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TRANSMITTAL

Via: U.S. Mail

To: Ms. Diane Sherwood
Port of Klickitat
154 E. Bingen Point Way
Bingen, WA 98605

From: Margaret Vandenberg

Date: 27 May 2004

Project: Dallesport Industrial Park, Condition Survey of Water Tank
WJE No. 2002.1428

Subject: Condition Survey of Water Tank

Attached for your information and use is a copy of the report Wiss, Janney, Elstner Associates, Inc. issued to Mr. John Buzzone of Kennedy/Jenks Consultants on 3 May 2002. I spoke with Mr. Buzzone this afternoon and he gave me the approval to send you a copy of the report. Hopefully this will answer any questions you have regarding the project.

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3 May 2002

Mr. John Buzzone
Kennedy/Jenks Consultants
2828 SW Naito Parkway, Suite 250
Portland, Oregon 97201

Re: Condition Survey for Welded, Plate Steel Water Tank
Dallesport Industrial Park
WJE No. 2002.1428

Dear Mr. Buzzone:

In accordance with our proposal dated 8 April 2002, the welded plate-steel water tank located at the Dallesport Industrial Park in Dallesport, Washington was inspected by Wiss, Janney, Elstner Associates Inc. (WJE). The 13 April 2002 inspection addressed all above grade structural elements of the tank, as well as interior and exterior surfaces of the plate steel shell.

The standpipe tank shown in Figure 1 was constructed by Pittsburgh-Des Moines Steel Company in 1972. The steel plates of floor and roof assemblies were configured with lap splices and joined with fillet welds. Fabrication drawings provided to WJE for reference indicated complete penetration butt joints for segments of the plate steel tank walls. Anchor straps that were embedded into the concrete foundation were joined with fillet welds to the lower course of shell plates. Protective coatings were applied to both interior and exterior surfaces of the tank.

Visual and nondestructive methods were utilized for inspection of the tank. Water was drained from the tank to permit access of personnel to the interior for inspection. Direct access to the tank exterior was limited to the lower course of wall plate segments, sections that could be reached from the roof access ladder installed at the north side from the tank, and to roof plate sections between the ladder and the roof vent. Floor, wall, and roof plate were subjected to ultrasonic thickness gauging. Floor plates were also tested for corrosion pitting. Interior and exterior surfaces were observed for evidence of corrosion and general condition of protective coatings. Anchorage straps were observed for spacing, nominal size, and general quality of associated welds joints. Overall tank dimensions were also measured.

Ultrasonic test methods used included a "pitch-catch" technique using a dual element transducer, and an angle beam technique with a single element transducer generating a refracted shear wave. All tests were performed without the removal of the painted coatings, except for several locations of the exterior wall plate within the lowest course of plate where comparative readings were made prior and following the removal of the coating. Based on the comparative sampling, typical error in readings due to the presence of the coating was estimated at 0.005 to 0.012 inches in excess of the actual plate thickness.

Floor plates were assembled as shown in fabrication drawings, and joined with fillet welded lap-splices, as may be seen in Figure 2. Random locations of each plate section were selected for ultrasonic thickness testing, and a surrounding area of about one square foot was surveyed for corrosion pitting. No evidence of significant underside corrosion damage was detected within the test areas, and no evidence of corrosion

damage was observed on the upper surface or floor of the tank. Nominal measured plate thickness exceeded 5/16 inch. Table 1 contains a summary of the ultrasonic thickness measurements.

Wall plate for the tank was made up of nine girth sections with butt joint welds between successive courses, and staggered vertical butt joint welds between girth segments. Ultrasonic thickness measurements were made for wall plates within arms reach of the roof access ladder shown in Figure 3, at approximately mid-height of each girth section. Wall plate thickness measurements are summarized in Table 2.

The roof assembly, comprised of lap-spliced plate as shown in fabrication drawings was joined at the exterior surface with fillet welds. Several roof plate segments, the center crown section, and outer wall attachment ring were tested for thickness. Roof plate thickness measurements are summarized in Table 3.

Observations of interior coatings were made from the floor of the tank. No access ladder was installed at the interior; therefore, only the lower course of plates could be accessed for close-up inspection. In general, the coating system as shown in Figure 4 appeared intact. Small diameter blisters however, mostly 1/8 to 3/4 inch in diameter, as shown in Figure 5 were observed in localized areas. A few blisters that were opened had retained water, and some corrosion product was evident. About six observed rust nodules exceeding one inch in diameter apparently occurred at locations of attachment hardware for exterior fixtures, and were not associated with failure of the coating. Lap splices in the roof of the tank were not required to be welded at the interior surface, and exhibited evidence of ongoing corrosion at and adjacent to lapped joints, as may be seen in Figure 6. Deterioration at the roof perimeter ring joint, as shown in Figure 7 may indicate the most significant potential for loss of structural integrity to the tank due to corrosion damage. The extent of damage due to corrosion pitting could not be fully determined without close-up access; there is no evidence however of extensive deterioration or of imminent impairment to the integrity of the structure.

The exterior coating was observed from ground level surrounding the tank, as well as from the roof access ladder and from the rooftop. Close-up viewing supported the general observation that a coating is intact and remains well adhered, although the finish-coat of the system had eroded in some locations. Deterioration was most severe at surface areas of the roof, as shown in Figure 8. Surface corrosion of the tank shell as seen in Figure 9 was observed at several localized areas of both roof and wall plates where the remaining coating coverage appeared to have insufficient thickness. The coating was typically weathered, leaving a chalk-like residue at the surface.

Although not within the scope of work, anchorage straps as shown in Figure 10 were observed and measured. All straps were configured as shown in fabrication drawings with a nominal width of 3 inches, and thickness of 3/8 inches. Spacing of the straps was not uniform, ranging from 46-3/4 to 61 inches. Table 4 presents the sequential on-center spacing measurements of the twenty eight straps. Straps were joined to the lower wall plates with fillet welds as specified in fabrication drawings. Based on cursory observations, approximately 40 to 60 percent of the fillet joints appeared to be in non-conformance with design specifications. Non-conformity included under sizing of deposited weld metal, and reduction in the effective throat as a result of the gap remaining at the faying surfaces of the strap and the tank wall, as shown in Figure 11. No evidence of cracking or distress was identified.

The Dallesport tank was constructed in general accordance with the fabrication drawings and is in serviceable condition. No evidence of measurable pitting from corrosion was observed visually or detected from ultrasonic tests in floor, wall, or roof plates. Interior coatings appear to be in fair condition with relatively minor blemishes. The exterior coating is intact overall, but is worn and gradually diminishing in effectiveness to resist atmospheric corrosion of the tank shell plate. Anchorage straps appear to be free of corrosion or distress, however many of the associated fillet welded joints appear to be in non-conformance with respect to the requirements of the specified design.

Respectfully Submitted,

Please contact us if you have any questions regarding our findings reported herein, or if we may be of further service

Very truly yours,

WISS, JANNEY, ELSTNER ASSOCIATES, INC.

Robert D. Gessel

Robert D. Gessel
Project Manager

Attachments

H:\2002\1428 Dallesport Water Tank (RDG)\condition survey e-letter.doc

Figure 1. Dallesport Industrial Park standpipe water tank viewed from southwest

Figure 2. A muddy residue left after removal of the water partially obscured portions of the steel floor plates.

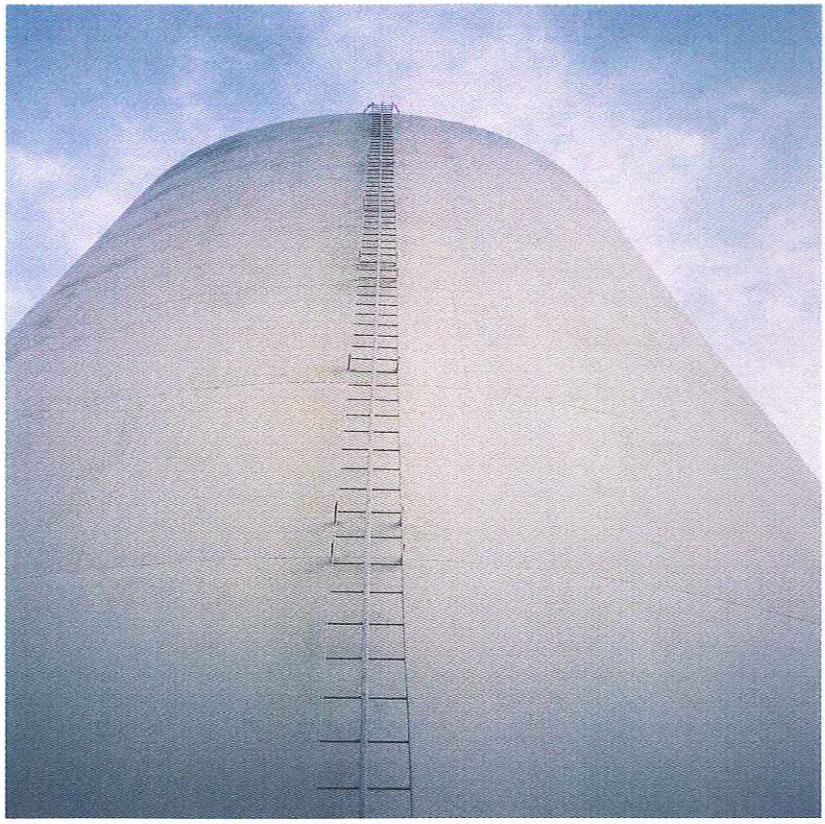

Figure 3. An access ladder attached to the tank extended from the 2nd girth plate level to the roof.

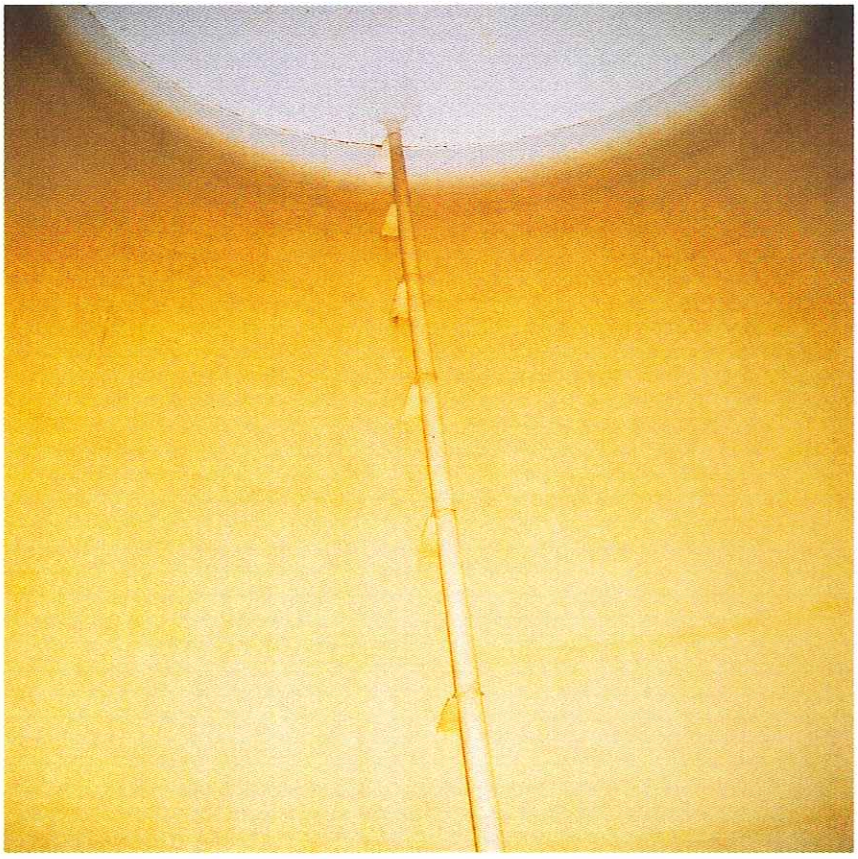

Figure 4. The interior coating generally appeared to be intact.

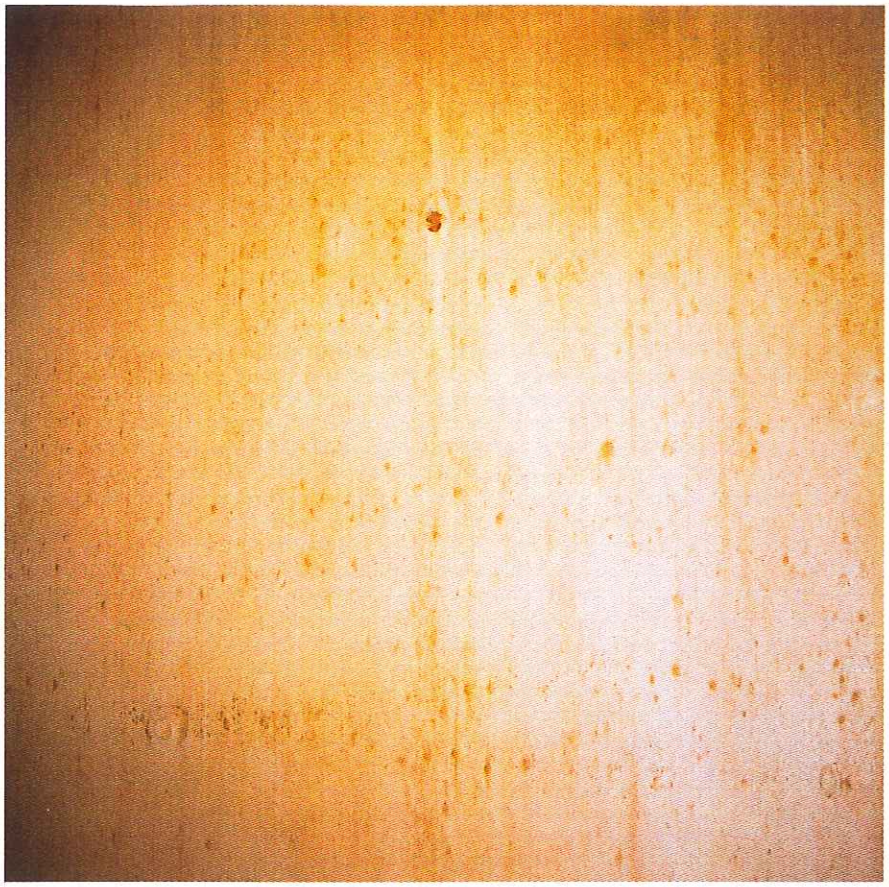

Figure 5. Blistering of the interior coatings was observed in local areas.

Figure 6. Corrosion staining of roof plate lap joints was observed at the interior of the tank.

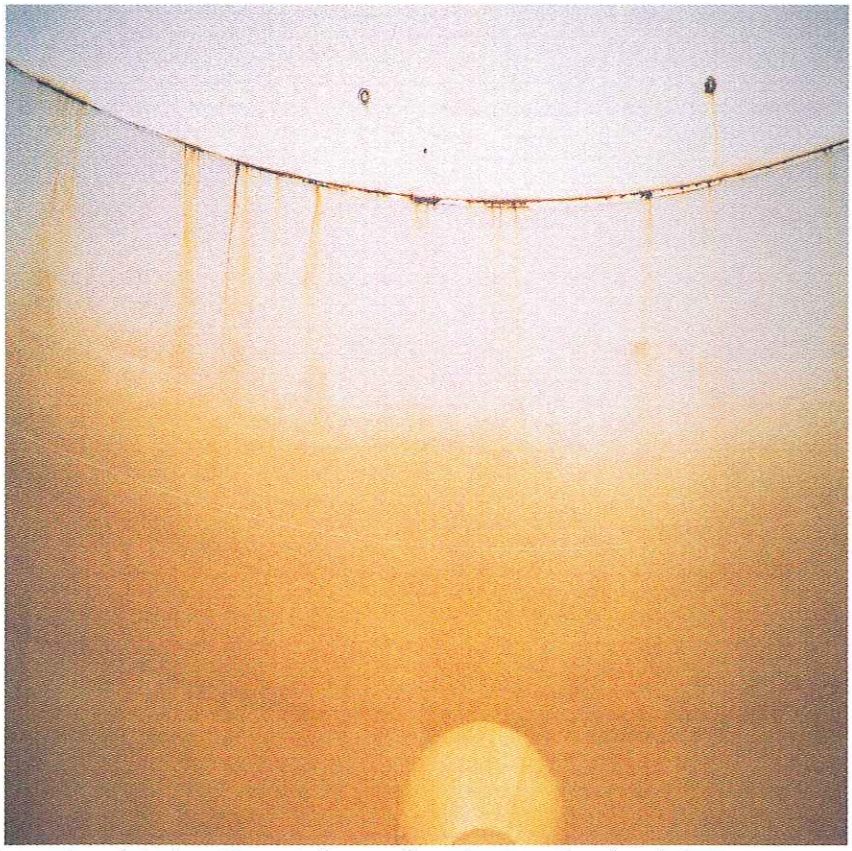

Figure 7. Corrosion deterioration at the roof perimeter ring lap joints was apparent through much of the tank circumference.

Figure 8. Thinned and worn exterior coatings were most severe at areas of the exterior roof plate.

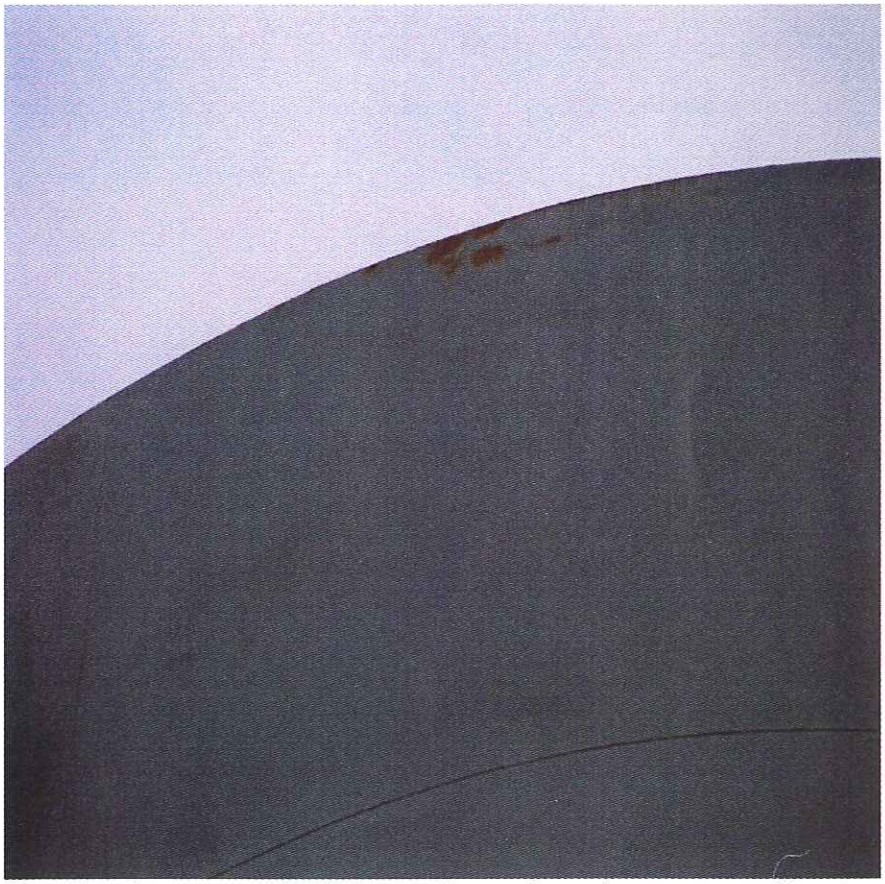

Figure 9. Thinned and worn exterior coatings observed mostly in upper wall and roof plates no longer provide protection from corrosion; however, surrounding areas were well adhered.

Figure 10. Straps embedded in the tank foundation were joined with fillet welds to the lower wall plates.

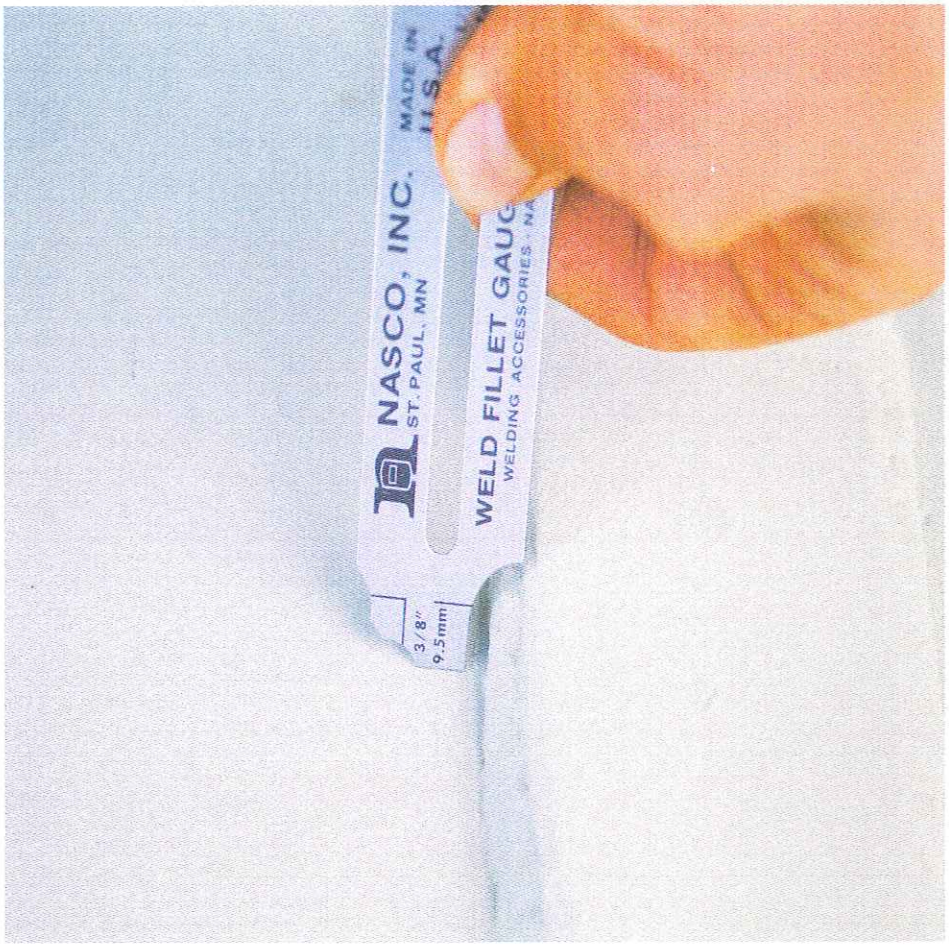

Figure 11. Fillet welded joints of many anchorage straps do not satisfy design requirements due to the excessive gap between adjoining surfaces, undersizing, and poor profiles.

Table 1

Dallesport Water Tank - Floor Plate
Thickness Measurement and Corrosion Survey
WJE No. 2002.1428

Floor Plate Section			
Row (from North)	**Plate (from East)**	**Thickness**	**Corrosion Pitting**
1	1	0.343	none detected
	2	0.344	none detected
	3	0.343	none detected
	4	0.346	none detected
	5	0.347	none detected
2	6	0.340	none detected
	7	0.340 / 0.347	none detected
	8	0.336	none detected
3	9	0.356	none detected
	10	0.337 / 0.340 / 0.344	none detected
	11	0.354	none detected
4	12	0.348	none detected
	13	0.345 / 0.341	none detected
	14	0.330	none detected
5	15	0.349	none detected
	16	0.339	none detected
	17	0.336	none detected
	18	0.343	none detected
	19	0.337	none detected

Table 2

Dallesport Water Tank - Shell Wall Plate
Thickness Measurement and Plate Height
WJE No. 2002.1428

Girth Plate Course	Thickness	Height of Girth Plate	Top Edge above Foundation	Number of Segments
9	0.403	7 ft. 5-1/2 in.	79 ft. 0 in.	7
8	0.409	7 ft. 5-1/2 in.	71 ft. 6-1/2 in.	7
7	0.406	7 ft. 5 in.	64 ft. 1 in.	7
6	0.406	9 ft. 5-1/2 in.	56 ft. 8 in.	5
5	0.396	9 ft. 5 in.	47 ft. 2-1/2 in.	5
4	0.387	9 ft. 6 in.	37 ft. 9-1/2 in.	5
3	0.401	9 ft. 5 in.	28 ft. 3-1/2 in.	5
2	0.394	9 ft. 5 in.	18 ft. 10-1/2 in.	5
1	0.388	9 ft. 5-1/2 in.	9 ft. 5-1/2 in.	5

Table 3

Dallesport Water Tank - Roof Plate
Thickness Measurement
WJE No. 2002.1428

Section	Thickness
Crown Plate	0.278
Roof Plate Segments	0.258 / 0.273
Perimeter Plate	0.383

Table 4

Dallesport Water Tank - Anchorage Straps
Spacing in Inches - Commencing Near Lower Access Hatch
WJE No. 2002.1428

1)	51.62	15)	55.00
2)	54.25	16)	56.00
3)	49.62	17)	56.50
4)	56.62	18)	53.62
5)	52.00	19)	51.75
6)	56.00	20)	61.00
7)	46.75	21)	56.00
8)	56.25	22)	51.00
9)	53.00	23)	55.12
10)	53.62	24)	55.88
11)	49.62	25)	54.75
12)	55.25	26)	52.00
13)	51.25	27)	55.62
14)	54.25	28)	55.12