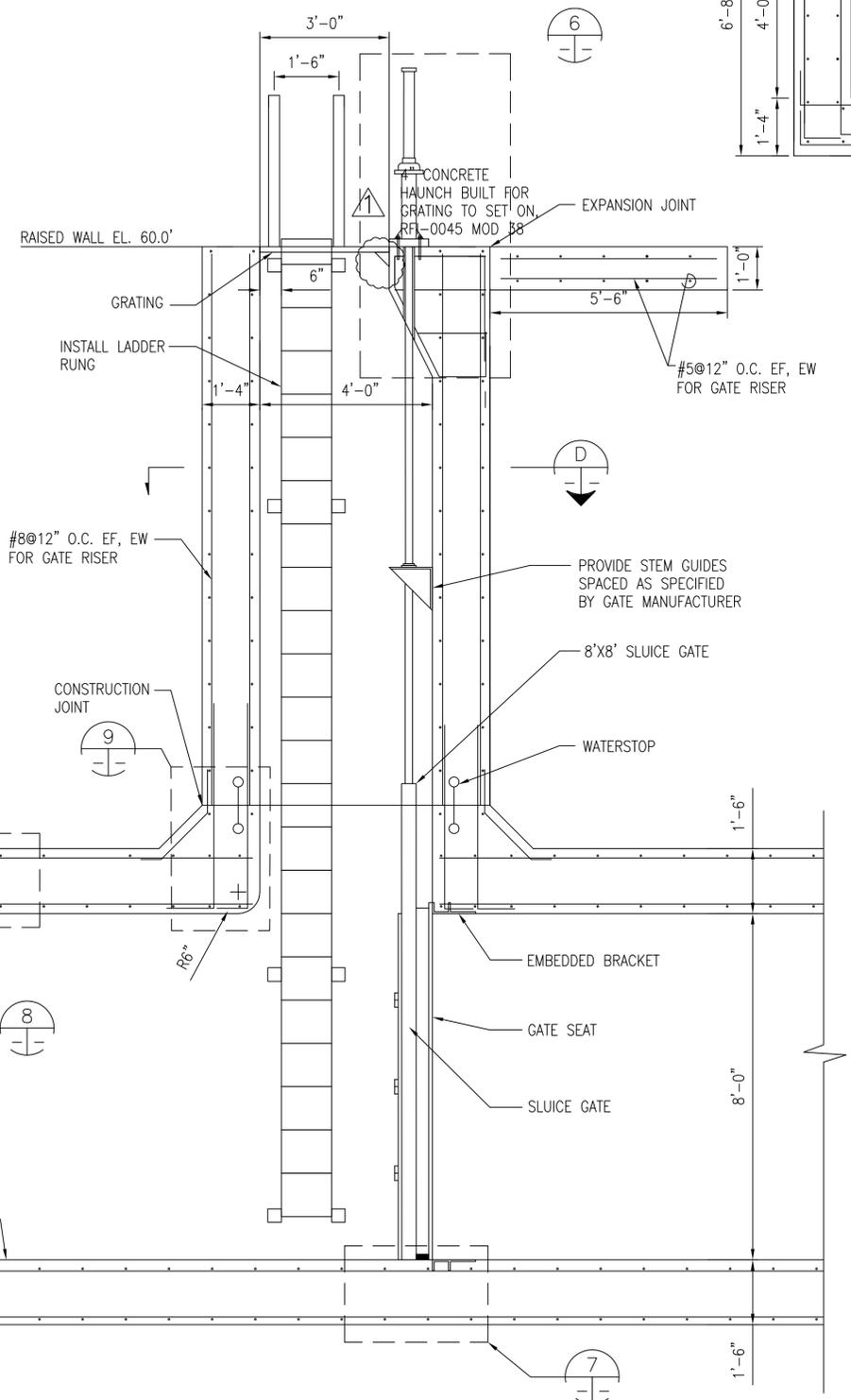
1



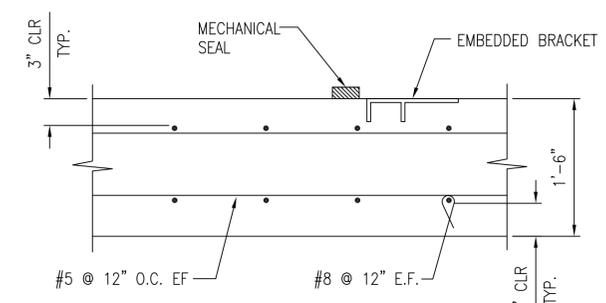
SECTION OF GATE RISER
SCALE: 1" = 2'

NOTES:

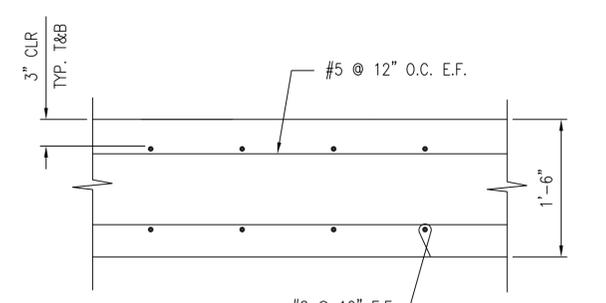
1. DRILL AND EPOXY ANCHOR BOLTS PER MANUFACTURER SPECIFICATIONS. EPOXY SHALL BE HILTI HIT HY 150 OR EQUIVALENT.
2. REINFORCEMENT SHALL HAVE 3" OF COVER WHEN CAST AGAINST FORMWORK AND 4" OF COVER WHEN CAST AGAINST EARTH.



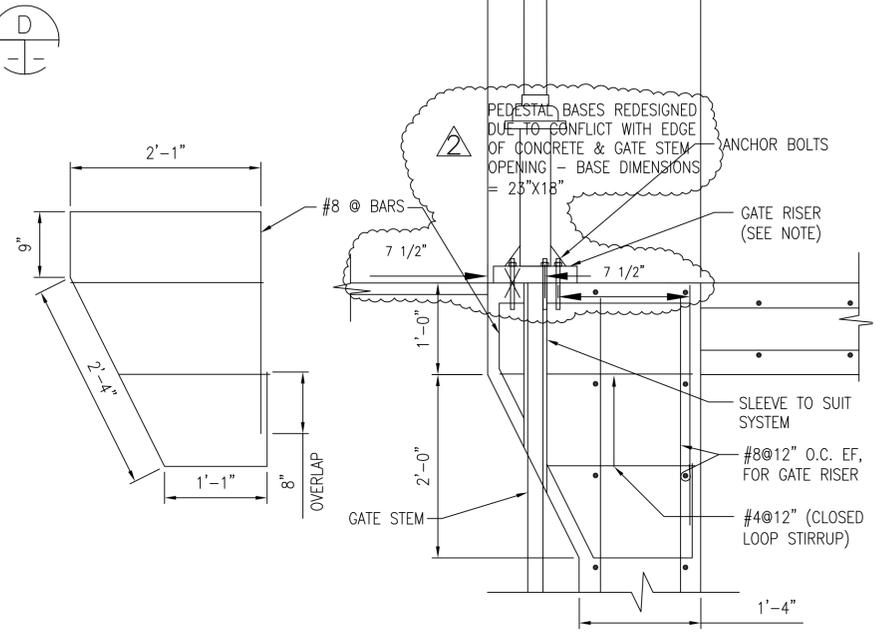
GATE RISER W/ LADDER DETAIL
SCALE: 1" = 2'



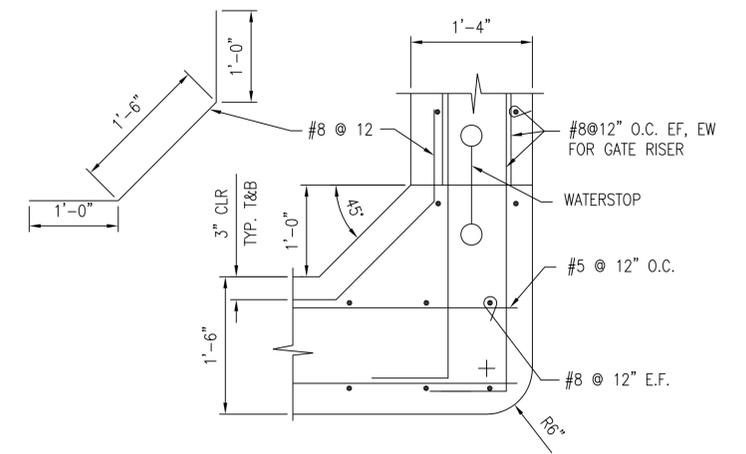
BASE OF GATE DETAIL
SCALE: 1" = 1'



REINFORCEMENT DETAIL TOP OF CULVERT
SCALE: 1" = 1'



GATE STEM RISER DETAIL
SCALE: 1" = 1'



CORNER RISER DETAIL
SCALE: 1" = 1'

SCALE: 1" = 2'

SCALE: 1" = 1'



AS-BUILT



| Revised | As-Built |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Date | Date | Date | Date | Date | Date | Date | Date | Date | Date |
| Symbol | Symbol | Symbol | Symbol | Symbol | Symbol | Symbol | Symbol | Symbol | Symbol |
| Description | Description | Description | Description | Description | Description | Description | Description | Description | Description |
| REDESIGNED AS-BUILT - HAUNCH FOR GRATE | | | | | | | | | |
| REDESIGNED AS-BUILT - REDESIGNED PESTAL BASES | | | | | | | | | |

| | | | | |
|---------------|------------------|--------------|---------------|------------|
| Designed by: | Date: | Spec No.: | Drawing Code: | File Name: |
| T. WALKER | | EM, UF | | AS NOTED |
| Dwn By: | Design file no.: | Reviewed by: | Scale: | Plot date: |
| L. CRAWLEY | | | | |
| Submitted by: | Checked by: | Approved by: | Scale: | Plot date: |
| L. CRAWLEY | | | | |

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

SACRAMENTO DISTRICT
IN-HOUSE DESIGN
3015 J STREET
SACRAMENTO, CA 95814-2922

CALIFORNIA
AMERICAN RIVER COMMON FEATURES PROJECT
MAYHEW DRAIN CLOSURE STRUCTURE

GATE RISER
STRUCTURAL DETAILS

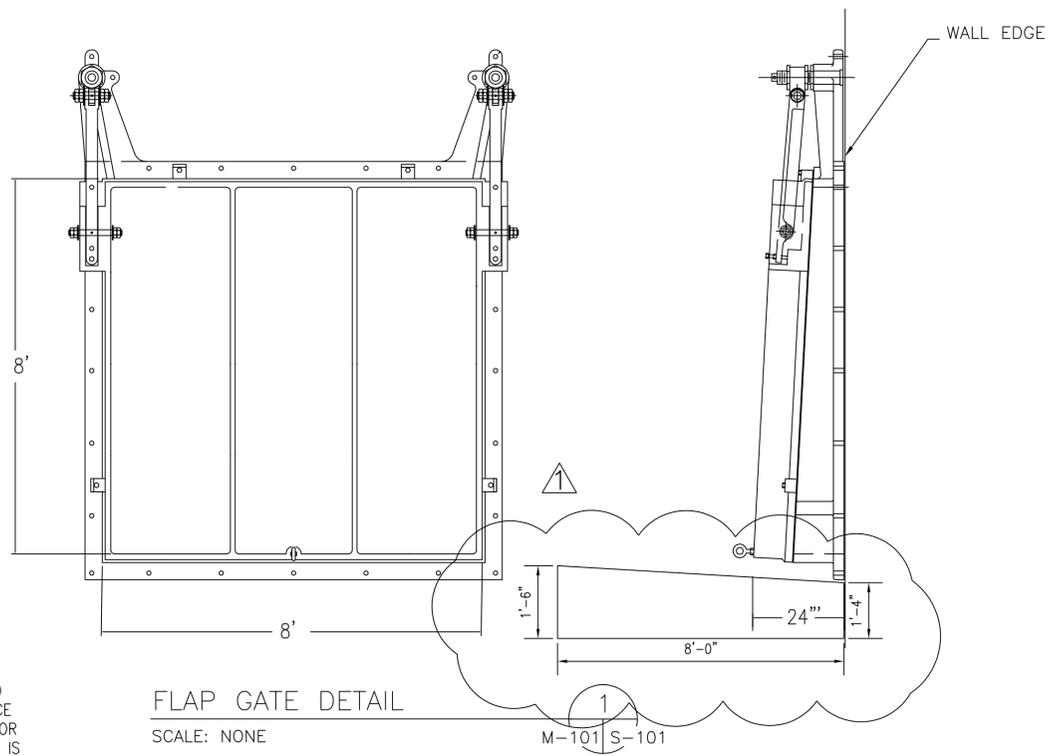
Sheet reference number:
S-102

UPDATE

Border Revised 06/20/02, CCE/STP/MLW

NOTES:

1. FLAP GATES ARE TO BE FABRICATED 304 STAINLESS STEEL. THEY ARE TO BE HINGE PIN DESIGN. FLAP GATES ARE TO BE GOLDEN HARVEST GH-42 OR EQUAL FABRICATED 304 STAINLESS STEEL. FLAP GATE TO BE PROVIDED WITH LIFTING RINGS. ALL GATE SURFACES THAT ARE NOT STAINLESS STEEL, ARE TO BE PROTECTED WITH THE GATE MANUFACTURES STANDARD FACTORY PAINT COATING. ALL EXPOSED FASTENERS ARE TO BE PRIMERED AND PAINTED TO MATCH GATE MANUFACTURES PAINTED SURFACES.



FLAP GATE DETAIL

SCALE: NONE

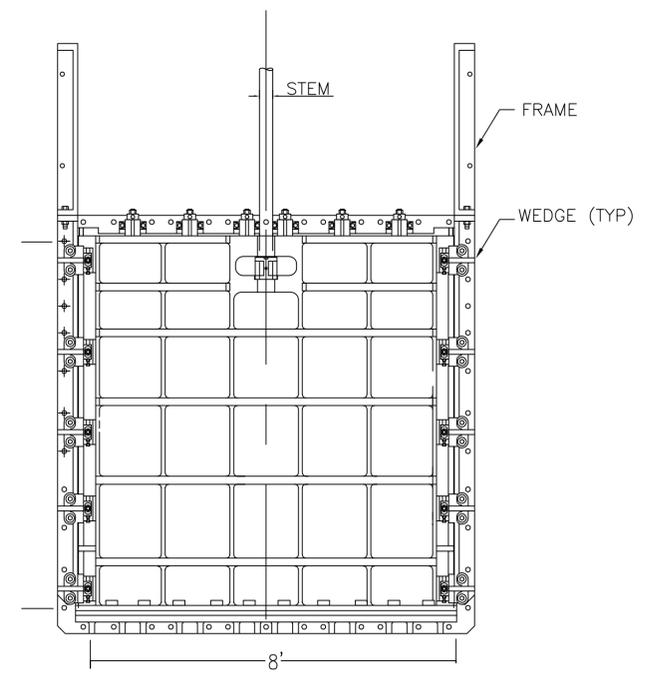
NOTES:

SLUICE AND FLAP GATE

- BOTH SLUICE AND FLAP GATES TO BE DESIGNED TO WITHSTAND 24 FEET OF HEAD MEASURED FROM THE INVERT. THE SLUICE GATE IS TO WITHSTAND 24 FEET OF HEAD IN BOTH THE UNSEATING AND SEATING DIRECTION.
- FLAP GATES TO BE PROVIDED WITH A DOUBLE HINGE PIVOT ASSEMBLY.
- SLUICE GATES STEMS TO HAVE A 3 INCH NOMINAL DIAMETER LIFTING SHAFT.
- SLUICE GATE MOTORS TO HAVE A ONE FOOT PER MINUTE TRAVEL. MOTOR TO HAVE A ONE HOUR SAFELY LIMIT ON OVERLOAD.
- ACTUATORS FOR THE SLUICE GATES TO BE AUMA OR EQUAL
- GEAR BOXES TO BE OUTDOOR RATED MUST BE CAPABLE OF EITHER MANUAL OPERATION OR ELECTRIC OPERATION BY MEANS OF A MULTITURN ELECTRIC MOTOR ACTUATOR. IT SHALL BE POSSIBLE TO CONNECT TO VALVE STEM AN AUXILIARY MOTOR DRIVE. THE CONTRACTOR IS TO PROVIDE A PORTABLE GAS POWERED ENGINE DRIVE UNIT FOR THE RAISING OF THE GATES. THIS UNIT IS TO CONNECT TO THE GATE ACTUATOR AND BE OF THE TYPE RECOMMENDED BY THE ACTUATOR MANUFACTURE.
- GATES ARE TO BE FABRICATED 304 STAINLESS STEEL GATES.
- DUE TO LONG LEAD TIMES FOR SLUICE GATES, THE CONTRACTOR MAYBE REQUIRED TO INSTALL THE GATES AFTER COMPLETION OF THE EMBANKMENT.

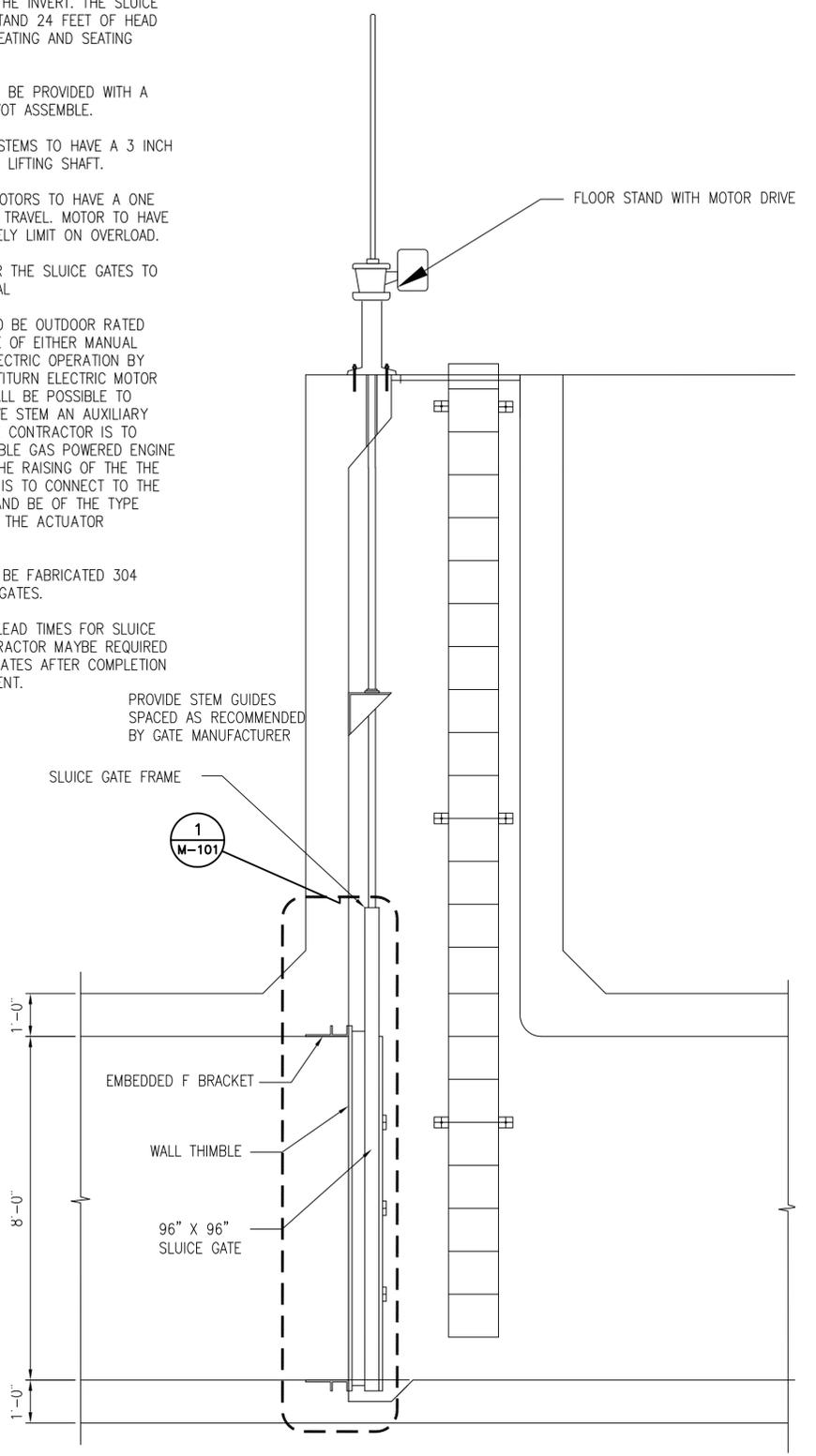
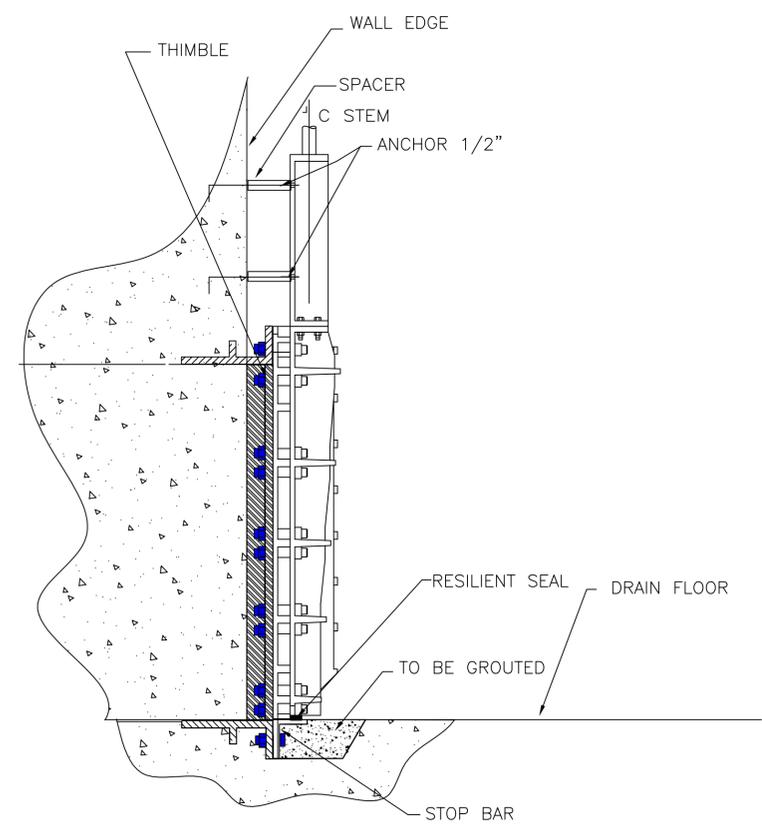
NOTES:

1. SLUICE GATES ARE TO BE FABRICATED 304 STAINLESS STEEL. FABRICATED SLUICE GATE TO BE GH-100 GOLDEN HARVEST OR EQUAL. 304 STAINLESS STEEL. THE GATE IS BE DESIGNED FOR 24 FEET OF HEAD IN BOTH THE UNSEATING AND SEATING DIRECTIONS AND IS TO HAVE ADJUSTABLE SEAL WEDGES. GATE IS TO HAVE FLUSH BOTTOM SEAL. ALL GATE SURFACES THAT ARE NOT STAINLESS STEEL, ARE TO BE PROTECTED WITH THE GATE MANUFACTURES STANDARD FACTORY PAINT COATING. ALL EXPOSED FASTENERS ARE TO BE PRIMERED AND PAINTED TO MATCH GATE MANUFACTURES PAINTED SURFACES.



SLUICE GATE DETAIL

SCALE: NONE



AS-BUILT



| Symbol | Description | Date | Approval |
|--------|--|------|----------|
| ▲ | REVISED AS-BUILT REDUCED THICKNESS OF SUB AT GATES TO ALLOW GATES TO CLOSE MOD. 35 | | |

| | | | |
|-----------------------------|------------------|-----------|----------|
| Designed by T. BARSTAD | Date: 6/5/07 | Spec No.: | 1355 |
| Dwn by: T. BARSTAD | Design file no.: | 1-04-514 | |
| Reviewed by: S. SLINKARD | Drawing Code: | | |
| Submitted by: S. BARWAN | File name: | | |
| Chf. ME/EL/ES/EN | Plot date: | | |
| | Dwg. scale: | | AS NOTED |

SACRAMENTO
AMERICAN RIVER COMMON FEATURES PROJECT
MAYHEW DRAIN CLOSURE STRUCTURE
SLUICE GATE DETAIL
MECHANICAL DETAILS

Sheet reference number:
M-101

