FIELD SUMMARY REPORT
INSPECTION OF THE PASCOAG UPPER RESERVOIR DAM
LOW LEVEL OUTLET

Pascoag, RHODE ISLAND

OCTOBER 2010

REPORT PREPARED FOR

PASCOAG RESERVOIR DAM MANAGEMENT DISTRICT

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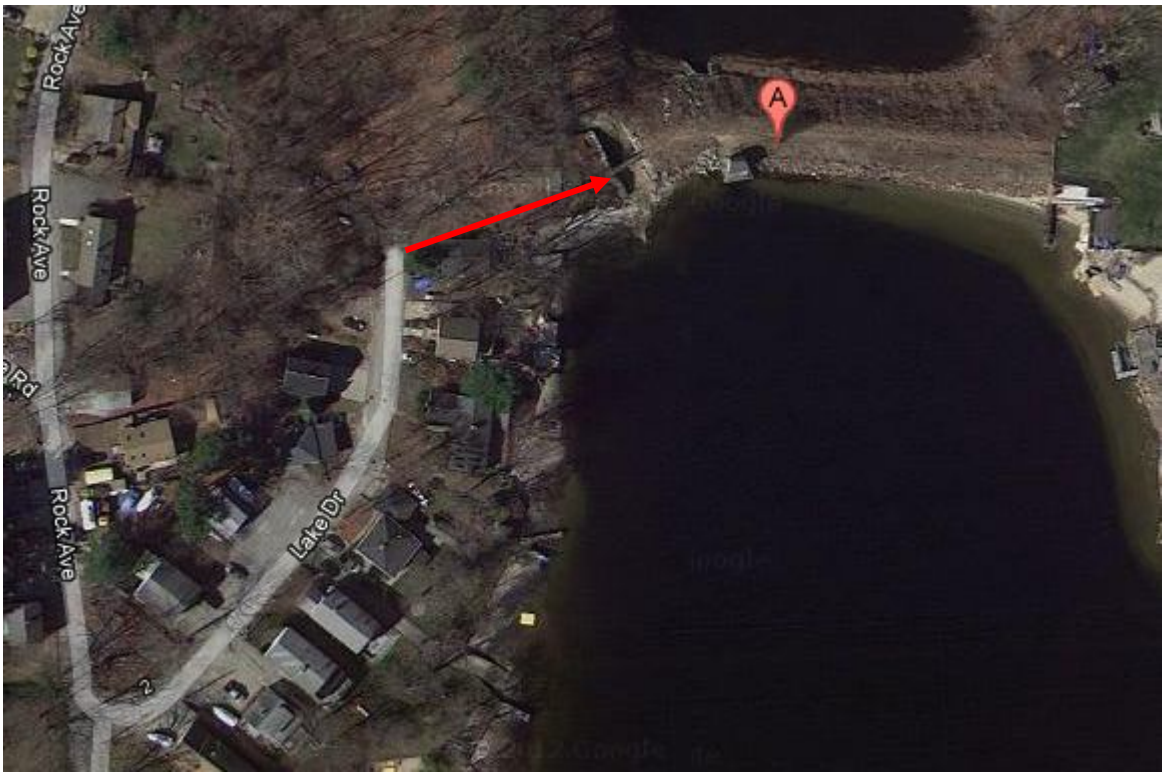
SECTION A
PROJECT LOCATION



Project is located at the northwest end of the Upper Pascoag Reservoir Dam and is accessed at the end of Lake Drive, Pascoag RI.

SECTION B
HISTORY AND SCOPE OF WORK

Inner Tech Marine Services was contacted and retained by Leo Plouffe from the Pascoag Reservoir Dam Management District to conduct an inspection of the low level outlet and discharge pipe. Scope of work includes visual inspection of the underwater portions of the low level outlet building, control gate, trash rack and supporting members and the discharge pipe. The inspection includes photographs and drawings of observations and a continuous video recording of the inspection. Submittals include a DVD copy of the inspection and a written report.

SECTION C
DIVE STATION AND INSPECTION PROCEDURES

The site was accessed through a small clearing at the end of Lake Drive. The dive station was trailered to the site. Diver's air supply was via a breathing air compressor in the trailer. Communications to the diver was provided by using helmets with microphone and speaker elements hard wired to a 2 way radio on the surface. The 3 person dive team consisted of diver-inspector, stand-by diver tender, and tender. A continuous recording of the inspection was via an underwater CCV color camera and DVD recorder. Cold water support equipment included wet suits and hot water system which pumps hot water down to the diver. Portable generator provided necessary power to run the hot water system and camera. Still photographs were taken using a Nikon, Nikonos V underwater camera and strobe. The 35 mm camera film was developed locally and scanned to disk for use in the report. Typical observation procedures were utilized, plastic tape measures for dimensions of structures, chipping hammer to clean off rust and test hardness, etc.

SECTION D
GENERAL OBSERVATIONS
Gate House

Photograph No. 1, gate house

Description: The gate house consists of a concrete walled structure with opening to the dam upstream. The gate house has a bar trash rack over the discharge opening and a control gate with hoister and stem rod connection to the gate. It is believed that the concrete gate house is a newer structure, built

approximately 1950's. The original gate house may have been a stone masonry structure built approximately late 1800's to early 1900's.

Observations:

1. Trash racks and supports: The trash rack consists of multiple, approx. 4 foot sections spanning the gate house opening. The trash rack is constructed of approx. 4 inch X ¼ inch steel bars spaced approximately 4 inches apart. Sections of the trash rack above the water appear original in thickness and are in good condition, sections of the trash rack below water, particularly just below the average water line show heavy rust and deterioration reducing the bar thickness by 25 to 50% (See photograph No. 2, following). Fasteners holding the bars together appeared heavily rusted. A section of rack was pulled forward to gain access to the gate. The section appeared reasonably sound and did not fall apart during the move.

Directly in front of the trash rack and in the center of the opening are two vertical "I"beams connected flange to flange. The I beams provide support for the platform above and center support for dewatering timbers which can be placed in stop log channels cast in either side of the concrete opening(See photograph #7 following). The I beams are braced horizontally by steel support members which are connected to horizontal trash rack supports behind (Note figure 1 following). The vertical I beam and horizontal supports are heavily rusted and deteriorated (75 -90%) and their web sections are perforated and very weak (See photograph No. 3, 4, following). The trash rack is supported by two horizontal I beams which span the gate house opening. The beams are spaced approximately 4 feet apart off the floor and above. The lower beam section measures approximately 12X16 inches and is approximately ½ inch in thickness. The beam appears heavily rusted and has sectional loss from deterioration of approximately 15-25%. The upper beam measures approximately 8 X 12 inches and is approximately 3/8 to ½ inch in thickness. The beam appears heavily rusted, the edges of the flanges are somewhat "knife edged" and the beam has sectional loss from deterioration of approximately 25-50%. The beams are connected to the gate house walls via flange brackets which are anchored into the walls using approximately ½ inch fasteners. The fasteners where heavily rusted.

2. Gate chamber, gate and stem: The control gate consists of an approximately 2-2.5 inch thick, approximately 40-48 inch square cast iron plate with cast in supporting members and a cast in rectangular pocket toward the top which accepts the operator stem from above. The gate sits in what appears to be a square cast iron guide frame with left and right guide channels for gate support. The guide frame spans the 36inch discharge pipe opening and is apparently cast into the concrete gate house structure. The gate and frame are situated in a lower "well" area (below the bottom of the trash racks). The lower well area has chamfered walls to direct the water into the gate. The concrete wall chamfer, right side (as facing downstream) is in close proximity to the vertical gate guide, within 1 to 2 inches. This is noted because replacement of the gate with a new gate frame which sits flat against the concrete wall would most likely interfere with the adjacent chamfered wall; gate or wall would have to be modified. The cast iron gate was chipped with a chipping hammer to test soundness. The cast iron appeared somewhat soft and could be chipped away with the hammer. It was not determined whether

this softness was due to chipping on outer layers of deterioration or deeper deficiencies in the cast iron. There are no upper gate guides above the gate frame to guide the gate back over the opening. The gate appeared opened approximately 1-2 inches, enough to cause a leak across the bottom but apparently not opened above the square gate frame behind. Some leakage was noted along the sides of the gate. Sticks and debris were mostly clogging the openings and controlling leakage.

The gate is opened and closed via a steel shaft measuring approximately 2 ½ inch in diameter. The steel shaft or "stem" is heavily rusted. The stem is severely bent in an "S" shape, most likely from over closing or excessive down force needed to close the gate. The lower section of stem terminates in an approximately 4 inch square stainless steel member spliced (welded) onto the round stem section. The stainless member sits in a rectangular pocket cast into the gate. The stainless member is through bolted (approximately 1" bolt) through the cast in pocket in the gate. Smaller fasteners were also noted in the face of the stainless member. These fasteners are believed to be threaded through the stainless into threads cut into the face of the gate pocket. The fasteners were rusted and loose, some evidence of the square stainless member twisting in the square cast gate pocket was evident. Figure 2 and photographs No's 5 and 6, following, show additional details of gate construction and condition. No upper stem guides, to control flex in the stem, were observed. The stem is flange coupled above and out of the water to an acme threaded stem (approximately 3 inches in diameter) section passing through a hole in the gate chamber floor.

PHOTO #3, SHOWING VERTICAL I BEAMS WITH PERFORATED WEB SECTION

PHOTO #4 SHOWING HORIZONTAL BRACE WITH PERFROATED WEB SECTION

PHOTO #2 SHOWING TRASHRACK DETERIORATION, NOTE HORIZONTAL SUPPORT BEHIND

PHOTO #5 SHOWING CONNECTION OF STEM TO GATE, NOTE THROUGH FASTENER

PHOTO #6 SHOWING TOP OF GATE GUIDE, CAMERA FACING FLOOR

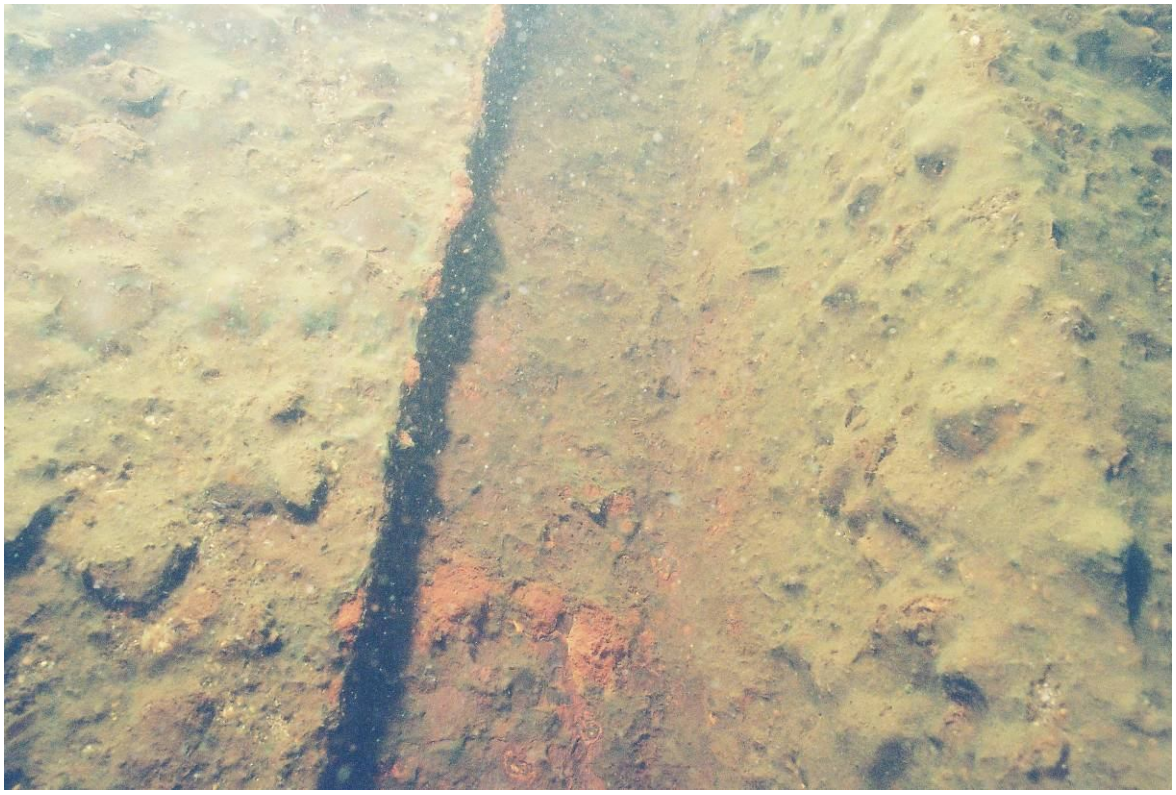


PHOTO #7 SHOWING STOPLOG CHANNEL CAST IN GATE HOUSE CONCRETE

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3. 36 inch Discharge pipe: The opened gate discharges into a 36 inch cast iron pipe which spans the approx. 70-80ft cross section of the dam at an angle somewhat less than 90 degrees. The cast iron measures approximately 1 inch thick. The pipe is heavily encrusted with a 1 to 2 inch layer of hard rust. The rust was chipped off a section to reveal a somewhat smooth and hard cast iron surface beneath. The pipe consists of sections approximately 4 to 5 feet long with joints. Typically, the joints could not be seen unless the rust was removed. Inspected sections closer to the gate showed a red-orange rust line where the joint was. The joints observable looked approximately ¼ inch wide with the above mentioned bright rust showing. The pipe typically appeared uniform in circumference, no pipe sections were noted as displaced. No significant water flow was noted coming out of the joints although close inspection of the bright rust stained joints may reveal some leakage. The pipe terminates at the closed gate. The gate frame was observed coupled to the last section of pipe. The square gate frame was observable around the circumference of the pipe. The gate leakage top and sides was observable around the back side of the gate. The pipe ends downstream at a stone wall with adjacent wing walls. The wall stones were somewhat loose and disarrayed with large gaps between the stones (note photograph No. 8 below).

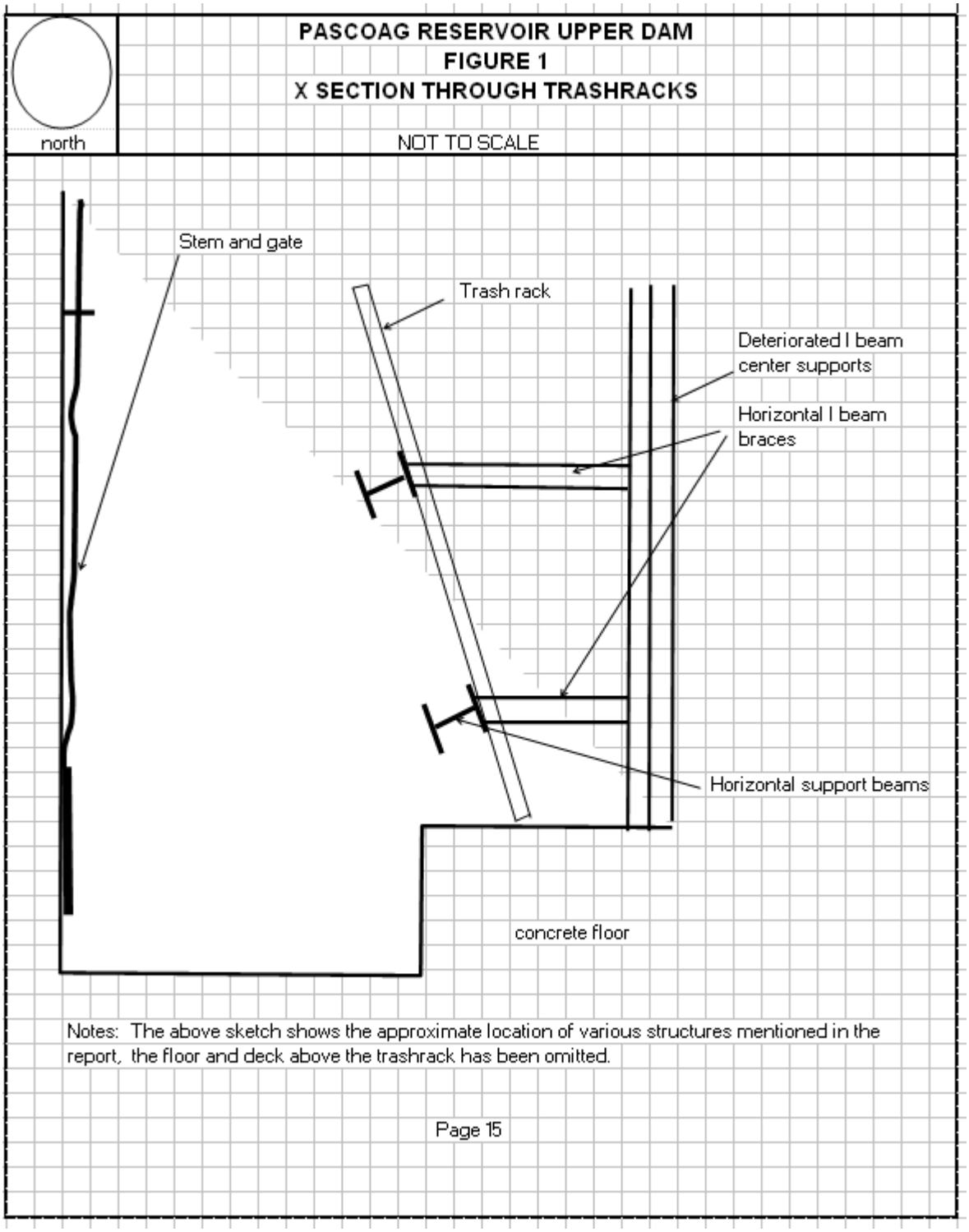
PHOTO #8 SHOWING DISCHARGE STRUCTURE AT END OF 36 INCH PIPE DOWNSTREAM

SECTION E
SUMMARY OF OBSERVATIONS:

Following is a summary of deficiencies observed during the inspection, there may be additional deficiencies not observed during the inspection:

1. Support vertical I beams and horizontal braces under the platform are very deteriorated with perforation of web sections.
2. The trash rack has deterioration to underwater sections but may be serviceable.
3. The horizontal support I beams behind the trash rack have some deterioration but may be serviceable.
4. The bracket connection from the support I beams to the wall has deterioration to the fasteners.
5. The gate stem is bent and is causing the gate to be difficult to close, the stem does not have guides causing the stem to flex or bend during closing.
6. The gate frame does not have upper guides causing the gate to skew in the guides below during closing.
7. The gate cast iron appeared to be somewhat soft when probed with a pick; the gate is leaking which suggests deterioration to sealing surfaces.
8. The existing stem appears to be twisting in the pocket which connects the stem to the gate.

Figures


PASCOAG RESERVOIR UPPER DAM
FIGURE 1
X SECTION THROUGH TRASHRACKS
NOT TO SCALE
north
Stem and gate
Trash rack
Deteriorated I beam center supports
Horizontal I beam braces
Horizontal support beams
concrete floor
Notes: The above sketch shows the approximate location of various structures mentioned in the report, the floor and deck above the trashrack has been omitted.
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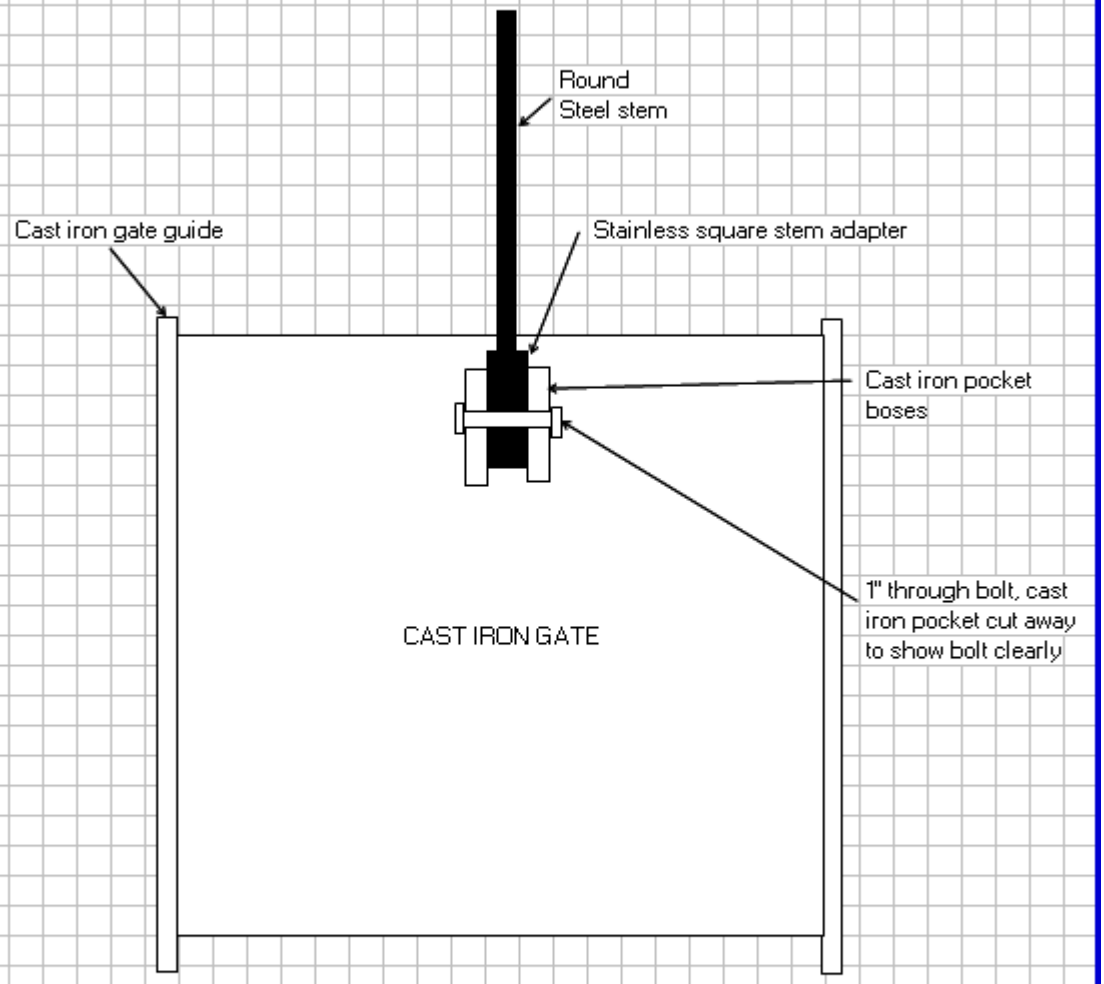
north

PASCOAG RESERVOIR UPPER DAM

FIGURE 2

ELEVATI0N VIEW OF GATE SHOWING STEM POCKET

NOT TO SCALE



Notes: The sketch above shows the gate and details of the connection of the stem to the gate.

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