OPENING PERMISSIVES

Traffic signals RED permissive

Do not allow continuation of cycle until traffic lights RED and 15 second timer times out or TRAFFIC LIGHT BYPASS is engaged.

Enable on-coming traffic gates LOWER and sidewalk gates CLOSE

On-coming traffic gates DOWN permissive

Do not allow continuation of cycle until on-coming traffic gates are DOWN or ON-COMING TRAFFIC GATES BYPASS engaged.

Enable off-going traffic gates LOWER

Off-going traffic gates DOWN permissive

Do not allow continuation of cycle until off-going traffic gates are DOWN or OFF-GOING TRAFFIC GATES BYPASS engaged.

Enable traffic barrier LOWER

Traffic barriers DOWN permissive

Do not allow continuation of cycle until traffic barriers are DOWN or TRAFFIC BARRIERS BYPASS engaged.

Sidewalk gates CLOSED permissive

Do not allow continuation of cycle until sidewalk gates are CLOSED or SIDEWALK GATES BYPASS engaged.

Span locks PULLED permissive

Do not allow continuation of cycle until span locks are PULLED or SPAN LOCKS BYPASS engaged.

Leaf(s) fully OPEN permissive

Do not allow channel clearance lights GREEN until all leaves are fully OPEN.

Enable span locks PULL

Enable leaf(s) RAISE

Enable channel clearance lights switch to GREEN

FLOWCHART LEGEND

Continue a process, start, stop

Enable a process device or routine, iteration

Decision

Action or process

Message

Logical OR's

Timer, delay

Logical AND's

Input, switch

Connector lines, data flow

Insert flag
CLOSING PERMISSIVES

A' N/A

B' On-coming gates RAISED permissive

C' Off-going gates RAISED permissive

D' Traffic barriers RAISED permissive

E' Sidewalk gates OPEN permissive

F' Span locks DRIVEN permissive

G' Leaf(s) fully SEATED permissive

Enable span locks DRIVE

Enable traffic signals GREEN

Enable traffic barriers raise and sidewalk gates OPEN

Enable off-going traffic gates RAISE

Enable on-coming traffic gates RAISE

Do not allow continuation of cycle until on-coming traffic gates are RAISED.

Do not allow continuation of cycle until off-going traffic gates are RAISED.

Do not allow continuation of cycle until traffic barriers are RAISED.

Do not allow continuation of cycle until sidewalk gates are OPEN.

Do not allow continuation of cycle until span locks are DRIVEN.

Do not allow continuation of cycle until leaf(s) are FULLY SEATED.
TRAFFIC SIGNALS - OPENING

START OPENING SEQUENCE

TRAFFIC SIGNALS TO RED

PUSH AND RELEASE

CONTROL CONSOLE PUSHBUTTON

TURN GREEN LIGHTS OFF AND ENERGIZE YELLOW LIGHTS

AN-15: ADVANCE WARNING SIGNALS TROUBLE (AN-15)

DISPLAY MESSAGE IF ANY LAMP IS BURNED OUT

TIMER ADJUSTABLE 1-10 SECONDS

TO MESSAGE SUBROUTINE

ENERGIZE FLASHING GATE ARM LIGHTS

Y

WARNING DRAWBRIDGE AHEAD SIGN

ENERGIZE ADVANCE WARNING SIGNAL CONTACTOR

ADVANCE WARNING SIGNAL CONTACTOR IS DE-ENERGIZED AT CLOSING

Y

N

ANY BURNT YELLOW LAMPS?

N

Y

AN-15: ADVANCE WARNING SIGNAL TRouble

TIMER ADJUSTABLE 5-20 SECONDS

15 SEC TIMER

TRAFFIC LIGHTS RED PERMISSIVE

TRAFFIC LIGHTS OFF

AND ENERGIZE RED LIGHTS

FROM MESSAGE SUBROUTINE

TO MESSAGE SUBROUTINE

EE SHEET 6 - "TRAFFIC SIGNALS - CLOSING" FOR CONTINUATION

RECORD DATE AND TIME OF BYPASS

BYPASS WILL ALSO BYPASS 15 SECOND TIMER

TRAFFIC LIGHT BYPASS

PUSH AND RELEASE

AN-24: TRAFFIC SIGNALS BYPASSED

ENERGIZE GONGS

ALL GATE ARMS DOWN/CLOSED

D-EENERGIZE GONGS

ALARMS THIS SHEET:

1. TRAFFIC SIGNALS BYPASSED (AN-24)

2. ADVANCE WARNING SIGNALS TROUBLE (AN-15)
TRAFFIC SIGNALS - CLOSING

- Display message if any lamp is burned out.
- Turn red lights off and energize green lights.
- De-energize flashing light contactor.
- De-energize flashing gate arm lights.
- Warning: drawbridge ahead sign.
- Traffic signal trouble.
- Start message subroutine.
- End message subroutine.

Alarms this sheet:
1. Traffic signals trouble (AN-13, AN-14)
NAVIGATION LIGHTS

ALARMS THIS SHEET:
1. NAVIGATION LIGHTS MODE (AN-17, AN-18)
2. NAVIGATION FENDER LIGHTS FAILURE (AN-19, AN-20)
3. CHANNEL CLEARANCE LIGHTS FAILURE (AN-21, AN-22)
ON-COMING TRAFFIC GATES - OPENING

NOTE: SEE SHEET 9 - "ON-COMING TRAFFIC GATES" FOR MESSAGE SUBROUTINES.

ALARMS THIS SHEET:
1. ON-COMING TRAFFIC GATES BYPASSED (AN-25)
ON-COMING TRAFFIC GATES

**MESSAGE A SUBROUTINE**

- **NEAR**
  - AN-52: NOC TRAFFIC GATE OPERATOR TROUBLE
  - AN-46: FOC TRAFFIC GATE OPERATOR TROUBLE

- **FAR**
  - AN-50: FOC TRAFFIC GATE HANDCRANK INSERTED

**MESSAGE B SUBROUTINE**

- **NEAR**
  - AN-56: NOC TRAFFIC GATE HANDCRANK INSERTED
  - AN-51: FOC TRAFFIC GATE HANDCRANK INSERTED

- **FAR**
  - AN-57: NOC TRAFFIC GATE OPERATOR DOOR OPEN
  - AN-55: NOC TRAFFIC GATE LIMIT SWITCH FAILURE

**MESSAGE C SUBROUTINE**

- **NEAR**
  - AN-51: FOC TRAFFIC GATE OPERATOR DOOR OPEN
  - AN-49: FOC TRAFFIC GATE LIMIT SWITCH FAILURE

- **FAR**
  - AN-57: NOC TRAFFIC GATE OPERATOR DOOR OPEN
  - AN-55: NOC TRAFFIC GATE LIMIT SWITCH FAILURE

**MESSAGE D SUBROUTINE**

- **NEAR**
  - AN-49: FOC TRAFFIC GATE LIMIT SWITCH FAILURE
  - AN-46: FOC TRAFFIC GATE OPERATOR TROUBLE

- **FAR**
  - AN-55: NOC TRAFFIC GATE LIMIT SWITCH FAILURE

**ALARMS THIS SHEET:**

1. TRAFFIC GATE OPERATOR TROUBLE (AN-46, AN-52)
2. TRAFFIC GATE LIMIT SWITCH FAILURE (AN-49, AN-55)
3. TRAFFIC GATE OPERATOR DOOR OPEN (AN-51, AN-57)
4. TRAFFIC GATE HANDCRANK INSERTED (AN-50, AN-56)
OFF-GOING TRAFFIC GATES - OPENING

NOTE: SEE SHEET 12 – "OFF-GOING TRAFFIC GATES" FOR MESSAGE SUBROUTINES.
OFF-GOING TRAFFIC GATES

MESSAGE A SUBROUTINE (OFF-GOING TRAFFIC GATE OPERATOR TROUBLE)

MESSAGE B SUBROUTINE (OFF-GOING TRAFFIC GATE HANDCRANK INSERTED)

MESSAGE C SUBROUTINE (OFF-GOING TRAFFIC GATE OPERATOR DOOR OPEN)

MESSAGE D SUBROUTINE (OFF-GOING TRAFFIC GATE LIMIT SWITCH FAILURE)

ALARMS THIS SHEET:
1. TRAFFIC GATE OPERATOR TROUBLE (AN-58, AN-64)
2. TRAFFIC GATE LIMIT SWITCH FAILURE (AN-61, AN-67)
3. TRAFFIC GATE OPERATOR DOOR OPEN (AN-63, AN-69)
4. TRAFFIC GATE HANDCRANK INSERTED (AN-62, AN-68)
SIDEWALK GATES - OPENING

NOTE: SEE SHEET 15 “SIDEWALK GATES – 1 OF 2” AND SHEET 16 “SIDEWALK GATES – 2 OF 2” FOR MESSAGE SUBROUTINES.
MESSAGE A SUBROUTINE
(SIDEWALK GATE OPERATOR TROUBLE)

MESSAGE B SUBROUTINE
(SIDEWALK GATE HANDCRANK INSERTED)

ALARMS THIS SHEET:
1. SIDEWALK GATE OPERATOR TROUBLE (AN-71, AN-77, AN-83, AN-89)
2. SIDEWALK GATE HANDCRANK INSERTED (AN-75, AN-81, AN-87, AN-93)
START MESSAGE C SUBROUTINE

NEAR OR FAR SIDEWALK GATE?

NEAR

AN-82: NOG SIDEWALK GATE OPERATOR DOOR OPEN

OC

AN-84: NOG SIDEWALK GATE OPERATOR DOOR OPEN

OC

AN-76: NOC SIDEWALK GATE OPERATOR DOOR OPEN

OC

AN-88: FOG SIDEWALK GATE OPERATOR DOOR OPEN

FAR

MESSAGE C SUBROUTINE (SIDEWALK GATE OPERATOR DOOR OPEN)

END MESSAGE C SUBROUTINE

START MESSAGE D SUBROUTINE

NEAR OR FAR SIDEWALK GATE?

NEAR

AN-80: NOG SIDEWALK GATE LIMIT SWITCH FAILURE

OC

AN-86: NOG SIDEWALK GATE LIMIT SWITCH FAILURE

OC

AN-92: NOG SIDEWALK GATE LIMIT SWITCH FAILURE

OC

AN-94: NOG SIDEWALK GATE LIMIT SWITCH FAILURE

OC

AN-74: FOG SIDEWALK GATE LIMIT SWITCH FAILURE

MESSAGE D SUBROUTINE (SIDEWALK GATE LIMIT SWITCH FAILURE)

END MESSAGE D SUBROUTINE

ALARMS THIS SHEET:
1. SIDEWALK GATE OPERATOR DOOR OPEN (AN-76, AN-82, AN-88, AN-94)
2. SIDEWALK GATE LIMIT SWITCH FAILURE (AN-74, AN-80, AN-86, AN-92)
NOTE: SEE SHEET 15 "SIDEWALK GATES – 1 OF 2" AND SHEET 16 "SIDEWALK GATES – 2 OF 2" FOR MESSAGE SUBROUTINES.

ALARMS THIS SHEET:
1. SIDEWALK GATES BYPASSED (AN-27)
TRAFFIC BARRIERS - OPENING

NOTE: SEE SHEET 19 “TRAFFIC BARRIERS – 1 OF 2” AND SHEET 20 “TRAFFIC BARRIERS – 2 OF 2” FOR MESSAGE SUBROUTINES.
TRAFFIC BARRIERS - 1 OF 2

START MESSAGE A SUBROUTINE

END MESSAGE A SUBROUTINE

MESSAGE A SUBROUTINE
(TRAFFIC BARRIER OPERATOR TROUBLE)

MESSAGE B SUBROUTINE
(TRAFFIC BARRIER HANDCRANK INSERTED)

START MESSAGE B SUBROUTINE

END MESSAGE B SUBROUTINE

ALARMS THIS SHEET:
1. TRAFFIC BARRIER OPERATOR TROUBLE (AN-96, AN-102, AN-108, AN-114)
2. TRAFFIC BARRIER HANDCRANK INSERTED (AN-100, AN-106, AN-112, AN-118)
TRAFFIC BARRIERS - 2 OF 2

MESSAGE C SUBROUTINE
(TRAFFIC BARRIER OPERATOR DOOR OPEN)

MESSAGE D SUBROUTINE
(TRAFFIC BARRIER LIMIT SWITCH FAILURE)

ALARMS THIS SHEET:
1. TRAFFIC BARRIER OPERATOR DOOR OPEN (AN-101, AN-107, AN-113, AN-119)
2. TRAFFIC BARRIER LIMIT SWITCH FAILURE (AN-99, AN-105, AN-111, AN-117)
TRAFFIC BARRIERS - CLOSING

NOTE: SEE SHEET 19 "TRAFFIC BARRIERS – 1 OF 2" AND SHEET 20 "TRAFFIC BARRIERS – 2 OF 2" FOR MESSAGE SUBROUTINES.

ALARMS THIS SHEET:
1. TRAFFIC BARRIERS BYPASSED (AN-28)
SPAN LOCKS - OPENING

NOTE: SEE SHEET 23 "SPAN LOCKS" FOR MESSAGE SUBROUTINES.

1. SPAN LOCKS BYPASSED (AN-29)
SPAN LOCKS

ALARMS THIS SHEET:
1. SPAN LOCK OPERATOR TROUBLE (AN-121, AN-126, AN-131, AN-136)
2. SPAN LOCK HANDCRANK INSERTED OR OVERPRESSURE (AN-125, AN-130, AN-135, AN-140)
3. SPAN LOCK LIMIT SWITCH FAILURE (AN-124, AN-129, AN-134, AN-139)
SPAN LOCKS - CLOSING

- **Use for Mechanical Span Lock Drives**
  - Record Date and Time of Trouble
  - To Message A Subroutine
  - From Message A Subroutine
  - Operator Trouble Cleared?

- **Use for Hydraulic Span Lock Drives**
  - Record Date and Time of Trouble
  - To Message B Subroutine
  - From Message B Subroutine
  - Handcrank Removed?

- **Span Lock Operator Trouble Cleared?**
  - Yes
    - Energize Drive (Forward) Contactor
  - No
    - Span Locks Driven Limit Switch Made?
      - Yes
        - Span Locks Driven Limit Switches Interlock Made?
          - Yes
            - De-Energize Drive (Forward) Contactor
            - Span Locks Driven Interlock Made?
              - Yes
                - Span Locks Bypassed
              - No
                - Span Locks Bypass Limit Switches
        - No
          - Span Lock High Pressure Cleared?
            - Yes
              - Span Locks Driven Limit Switches Interlock Made?
                - Yes
                  - Span Locks Bypassed
                - No
                  - Span Locks Bypass Limit Switches
            - No
              - Span Locks Driven Limit Switch Cleared?
                - Yes
                  - Span Locks Bypassed
                - No
                  - Span Locks Bypass Limit Switches

- **Bypass Span Locks Driven Limit Switches**
  - Record Date and Time of Bypass
  - Control Console Pushbutton

**Note:** See Sheet 23 "Span Locks" for Message Subroutines.

**Alarms This Sheet:**
1. Span Locks Bypassed (AN-29)
NOTE: SEE SHEETS 27 THRU 35 "LEAFS – 1 OF 9" THRU "LEAFS - 9 OF 9" FOR MESSAGE SUBROUTINES.
LEAFS - OPENING - 2 OF 2

FROM

ACCELERATE
PER
ACCELERATION
RAMP

Y

NEAR
OPEN
LIMIT
SWITCH
MADE?

STOP
BUTTON
PRESSED?

Y

STOP
 BUTTON
PRESSED?

N

OVERSPEED?

Y

OVERSPEED?

N

MOTOR
HIGH
TEMPERATURE?

Y

MOTOR
HIGH
TEMPERATURE?

N

DRIVE
TROUBLE?

Y

DRIVE
TROUBLE?

N

POSITION
TRANSDUCER
FAILURE?

Y

POSITION
TRANSDUCER
FAILURE?

N

LOCKS
DRIVEN
(NOT
PULLED)?

Y

LOCKS
DRIVEN
(NOT
PULLED)?

N

ISSUE
REduced
(CREEP)
SPEED
COMMAND

REMOVE
RAISE
(Forward)
DIRECTION
COMMAND

Y

FULLY
OPEN
LIMIT
SWITCH
MADE?

Y

REMOVE
DRIVE
ENABLE
COMMAND

STOP
BUTTON
PRESSED?

OR

TO MESSAGE
N
SUBROUTINE

FROM MESSAGE
N
SUBROUTINE

TO MESSAGE
H
SUBROUTINE

FROM MESSAGE
H
SUBROUTINE

TO MESSAGE
I
SUBROUTINE

FROM MESSAGE
I
SUBROUTINE

NOTE: SEE SHEETS 27 THRU 35 “LEAFS – 1 OF 9” THRU “LEAFS - 9 OF 9” FOR MESSAGE SUBROUTINES.
MESSAGE B SUBROUTINE
(EMERGENCY DRIVE ENGAGED)

AN-173:
NA LEAF EMERGENCY DRIVE ENGAGED

AN-172:
NA LEAF DRIVE B FAULT

AN-171:
NA LEAF DRIVE A FAULT

AN-208:
NO LEAF DRIVE B FAULT

AN-207:
NO LEAF DRIVE A FAULT

AN-209:
NO LEAF EMERGENCY DRIVE ENGAGED

START MESSAGE B SUBROUTINE

NEAR OR FAR LEAF?

END MESSAGE B SUBROUTINE

START MESSAGE C SUBROUTINE

NEAR OR FAR LEAF?

END MESSAGE C SUBROUTINE

MESSAGE C SUBROUTINE
(DRIVE FAULT)

AN-190:
FA LEAF DRIVE B FAULT

AN-191:
FA LEAF EMERGENCY DRIVE ENGAGED

AN-189:
FA LEAF EMERGENCY DRIVE ENGAGED

AN-225:
FO LEAF DRIVE A FAULT

AN-226:
FO LEAF DRIVE B FAULT

AN-227:
FO LEAF EMERGENCY DRIVE ENGAGED

START MESSAGE C SUBROUTINE

NEAR OR FAR LEAF?

END MESSAGE C SUBROUTINE

ALARMS THIS SHEET:
1. EMERGENCY DRIVE ENGAGED (AN-173, AN-191, AN-209, AN-227)
2. LEAF DRIVE A FAULT (AN-171, AN-189, AN-207, AN-225)
3. LEAF DRIVE B FAULT (AN-172, AN-190, AN-208, AN-226)
A
1. MOTOR A BRAKE NOT RELEASED
   (AN-176, AN-194, AN-212, AN-230)
2. MOTOR B BRAKE NOT RELEASED
   (AN-179, AN-197, AN-215, AN-233)
3. MACHINERY BRAKE A NOT RELEASED
   (AN-182, AN-200, AN-218, AN-236)
4. MACHINERY BRAKE B NOT RELEASED
   (AN-185, AN-203, AN-221, AN-239)
START MESSAGE E SUBROUTINE

NEAR OR FAR LEAF?

NEAR

OPPOSITE OR ADJACENT LEAF?

O

A

MOTOR A BRAKE?

Y

N

MOTOR B BRAKE?

Y

N

MACHINERY BRAKE A?

Y

N

AN-210: NO LEAF MOTOR A BRAKE TROUBLE

AN-216: NO LEAF MACHINERY BRAKE B TROUBLE

AN-174: NA LEAF MOTOR A BRAKE TROUBLE

AN-180: NA LEAF MACHINERY BRAKE A TROUBLE

AN-183: NA LEAF MACHINERY BRAKE B TROUBLE

AN-228: FO LEAF MOTOR A BRAKE TROUBLE

AN-231: FO LEAF MOTOR B BRAKE TROUBLE

AN-234: FO LEAF MACHINERY BRAKE A TROUBLE

AN-192: FA LEAF MOTOR A BRAKE TROUBLE

AN-195: FA LEAF MOTOR B BRAKE TROUBLE

AN-198: FA LEAF MACHINERY BRAKE A TROUBLE

AN-201: FA LEAF MACHINERY BRAKE B TROUBLE

END MESSAGE E SUBROUTINE

MESSAGE E SUBROUTINE (BRAKE TROUBLE)

ALARMS THIS SHEET:
1. MOTOR A BRAKE TROUBLE (AN-174, AN-192, AN-210, AN-228)
2. MOTOR B BRAKE TROUBLE (AN-177, AN-195, AN-213, AN-231)
3. MACHINERY BRAKE A TROUBLE (AN-180, AN-198, AN-216, AN-234)
4. MACHINERY BRAKE B TROUBLE (AN-183, AN-201, AN-219, AN-237)
MESSAGE F SUBROUTINE
(MOTOR OVERSPEED)

START MESSAGE F SUBROUTINE

NEAR OR FAR LEAF?

OPPOSITE OR ADJACENT LEAF?

MOTOR A?

AN-242: NO LEAF MOTOR A OVERSPEED

AN-243: MOTOR A OVERSPEED

AN-244: NA LEAF MOTOR A OVERSPEED

AN-245: NA LEAF MOTOR B OVERSPEED

OPPOSITE OR ADJACENT LEAF?

MOTOR A?

AN-246: NO LEAF MOTOR A OVERSPEED

AN-247: FO LEAF MOTOR A OVERSPEED

AN-248: FA LEAF MOTOR A OVERSPEED

AN-249: FA LEAF MOTOR B OVERSPEED

END MESSAGE F SUBROUTINE

ALARMS THIS SHEET:
1. MOTOR A OVERSPEED (AN-242, AN-244, AN-246, AN-248)
2. MOTOR B OVERSPEED (AN-243, AN-245, AN-247, AN-249)
MESSAGE G SUBROUTINE (MOTOR HIGH TEMPERATURE)

ALARMS THIS SHEET:
1. MOTOR A HIGH TEMPERATURE (AN-186, AN-204, AN-222, AN-240)
2. MOTOR B HIGH TEMPERATURE (AN-187, AN-205, AN-223, AN-241)
ALARMS THIS SHEET:
1. LOCKS NOT PULLED (AN-165)
2. FULL OPEN LIMIT SWITCH FAILURE (AN-145, AN-151, AN-157, AN-163)
3. NEAR OPEN LIMIT SWITCH FAILURE (AN-144, AN-150, AN-156, AN-162)
MESSAGE K SUBROUTINE
(FULL CLOSED LIMIT SWITCH FAILURE)

MESSAGE L SUBROUTINE
(NEAR CLOSED LIMIT SWITCH FAILURE)

ALARMS THIS SHEET:
1. FULL CLOSED LIMIT SWITCH FAILURE (AN-142, AN-148, AN-154, AN-160)
2. NEAR CLOSED LIMIT SWITCH FAILURE (AN-143, AN-149, AN-155, AN-161)
MESSAGE M SUBROUTINE
(FULL SEATED LIMIT SWITCH FAILURE)

MESSAGE N SUBROUTINE
(POSITION TRANSUDER FAILURE)

ALARMS THIS SHEET:
1. FULL SEATED LIMIT SWITCH FAILURE (AN-141, AN-147, AN-153, AN-159)
2. POSITION TRANSUDER FAILURE (AN-146, AN-152, AN-158, AN-164)
NOTE: SEE SHEETS 27 THRU 35 "LEAFS – 1 OF 9" THRU "LEAFS - 9 OF 9" FOR MESSAGE SUBROUTINES.
NOTE: SEE SHEETS 27 THRU 35 "LEAFS – 1 OF 9" THRU "LEAFS - 9 OF 9" FOR MESSAGE SUBROUTINES.
LEAFS - SEATED

**Flowchart Description:**

1. **FROM PREVIOUS SHEET**
   - Y: FULLY SEATED LIMIT SWITCH MADE?
   - N: FULLY SEATED LIMIT SWITCH FAILURE
     - Y: FROM MESSAGE M SUBROUTINE
     - N: TO MESSAGE M SUBROUTINE

2. **FULLY SEATED LIMIT SWITCH MADE?**
   - Y: FULLY SEATED LIMIT SWITCHES CLOSED?
     - Y: RECORD DATE AND TIME OF BYPASS
     - N: LEAF(S) FULLY SEATED BYPASSED (AN-30)
   - N: LEAFS FULLY SEATED PERMISSIVE

3. **FULLY SEATED LIMIT SWITCH FAILURE**
   - Y: LEAF(S) FULLY SEATED BYPASSED (AN-30)

**Alarms This Sheet:**
1. LEAF(S) FULLY SEATED BYPASSED (AN-30)