DiBlasi Associates, PC
Structural Engineers

04 April 2025

Mr. Angelus Papageorge, Executive Director of Operations
Fairfield Public Schools
501 Kings Highway East
Fairfield, CT 06825

Dear Mr. Papageorge:

Light Pole Assessment
Fairfield Warde High School
Fairfield, Connecticut
DA Project No. 2025-012

As requested, we have performed an assessment of the structural integrity of the light poles at the football field of Fairfield Warde High School. This assessment was prompted by the collapse of one of the four (4) 70'-high light poles on 02/17/2025 during high winds (see *Photo Nos. A-1, A-2*).

Per our discussion, you were not able to locate any of the original light pole drawings in the school's drawing archives; you were able to locate the soil boring logs and some foundation design sketches that you provided to us (see *Appendix B*).

After undertaking some research, we believe that these poles were manufactured by Whitco Company, LP, of Fort Worth, TX, based on information contained on an installation location summary assembled by the U.S. Consumer Product Safety Commission (CPSC). This installation location summary identified locations where poles manufactured by Whitco were subject to a *Recall to Repair* due to multiple pole collapses. A copy of the CPSC notice is included in *Appendix C*.

The light poles at Fairfield Warde are 70'-high, galvanized steel poles that each support a cluster of fourteen (14) light fixtures. The poles taper from approximately 15⅝" outside diameter (15⅝" O.D.) at the base to approximately 6¼" O.D. at the top. At the bottom of each pole is a 24" diameter base plate that is welded to the pole and attached to a concrete pier using six (6) 1⅜" diameter anchor rods (see *Photo No. A-3*). The piers upon which the poles bear are 4'-0" x 4'-0"; this does not coincide with the foundation sketches that we received that specified 4'-0" diameter piers. The footings that support the piers were not observed.

The light poles were installed in early 2000 according to the information obtained from CPSC. Based on this installation date, the governing building code would have been the 1999 Connecticut State Building Code (1999 CSBC) which was based upon the *BOCA National Building Code/1996* and the applicable provisions of the 1999 Connecticut Supplement. This would have required that the pole structures be designed to resist a wind load associated with an 80 mph wind speed (fastest mile criteria) with an importance factor (amplification factor) of 1.21. Between that building code and the current 2022 CSBC,

significant changes to the wind design requirements have taken place: the wind speeds are now based on three-second gusts rather than fastest mile criteria, the importance factors are embedded in the wind speeds, and the wind speeds are strength-level (ultimate) rather than allowable stress design (ASD) level loads. Under the 2022 CSBC which is based on the *2021 International Building Code* (2021 IBC), the applicable Basic Design Wind Speed would be 120 mph (strength-level) which equates to an ASD-level wind speed of 93 mph. In addition, there have been changes to the steel design standards that are incorporated into the building codes.

Wind loads are impacted by the surrounding terrain, and the building code assigns different exposure categories based on the nature of the terrain. Under the current building code, the default exposure category is "C", and this is to be utilized when the terrain does not fall into either of the other exposure categories ("B" or "D"). When the light poles were constructed, engineers often assumed exposure category "B" which is defined as *urban and suburban areas with scattered obstructions generally less than 30'*. While the surrounding area clearly fits this definition, the poles themselves are adjacent to fields that have few obstructions. As such, the design under the current building code would be based on the higher winds associated with an exposure category "C" classification.

As none of the original drawings were available, the type and strength of steel used in the fabrication of the poles was not known. We engaged NAVSEA Solutions to undertake inspections of the pole-to-base plate welds and to obtain specimens from the poles for physical and chemical testing (see *Appendix D*). A 2002 specification sheet from Whitco was found online (see *Appendix E*); this indicated that the pole was to be fabricated of steel meeting the requirements of either ASTM A572 or ASTM A595, Grade A. The results of the tests were compared with these steel classifications as well as other commonly utilized steel grades; however, none were found to correlate closely with the testing results. The testing indicated that the steel had a yield strength of 67,000 pounds per square inch (67,000 psi). Tested strengths are generally higher than the minimum strengths prescribed by the specifications. Steel with a 55,000 psi minimum allowable yield strength would oftentimes have a tested yield strength in the range observed; this would also coincide with the yield strength of the ASTM A595 (Grade A) steel and would also have been available in ASTM A572 steel. For the basis of our analyses, we utilized a minimum yield strength of 55,000 psi.

Structural analyses of the pole were performed considering the following loading conditions:

- Wind loads under the 1999 CSBC using wind exposure category "B"
- Wind loads under the 1999 CSBC using wind exposure category "C"
- Wind loads under the 2022 CSBC using wind exposure category "C"

In all conditions, we found that the poles were stressed to a higher level than that which would have been permitted by the building code in effect at the time; the degree to which the stress level exceeded the permissible level is reflected as the percent overstress in the following:

Building Code	Steel Standard	Wind Speed	Wind Importance Factor	Wind Exposure Category	Pole Steel Stress Level
1999 CSBC / 1996 BOCA	AISC ASD-89	80 mph fastest mile (ASD level)	1.21	B	30% overstress
				C	110% overstress
2022 CSBC / 2021 IBC	AISC 360-16	120 mph 3-second gust (Strength Level)	N/A	C	124% overstress

In the unlikely event that a high-strength steel with a minimum yield strength of 65,000 psi was utilized, we assessed pole stress level under that original design scenario (1999 CSBC / wind exposure category "B"). We found that even with the higher steel strength, the poles would have been overstressed by 13% under the design wind loads.

We also analyzed the weld between the poles and the base plates. Under the original design scenario, we found the welds to be stressed to 70% of the limits prescribed by the building code. Under the exposure category "C" scenarios, overstress conditions would exist (20% overstress under the 1999 CSBC; 36% overstress under the 2022 CSBC).

In addition to analyzing the poles themselves, we assessed the ability of the anchor rods to secure the poles to the foundation piers. At the time when the structure was designed, the building code did not contain prescriptive design requirements for anchor rods, and, as a result, different and oftentimes conflicting design methodologies were utilized by different engineers. Under the current building code (and all building codes since the 2005 CSBC), there are defined requirements for the design of anchor rods. Based on our analysis utilizing the lower wind loads associated with the initial design (exposure category "B"), we find that the anchor rods do not conform to current design standards. We find they are 595% overstressed under this prior loading scenario with tension pullout being the applicable failure mode; this is impacted to a large extent by the fact that the anchor rods had hooked ends rather than headed ends according to the foundation sketch provided to us.

The failure of the pole in question occurred just above the weld that attached the pole to the base plate; the weld itself did not fail. During their investigation, NAVSEA observed that the fracture that initialed the failure of the pole occurred at the junction between the pole and the upper toe of the fillet weld that connected the pole to the base plate. Rust staining of the fracture surface indicated that it was likely the result of a fatigue crack in the steel of the pole, and that under the high winds of 2/17/2025, the crack propagated further, triggering the failure.

Fatigue is a phenomenon in steel (and other metals) that results in the weakening and potential failure of the material due to cyclical loads that are often well below the magnitude of the design loads. Fatigue is influenced by discontinuities that create stress concentrations such as the base plate to pole

connection. In 2021, the American Society of Civil Engineers published ASCE/SEI 72-21, *Design of Steel Lighting System Support Pole Structures*. While this standard is not incorporated into the building code at the present time, it does contain detailed recommendations to address fatigue-prone conditions. The type of base plate connection utilized at the pole in question is known as a "*socketed connection*"; this is recognized as being very vulnerable to fatigue effects. What is also worth noting is that this design standard requires the use of exposure category "C" for the derivation of wind loads; the use of exposure category "B" is not permitted.

Based on our research and analyses coupled with the testing undertaken by NAVSEA, it is our opinion the pole assemblies, including the foundation anchorage, are structurally inadequate, and we would recommend that they be disassembled. While we have not analyzed the existing foundations, we do not believe they could be utilized to support a new light pole system given the anchor rod deficiencies and the fact that the original design was clearly based on lower wind loads than those that would be required under the current CSBC.

It must be noted that this report is based on limited visual observations only and there is no claim, either stated or implied, that all conditions were observed. The structural analyses were limited to the poles, base plates, and anchor rods. The physical testing was limited to the pole steel and the pole-to-base plate welds. This report does not address any other portions of the structure other than those mentioned, nor does it provide any warranty, either expressed or implied, for any portion of the existing structure. It is conceivable that additional information may be forthcoming that bears on the conclusions and opinions stated herein. Therefore, the right is reserved to review and modify all conclusions and opinions at any future point in time should, in fact, additional information become available.

Should you have any questions, please do not hesitate to contact us. We appreciate this opportunity to have been of service to you.

Respectfully submitted,

DiBLASI ASSOCIATES, P.C.

Digitally signed by Thomas A. DiBlasi
DN: E=TomD@DiBlasi-Engrs.com, CN=Thomas A. DiBlasi, O=DIBLASI ASSOCIATES P.C., SERIALNUMBER=AATL20231023319997, L=Monroe, S=Connecticut, C=US
Date: 2025.04.04 14:04:07-04'00'

Thomas A. DiBlasi, P.E.

STATE OF CONNECTICUT
THOMAS A. DIBLASI
16418
LICENSED
PROFESSIONAL ENGINEER
04-7-2025

Mark. J. Rodriguez, P.E.

h:\project_files\2025 projects\2025-012 fairfield warde hs poles\project design data\dapc correspondence & reports\2025-012 ffld warde hs-light poles.docx

DiBlasi
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Structural
Engineers

Appendix A

Photo Images



Figure A-1: Collapsed light pole.

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Structural Engineers



Photo No. A-2: Connection at base of collapsed light pole.

DiBlasi Associates, PC
Structural Engineers



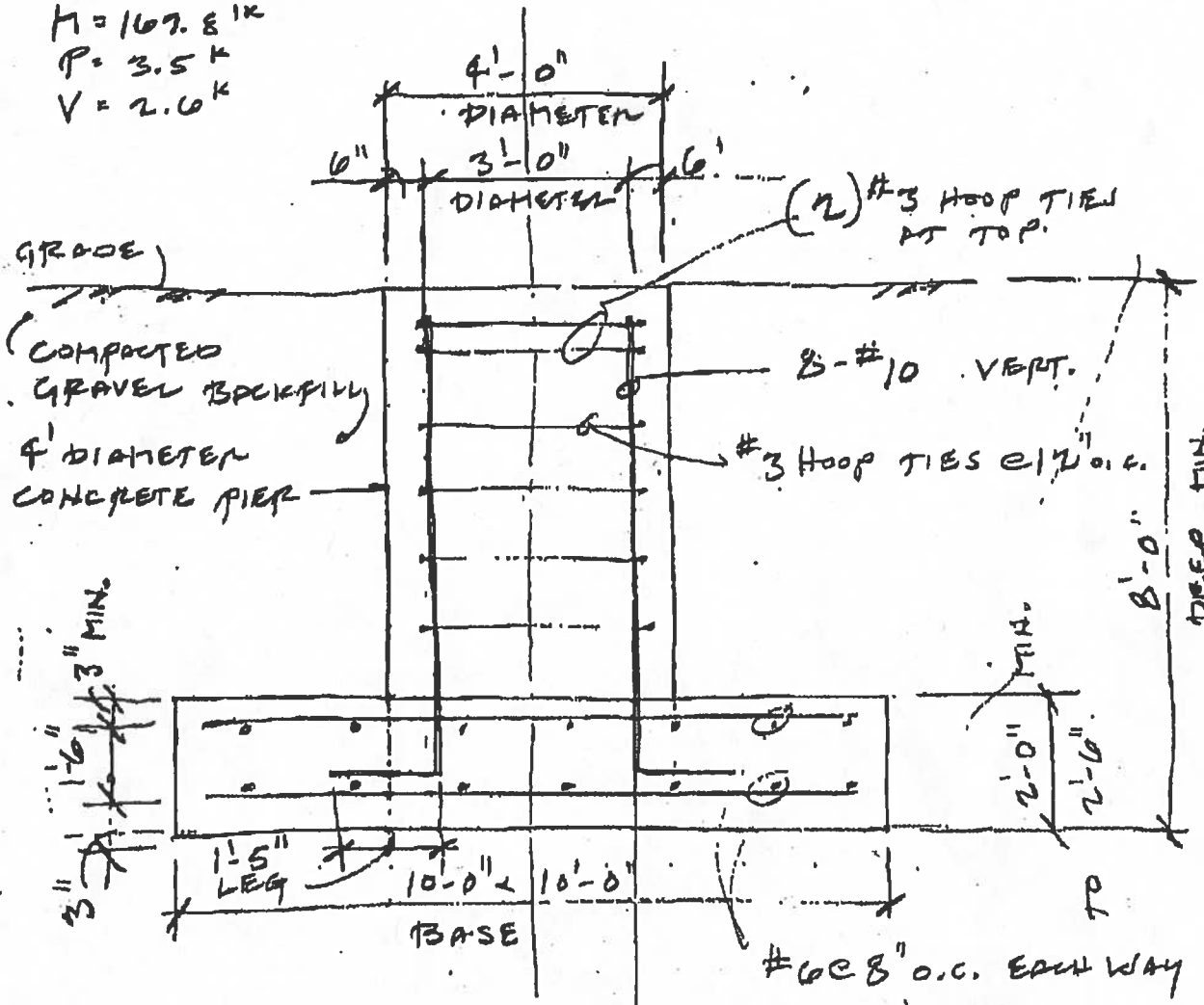
Photo No. A-3: Base connection of light pole.

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Structural
Engineers

Appendix B

Original Light Pole Foundation Sketches and Soil Boring Logs

DESIGN LOADS:
M = 167.8 IK
P = 3.5 K
V = 2.6 K



LIGHT POLE BASE

CONCRETE: 3000 psi 28 DAY STRENGTH

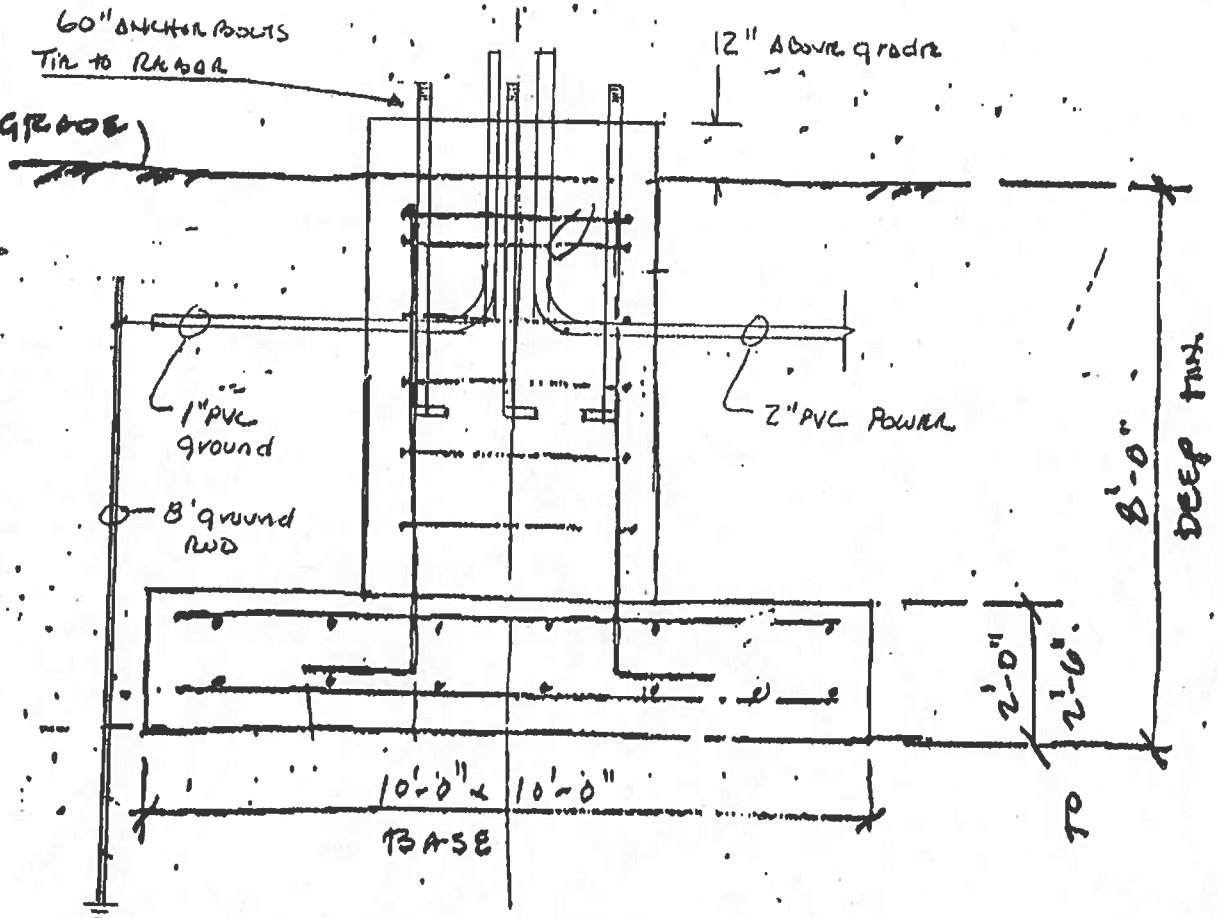
REBAR: GRADE 60

BACKFILL: SAND AND GRAVEL COMPACTED TO 90% MAXIMUM DENSITY.

STATE OF CONNECTICUT
MICHAEL J. SIRAK
No. 17865
REGISTERED PROFESSIONAL ENGINEER

MICHAEL J SIRAK, P.E.
110 NATIONAL DR.
GLASTONBURY CT 06033

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD



LIGHT POLE BASE

Form HD-8 10/80 B.B.

HARDIMAN CO. & ASSOC. 10 Fox Hunt Road SHELTON, CT 06484	CLIENT: Fairfield H.S. Gridiron Club.	SHEET 1 OF 1 HOLE NO. B-1
CONTRACTOR	PROJECT NO. F-119	LINE
FOREMAN — DRILLER TJH. III	PROJECT NAME Proposed Lighting	STATION
INSPECTOR	LOCATION Melville Ave. Fairfield, Ct.	OFFSET

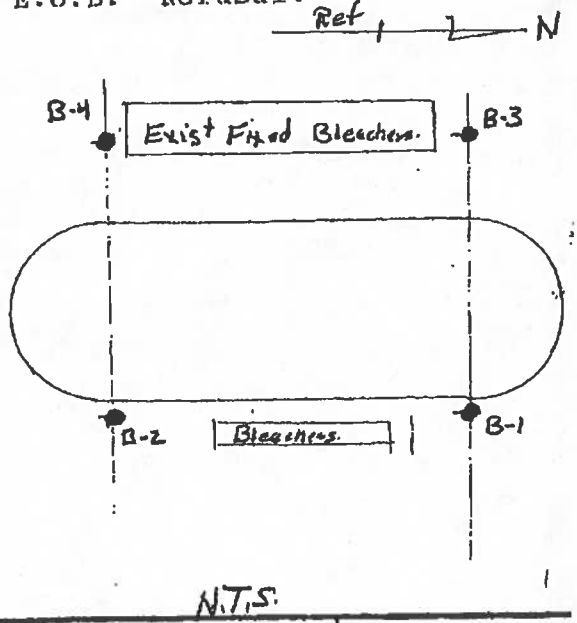
GROUND WATER OBSERVATIONS
AT 10.0 FT. AFTER 0 HOURS
AT ____ FT. AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	HSA	SS	
SIZE I.D.	3¼"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

BIT.

Date Start 5/21 Date Fin. 5/21/99
SURFACE ELEV Exist. Grnd.
GROUND WATER ELEV. -10.0

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO.	SAMPLE TYPE	SAMPLE PEN.	SAMPLE REC.	SAMPLE DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	18-24	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
											1.0	Topsoil.
		1	ss	1.0	1.8	2.0	2	3	3	3		Brown silty fine sand.
											5.0	
5		2	SS	2.0	1.5	7.0	16	17	14	16		Brown silty fine sand, trace gravel (till).
10		3	ss	2.0	1.5	12.0	16	13	17	24		
15		4	ss	2.0	1.5	17.0	29	40	35	42		
											19.0	
20												E.O.B. Refusal.
25												
30												
35												
40												



GROUND SURFACE TO ____ FT.. USED ____ " CASING THEN ____ " CASING TO ____ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED PISTON
UB = UNDISTURBED BALL CHECK T = THINWALL V = VANE TEST

HOLE NO. B-1

Form HD-2 10/80 B.B.

HARDIMAN CO. & ASSOC. 10 Fox Hunt Road SHELTON, CT 06484	CLIENT: Fairfield H.S. Gridiron Club.	SHEET 1 OF 1 HOLE NO. B-2
CONTRACTOR	PROJECT NO. F-119	LINE
FOREMAN - DRILLER TJH. III	PROJECT NAME Proposed Lighting	STATION
INSPECTOR	LOCATION Melville Ave. Fairfield, Ct.	OFFSET

GROUND WATER OBSERVATIONS
AT 9.0 FT. AFTER 0 HOURS
AT ____ FT. AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	HSA	SS	
SIZE I.D.	3¼"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	BIT.

Date Start 5/21 Date Fin. 5/21/99
SURFACE ELEV Exist. Grnd.
GROUND WATER ELEV. -9.0

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO.	SAMPLE TYPE	SAMPLE PEN.	SAMPLE REC.	SAMPLE DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	18-24	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	1.0	1.5	2.0	1	1	2	2	1.5	Topsoil. Brown silty fine sand, some gravel (possible fill).
5		2	SS	2.0	1.5	7.0	13	11	15	16	8.0	
												Brown silty fine sand, some gravel (till).
10		3	ss	0.4	0.2	10.4	100					
		4	ss	2.0	1.5	17.0	35	31	29	36	19.0	
20												Weathered rock.
		5	ss	1.4	1.0	21.4	22	22	100		21.4	
												E.O.B. Refusal.
25												
30												
35												
40												

GROUND SURFACE TO ____ FT., USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. B-2

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED PISTON
UB = UNDISTURBED BALL CHECK T = THINWALL V = VANE TEST

PROPORTIONS USED: TRACE = 0-10%, LITTLE = 10-20%, SOME = 20-35%, AND = 35-50%

Form HD-2 10/80 S.S.

HARDIMAN CO. & ASSOC. 10 Fox Hunt Road SHELTON, CT 06484	CLIENT: Fairfield H.S. Gridiron Club.	SHEET 1 OF 1 HOLE NO. B-3
CONTRACTOR	PROJECT NO. F-119	LINE
MAN-DRILLER TJH.III	PROJECT NAME Proposed Lighting	STATION
INSPECTOR	LOCATION Melville Ave. Fairfield,Ct.	OFFSET

GROUND WATER OBSERVATIONS
AT 10.0 FT. AFTER 0 HOURS
AT ____ FT. AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	HSA	SS	
SIZE I.D.	3¼"	1 3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	DIT.

Date Start 5/21 Date Fin. 5/21/99
SURFACE ELEV Exist. Grnd.
GROUND WATER ELEV. -10.0

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO.	SAMPLE TYPE	SAMPLE PEN.	SAMPLE REC.	SAMPLE DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	18-24	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
											0.5	Topsoil.
		1	ss	1.0	2.0	2.0	2	6	9	13		Brown silty fine sand & gravel, fill.
											5.0	
5		2	SS	2.0	1.5	7.0	17	16	17	17		Brown silty fine sand, some gravel (till)
10		3	ss	2.0	2.0	12.0	23	12	17	24		
		4	ss	2.0	1.5	17.0	18	27	30	34		
20		5	ss	2.0	1.5	22.0	17	27	40	42	22.0	
												E.O.B.
25												
30												
35												
40												

GROUND SURFACE TO ____ FT., USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. B-3

D=DRY W=WASHED C=CORED P=PIT A=AUGER UP=UNDISTURBED PISTON
US=UNDISTURBED BALL CHECK T=THINWALL V=VANE TEST

PROPORTIONS USED: TRACE = 0-10%, LITTLE = 10-20%, SOME = 20-35%, AND = 35-50%

Form HD-2 10/80 B.S.

HARDIMAN CO. & ASSOC. 10 Fox Hunt Road SHELTON, CT 06484	CLIENT: Fairfield H.S. Gridiron Club.	SHEET 1 OF 1 HOLE NO. B-4
CONTRACTOR	PROJECT NO. F-119	LINE
MAN -DRILLER TJH. III	PROJECT NAME Proposed Lighting	STATION
INSPECTOR	LOCATION Melville Ave. Fairfield, Ct.	OFFSET

GROUND WATER OBSERVATIONS
AT 11.0 FT. AFTER 0 HOURS
AT ____ FT. AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	HSA	SS	
SIZE I.D.	3¼"	1 3/8"	
HAMMER WT.		140	BIT.
HAMMER FALL		30"	

Date Start 5/21 Date Fin. 5/21/99
SURFACE ELEV Exist. Grnd.
GROUND WATER ELEV. -11.0

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO.	SAMPLE TYPE	SAMPLE PEN.	SAMPLE REC.	SAMPLE DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	18-24	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS INCL. COLOR, LOSS OF WASH WATER, BEANS IN ROCK, ETC.
											1.0	Topsoil.
		1	ss	1.0	1.0	2.0	1	3	7	5		Brown m/f sand, some silt (possible fill).
											4.0	
5												Brown silty fine sand, trace gravel (till).
		2	SS	2.0	2.0	7.0	9	12	19	22		
10												
		3	ss	2.0	2.0	12.0	12	18	23	27		
											15.0	
												Weathered rock.
		4	ss	2.0	1.5	17.0	15	15	24	48		
20		5	ss	0.0	0.0	20.0	50				20.0	
												E.O.B. Refusal.
25												
30												
35												
40												

ROUND SURFACE TO ____ FT., USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. B-4

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED PISTON
US = UNDISTURBED BALL CHECK T = THINWALL V = VANE TEST

PROPORTIONS USED: TRACE = 0-10%, LITTLE = 10-20%, SOME = 20-35%, AND = 35-50%

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Appendix C

Consumer Products Safety Commission
Recall to Repair

United States
CONSUMER PRODUCT SAFETY COMMISSION

Recall to Repair: Whitco Company LP Stadium Light Poles Can Fall Over, Posing Risk of Serious Injury and Death

Note: There is a previous press release regarding this product.

No image available

Recall Date:
July 06, 2010

Recall Details

FOR IMMEDIATE RELEASE

July 6, 2010

Release #10-295

CPSC Media Contact: (301) 504-7908

WASHINGTON, D.C. - The U.S. Consumer Product Safety Commission, today announced a recall of the following consumer product. Consumers should immediately stop using recalled products until they are inspected and repaired.

Name of product: Whitco Company LP poles 70 feet tall or higher

Units: More than 2,500

Manufacturer: Whitco Company LP, of Fort Worth, Texas (which is out of business)

Hazard: The poles can fracture or crack and fall over, posing a risk of serious injury or death to patrons and bystanders from being hit or crushed. The poles range from 1 to 4 tons increasing the risk of death if the pole falls toward a crowded stadium or onto a building.

Incidents/Injuries: As of June 2010, CPSC has confirmed eleven incidents in which Whitco Co. LP poles fell. In one incident, a pole fell through the roof of a school gymnasium causing significant property damage. In two other incidents, the poles fell onto outdoor bleachers causing significant property damage. The latest incident occurred at Integrity Park Inc. in Argyle, Texas. The majority of incidents occurred in Texas with others in several other states where Whitco Co. LP poles have been installed. To date, CPSC is not aware of any injuries. However, some incidents have been close calls, with people exiting the area just minutes before a pole fell. CPSC has also identified more than 50 Whitco Co. LP poles that have not yet fallen, but inspections revealed fractures and/or cracks next to the weld that joins the pole to its base plate. The fallen and cracked poles were located near or around school football stadiums and gymnasiums.

Description: This recall to inspect and repair involves Whitco Co. LP outdoor steel stadium light poles from about 70 to 135 feet and weigh from about 1 to 4 tons. The poles are constructed of steel with a galvanized coating and were manufactured between 2000-2005.The poles can be found

at facilities such as recreational parks and fields, schools and outdoor stadiums. Attached is a listing (pdf) of locations that may have the affected poles.

Note: This release does not affect Whitco Pole products.

Sold by: Lighting contractors nationwide from 2000 through 2005.

Manufactured in: United States and Mexico

Remedy: To reduce the risk of injury, Whitco Co. LP light poles should be inspected by an engineer or a Level II non-destructive testing technician immediately to identify cracking at or near the weld connecting the pole to the base plate flange. A visual examination with the naked eye or with a magnifier will not determine the extent of any cracking. Non-destructive techniques such as magnetic particle inspection, dye penetrant, or ultrasonic inspection techniques are recommended. If any cracking or fracturing is found, immediately have the affected poles repaired or replaced by a qualified professional. A design analysis to assess the stresses placed on the pole is also recommended. CPSC recommends that all outdoor steel stadium light poles be routinely inspected by a professional. As the manufacturer has become bankrupt, individual owners of the poles must arrange for inspection.

Consumer Contact: For additional information, please contact CPSC's Hotline at (800) 638-2772 anytime or send an e-mail to info@cpsc.gov

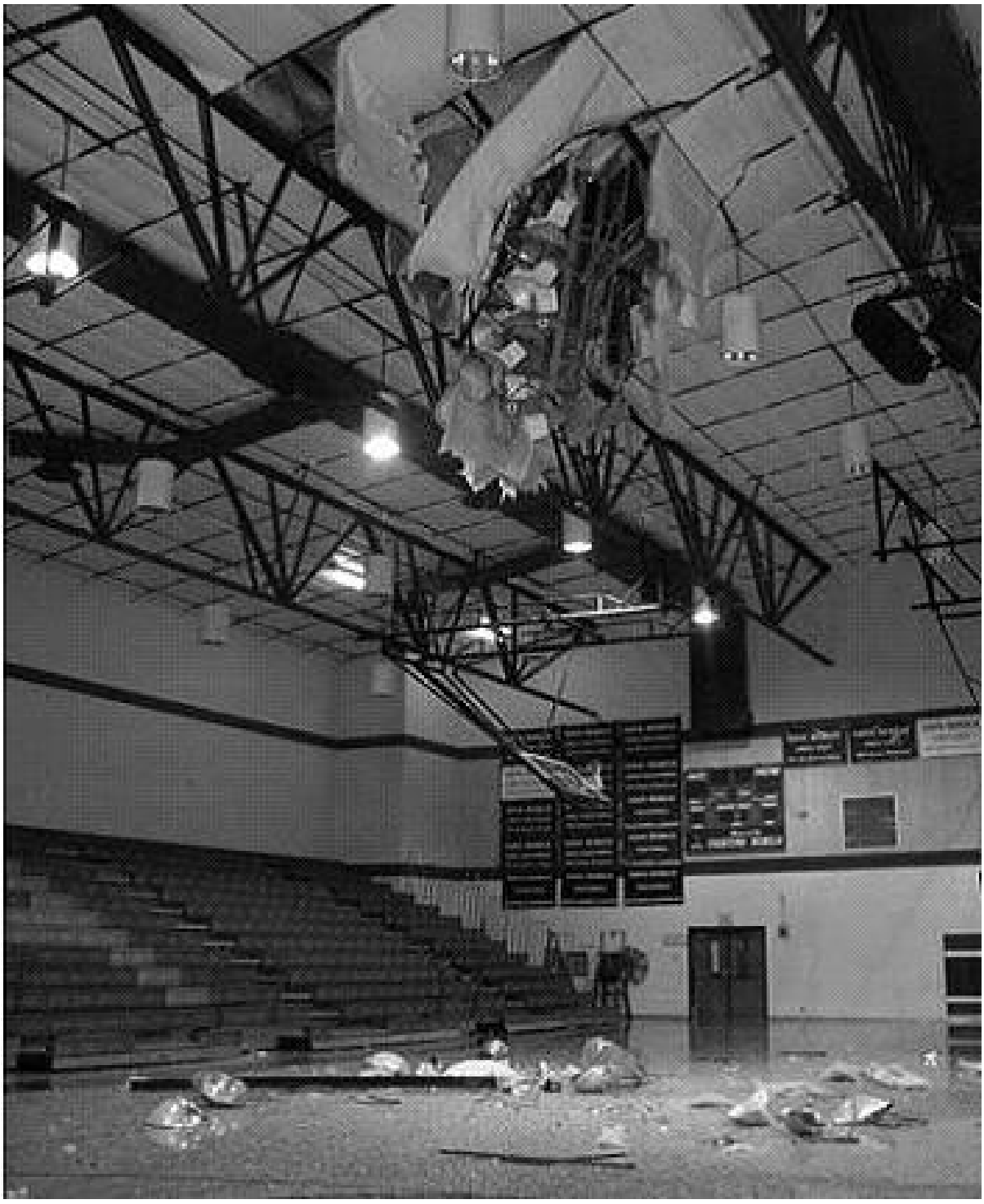


Upright stadium light pole





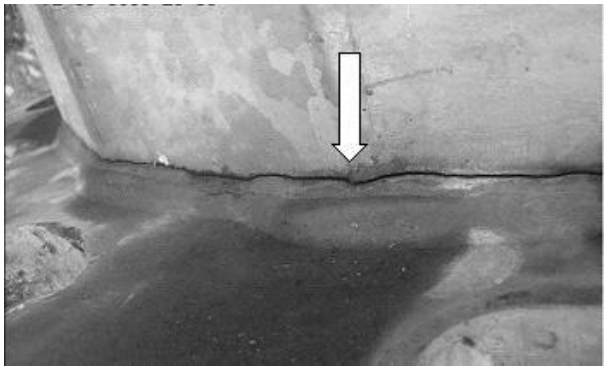
Fallen stadium light poles



Stadium light pole fallen through gymnasium roof



Base plate of stadium light pole



Close-up - crack near weld that joins the pole to its base plate

Note: Individual Commissioners may have statements related to this topic. Please visit www.cpsc.gov/commissioners to search for statements related to this or other topics.

Recall Complaint

If you are experiencing issues with a recall remedy or believe a company is being non-responsive to your remedy request, please use this form and explain the situation to CPSC.

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Appendix D

NAVSEA Solutions
Inspection and Testing Reports

March 11, 2025

Thomas DiBlasi
DiBlasi Engineering
500 Purdy Hill Road
Monroe, CT 06468

Reference: 2025-012 Fairfield Warde High School

Subject: Inspection of Light Pole, revised to include laboratory test reports 3-April-2025

NAVSEA Solutions was retained by DiBlasi Engineering for the purpose of performing examinations of four 70-foot tall light poles located on the grounds of the Athletic Field of the Fairfield Warde High School, 755 Melville Ave. Fairfield, CT.

At the time of the on-site visit, March 10, 2025, it was observed one of the four light poles had failed at the welded joint between the mast and the base plate and was on the ground. The remaining three light poles were still standing upright. The welded joint between the mast and base plate of the four light poles were subjected to both visual examination and magnetic particle testing. The fallen light pole was identified by the inspector as #1 and the three upright light poles identified as #2, #3, and #4 moving in a clockwise direction from pole #1. At the time of the on-site visit, the top of the light poles appeared to sway about 1-foot in either direction of the centerline of the pole in the high wind. The wind speed was unknow, but there were high wind warnings of up to 50 mph forecasted.

The construction of the light poles consisted of a tapered steel mast welded to a steel base plate, with the assembly being hot dipped galvanized. The shaft of the tapered mast was constructed of two halves welded together. The steel mast of the light pole was fillet welded to steel base plates which were anchored to concrete footings. At the time of the inspections there were no design drawings available for review by the inspector. Two specimens were removed from light pole #1. One specimen has been sent to a testing laboratory for chemical analysis. The second specimen was sent to a laboratory to be tensile tested to determine the yield strength and ultimate tensile strength of the steel used to construct the mast of the light poles.

Light Pole #1

Pole #1 failed at the multi-bead fillet weld between the mast shaft and the steel base plate. The failure was located at base of the mast's shaft and the upper toe of the fillet weld joining the mast to the steel base plate. The fillet weld was fully intact with no discontinuities revealed by visual testing or by the magnetic particle test.

The visual examination of the fractured surface revealed rust stains on a portion of the fracture and the face of the fillet weld below the fracture. This suggests the failure initiated as a fatigue crack that extended approximately 15% of the circumference on the side opposite the direction the light pole fell. Over a period of time, the fatigue crack propagated to 25% of the circumference at which time the the shaft failed suddenly in a brittle manner on a windy day.

The inspector was told by school personnel that the light pole fell during a wind storm. Neither the date or wind speed at the time of failure wasn't provided to the inspector.

The remaining three light poles were visually examined and subjected to a continuous AC current magnetic particle test using dry magnetic particles with an AC yoke. The visual examination of fillet weld and the base of the hot dipped galvanized steel light poles revealed no discontinuities. The fillet welds were of uniform size, free of unacceptable undercut or other surface discontinuities at the toe of the fillet weld and the steel mast of the light pole. The toe of the fillet weld against the mast is the area where a fatigue crack is most likely to initiate due to that being the thinnest area, the flexing of the light pole's mast, and the rigid thick steel base plate.

Light Pole #1 – The pole was lying on the ground, but a visual examination of the fractured surface of the mast and fillet weld was performed. The fillet weld to the base plate was subjected to a magnetic particle test to determine if there were any detectable weld discontinuities. Other than the fracture at the toe of the fillet weld to the mast, no weld discontinuities were detected by visual or the magnetic particle test.

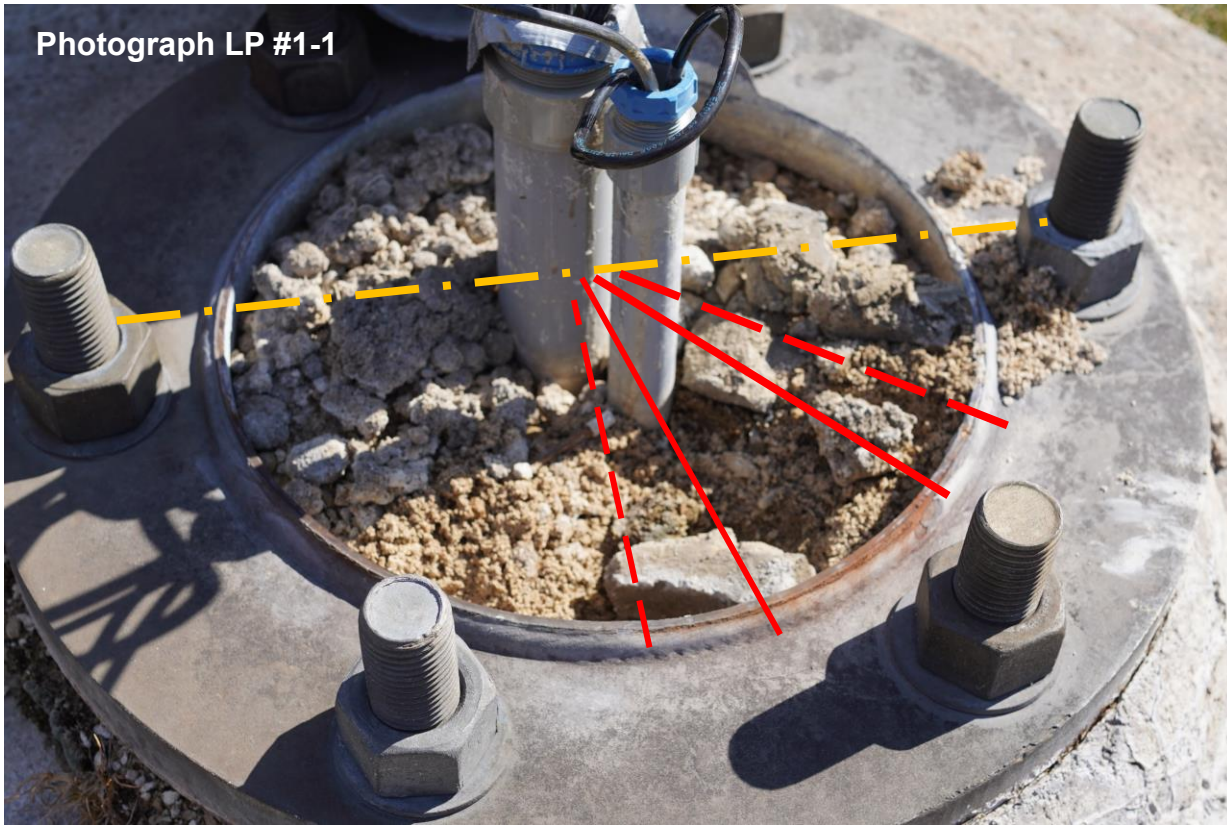
Specimens were cut from the mast of the light pole #1 for mechanical and chemical testing.

Light Pole #2 – several faint magnetic particle indications were observed along a 5-inch length, on the same side as the electrical cover, along the toe of the fillet weld and the base plate. The indications may have been caused by shallow undercut along the toe of the fillet weld which were concealed by the hot dip galvanizing. Since the indications were not in an area where fatigue cracks would initiate, no further investigation was undertaken.

Light Pole #3 – several faint magnetic particle indications were observed along a 3-inch length, on the side opposite the electrical cover, along the toe of the fillet weld and the base plate. The indications may have been caused by shallow undercut along the toe of the fillet weld and were concealed by the hot dip galvanizing. Since the indications were not in an area where fatigue cracks would initiate, no further investigation was undertaken.

Light Pole #4 – No visual indications or magnetic particle indications were observed.

Photographs



Photograph LP #1 – 1 This photograph depicts the fractured surface of Light Pole #1. The two solid radial red lines depict the extent of the "initial" crack that led to the final collapse of Light Pole #1. The heavily oxidized surface (rusty) surface indicates the crack had existed some time before the pole collapsed. The rust stain extends down over the surface of the fillet weld face reinforcing the crack existed for some time before the collapse occurred.

To either end of the initial crack, the fractured surface extends beyond the heavily oxidized surface as indicated by the dashed red lines. The surface between the dashed red lines are lightly oxidized indicating the crack propagated a short while prior to the collapse.

The fractured surfaces without oxidization are rather recent. The fractured surface without evidence of corrosion indicates the mode of failure was recent and are indicative of brittle fracture.



LP #3 – 1 This photograph depicts faint magnetic particle indications along the toe of the fillet weld deposited against the base plate. The indications were in an area about three to four inches long on both light poles #2 and #3. As noted in the body of the report, the faint magnetic particle indications could be due to undercut that is concealed by the hot dip galvanize. There were no other magnetic particle indications observed. It is unlikely these indications played any role in the failure of the light pole since there were no similar indications observed at the base of Light Pole #1 and they were not in located where where Light Pole #1 failed.

Magnetic Particle Test

Test: Indirect magnetism using an AC Yoke, Brand – Magneflux

Current: Continuous current

Magnetic Particles: Dry particles, Color – Red

Electrical power was provided by a gasoline powered inverter type generator.

NSS

Laboratory Test Reports

STURBRIDGE METALLURGICAL Services, Inc

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Sturbridge Ma 01566
508-347-5288 /fax 508-347-8288
www.smslabs.com

Lab Report 48501

Customer:	Navea Solutions, Burlington CT	**Date:**	March 19, 2025
PO #:	PO FWHS 032	**Technician:**	R. Gonzalez
Contact:	Albert Moore (amoore999@comcast.net)	**Reviewed By:**	C. Mitchell

Introduction / Test:
One (1) plate sample submitted for room temperature tensile testing.

Acceptance Criteria:
Report resulting properties for information only.

Method(s):
Machining and room temperature tensile testing performed per ASTM E8-24.
Bar machined to the 0.250 wide x .190 thick" flat reduced gauge specimen configuration.

Results:

	Test Results
Ultimate Strength	77 KSI
Yield Strength at 0.2% Offset	67 KSI
Elongation in 4D	33%

A plating was found to delaminate during testing. The finding is indicative of a galvanize surface layer. The thickness of the plating was included in the stress area for calculating tensile strength.

Conclusion:
All results reported for customer information only.

Signed By: Craig Mitchell Digitally signed by Craig Mitchell Date: 2025.03.19 15:20:30 -04'00'

ACCREDITED
Test Lab Cert 3929.01

The reported results relate only to the customer sampled material made available to the laboratory at the time of testing. For purposes of determining conformance with applicable specifications, all reported results are rounded, as defined in ASTM Practice E29, for Using Significant Digits in Test Data to Determine Conformance with Specifications. Decision Rule: Consideration of uncertainties in all specified test methods shall be the responsibility of the customer. This report shall not be reproduced, except in full, without written approval of SMS Inc.

Nadcap ACCREDITED
For Materials Testing

Luvak Inc.
722 Main Street
Boylston, MA 01505
Phone 508-869-6401
www.luvak.com

Analytical report no.
L-3664

Requested By:
Navsea Solutions
21 Savarese Lane
Burlington CT 06013

Attention:
Al Moore
amoore@comcast.net

Invoice Number: 105496
Check Pd. 03/11/25

Date Received: 03/11/25
Report Date: 03/25/25
Invoice Date: 03/25/25

Description: One Steel sample was analyzed as listed below.
Results:

Sample Identification:	Steel
3/11/2025	Wt%
Carbon	0.083
Chromium	0.007
Manganese	0.54
Nickel	0.013
Phosphorus	0.014
Silicon	0.023

Methods: Carbon – Combustion Infrared Detection – ASTM E 1019-18
All Others – Direct Current Plasma Emission Spectroscopy – ASTM E 1097-12

Luvak Inc. utilizes the ASTM E29 rounding method based upon simple acceptance unless specification or customer designates otherwise.

The analytical report shall not be reproduced, except in full, without the written approval of the laboratory. The recording of false, fictitious, or fraudulent statements or entries on the analytical report may be punished as a felony under federal law.

Luvak Inc.

By Derek Langlois
Derek Langlois
Quality Manager

Based on the analysis of the specimens extracted from Light Pole # 1, the chemical analysis and mechanical properties provided by the laboratory test reports, there appears to be no direct correlation to an ASTM specification typically used for steel construction. Based on the chemistry, the material meets the requirements of AISI 1008 carbon steel. Unfortunately, AISI does not provide the requirements for the mechanical properties. While the chemistry meet the requirements of several ASTM material specifications, one cannot narrow the choices to one or two material specifications. As an example; ASTM A595 lists the chemical composition for several grades that lists the maximum carbon content. The chemistry of the specimen taken from light pole # 1 falls within the chemistry of several ASTM A595 grades. While comparing the mechanical properties listed for ASTM A595, the elongation of the specimen taken from light pole # 1 is about 50% higher than the minimums listed by the specification. A direct correlation to a particular ASTM specification and grade doesn't seem to be feasible.

This report is believed to be an accurate account of the results of the magnetic particle test and the observations of the inspector.

Respectfully submitted –

Albert J. Moore Jr. AWS SCWI
SNT-TC-1A Level III – RT, UT, MT, PT, VT
NAVSEA TP Examiner – VT, PT, MT

DiBlasi
Associates, PC
Structural
Engineers

Appendix E

Whitco Poles
Specification Sheet
(2002)

Specifications

Structural Design

The pole standards shown in this catalog are designed for the combined effects of both wind and dead load. The wind load effects have been analyzed with wind velocities ranging from 70 to 120 mph plus a 1.3 gust factor. Due to varying wind effects, height correction factors and drag coefficients have been applied to the entire structure. The dead load effects have been determined by using a final deflected position analysis to account for secondary moments caused by eccentric dead loads. These combined loading effects have been used to determine the maximum allowable loading capacities, which are shown on the following pages. These maximum loading capacities include an appropriate factor of safety, which is based upon the minimum yield strengths of the materials.

Pole Shaft

Each pole shaft is made from a single ply steel sheet. This steel sheet is formed into a tubular shape with one or more longitudinal welds; no circumferentially welded splices are permitted. This tubular shape has a cross-section, which is either multi-sided or round. Multi-sided cross-sections do not utilize a bend radius of less than 2" and do not have a cross-section with less than 12 sides. The material used for the pole sections meets the requirements of ASTM A572 or ASTM A595 Grade-A.

Poles, which exceed 50 feet in length, are designed as two-piece pole assemblies. These two-piece assemblies are joined together by telescoping the upper "female" section over the lower "male" section by a minimum lap distance of 1.5 times the female inside diameter. The longitudinally welded seam on the female section is welded both inside and out to insure 100% weld penetration at the telescoped area. Pole assemblies, which exceed 50 feet in height, are also designed with an internal cable guide and strain relief mechanism, which is typically attached at the mid-height of the pole assembly. This cable guide assembly consists of an offset bar, steel pipe sleeve with internal PVC sheathing to reduce wear, and a hand hole opposite the offset bar for access.

Base Plate

Base plates are used for either anchor base or stub base-type pole assemblies. These plates are integrally welded to the bottom pole section with either a telescopic weld or a full penetration weld with a back-up-bar. All bolt holes are circumferentially slotted to allow for ± 2.5 degrees rotation for field adjustment. The material used for these plates will conform to either ASTM A36 or ASTM A572.

Anchor Bolts

All standard anchor bolts meet the requirements of ASTM F1554, Grade 55. The bolts have a minimum threaded length of at least 6 inches and are galvanized for a minimum of 12" on the threaded end to the requirements of ASTM A153. Each anchor bolt is supplied with two hex nuts and two flat washers. All standard anchor bolts have a "hooked" end on the embedded portion to assist in the development of pull-out-strength.

Stub Base

The stub base consists of a steel pipe with an integrally welded flange plate, which conforms to the requirements and dimensions of the aforementioned base plate. The flange plate is mechanically fastened to the base plate with hardware, which meets the requirements of ASTM A325. These bolts include two flat washers and one heavy hex nut. All bolt holes are circumferentially slotted to allow for ± 2.5 degrees rotation for field adjustment. The steel pipe used for the stub base will either meet or exceed the requirements of ASTM A53 Grade B. The stub base will have a pair of wire entrances at 180 degrees apart located 24 inches below grade, dependent upon local electrical codes.

Embedded Poles

Embedded poles will be set directly into the ground by an embedment distance which is equal to 10% of the free pole height plus 2 feet. The embedded pole will not utilize a stub base or base plates as an anchoring means, but will rest upon a bearing plate which is integrally welded to the bottom of the pole shaft. The embedded portion of the pole plus 6" will be additionally protected with a mastic coating described hereafter under "Protective Coatings". Two 3" x 5" hand holes located 24 inches below grade and oriented at 180 degrees apart will be provided for wire access.

Platforms

All service platforms shall be constructed from either tubing or angle material, which meets the minimum requirements of ASTM A53 grade B and ASTM A36 respectively. Top-mounted platforms shall be mechanically attached to the pole with plates meeting the requirements of ASTM A36 and connecting hardware meeting the minimum requirements of ASTM A325. Side-mounted platforms should be mechanically fastened to the pole with plates conforming to ASTM A36 and U-bolts fabricated from round stock conforming to ASTM A36. The floor of the platform shall consist of expanded metal grating and should incorporate a hinged door for access to the platform. The hinged door shall be capable of closing prior to unlatching any safety climbing devices.

Cross Arms

All cross arms shall be constructed from either tubing or angle material which meets the minimum requirements of ASTM A53 grade B and ASTM A36 respectively. Top-mounted cross arms shall be mechanically attached to the pole with plates meeting the requirements of ASTM A36 and connecting hardware meeting the minimum requirements of ASTM A325. Side-mounted cross arms should be mechanically fastened to the pole with plates conforming to ASTM A36 and U-bolts fabricated from round stock conforming to ASTM A36.

Hand Holes

All hand holes are peripherally reinforced with flat bar which is integrally welded to the pole shaft. Each pole will have 4" x 6.5" reinforced hand hole located 18" from the base of the pole or for embedded poles, 18" above finished grade. Cover plates are included with all hand holes and are attached to the pole with a back-bar and screw.

Protective Coatings

All Pole shaft and stub base sections are galvanized in accordance with the requirements of ASTM A123. Each shaft assembly is completely coated both inside and out with a single dip. Double dipping will not be permitted in compliance with USGA (United States Galvanizing Association) recommended practices. Embedded portions of all pole shafts and stub bases will be additionally protected with a mastic coating which meets the performance requirements of TT-V-51F Varnish: Asphalt.

Welding

All welding is performed by AWS (American Welding Society) certified welders and all welds comply with the most recent edition of the AWS Structural Welding Code.

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WHITCO POLES