

OWNER/CLIENT:

YALE UNIVERSITY

LANDSCAPING & GROUNDS MANAGEMENT
2 WHITNEY AVENUE
NEW HAVEN, CT 06510

ARCHITECT:

DBVW ARCHITECTS, INC.

111 CHESTNUT STREET
PROVIDENCE, RI 02903
T: 401.831.1240 F: 401.331.1945

STRUCTURAL ENGINEER:

YODER + TIDWELL, LTD

333 SMITH STREET
PROVIDENCE, RI 02908
T: 401.751.2460 F: 401.274.7517

PLANT SUPPORT PROTOTYPE



HARKNESS MEMORIAL QUADRANGLE, KILLINGWORTH COURT, 1940,
PHOTO BY CHAMBERLAIN

DRAWING LIST

GENERAL
A000 COVER

ARCHITECTURAL
A001 SUPPORT TYPE 1 - BRONZE ROD
A002 SUPPORT TYPE 2 - STEEL CABLE
A003 PROTOTYPE CALCULATIONS

GENERAL NOTES:

1. THE SYSTEMS SHOWN IN THESE DRAWINGS ARE INTENDED TO BE PROTOTYPES FOR INSTALLATION IN STONE, COMPOSITE MASONRY BUILDINGS ON THE YALE CAMPUS. THE INFORMATION SHOWN IS FOR REFERENCE ONLY; THE SYSTEMS HAVE NOT BEEN DESIGNED FOR A SPECIFIC SIZE OR TYPE OF PLANT OR SPECIFIC INSTALLATION LOCATION. THE PROTOTYPES ARE BASED ON THE PARAMETERS NOTED BELOW.

2. ALL COMPONENTS FOR SUPPORT TYPE 1 SHALL BE FABRICATED FROM BRONZE EXTRUSIONS, ASTM B455, ALLOY UNS NO. C38500.

3. ALL COMPONENTS FOR SUPPORT TYPE 2 SHALL BE TYPE 316 STAINLESS STEEL. WIRE ROPE FITTINGS SHALL HAVE THE CAPABILITY TO SUSTAIN, WITHOUT FAILURE, A LOAD EQUAL TO THE MINIMUM BREAKING STRENGTH OF WIRE ROPE WITH WHICH THEY ARE USED.

4. TYPE 1 (BRONZE ROD) IS INTENDED FOR VERTICAL AND HORIZONTAL INSTALLATION.

5. TYPE 2 (STAINLESS STEEL CABLE) SHALL BE USED FOR VERTICAL INSTALLATION ONLY.

6. THE SUPPORTS SHALL BE INSTALLED IN STONE MASS MASONRY ASSEMBLIES WITH JOINTS WIDE ENOUGH TO ACCOMMODATE A 1/2-INCH THICK PLATE WITHOUT DAMAGING THE EXISTING MASONRY. IF A THINNER PLATE IS REQUIRED FOR ASSEMBLIES WITH NARROWER JOINTS, THE SYSTEM WILL REQUIRE SOME COMBINATION OF WIDER PLATE, SHORTER OFFSET, AND/OR SHORTER SPAN.

7. THE SUPPORTS ARE DESIGNED FOR INSTALLATION IN STONE MASONRY THAT CAN ADEQUATELY SUPPORT THE WEIGHT OF THE SYSTEM. INSTALLATION IN BRICK, AND SOME SOFTER VARIETIES OF STONE (SUCH AS BROWNSTONE), WILL REQUIRE COMPRESSIVE TESTING OF THE MATERIAL TO CONFIRM WHETHER IT CAN WITHSTAND THE STRESS AT EACH EMBEDDED ANCHOR.

8. THE SUPPORTS SHALL NOT BE INSTALLED IN CAVITY WALL CONSTRUCTION.

9. THE FOLLOWING DESIGN PARAMETERS WERE USED TO CALCULATE THE CAPACITY OF THE PROTOTYPE SYSTEMS (MAXIMUM LOADS - SEE SHEET A003):

- WEIGHT OF THE PLANTS TO BE SUPPORTED:
5.5 POUNDS PER SQUARE FOOT
- SPREAD OF PLANTS TO BE SUPPORTED:
3 FEET ON EACH SIDE, OR 6 FEET IN TOTAL WIDTH
- WEIGHT OF SNOW OR ICE CARRIED BY THE PLANTS:
4 POUNDS PER SQUARE FOOT (IN ADDITION TO THE WEIGHT OF THE PLANT)
- WIND LOAD CARRIED BY THE SUPPORT SYSTEM:
5 POUNDS PER SQUARE FOOT OF PLANT AREA

Yale

Yale University
•
Yale University
2 Whitney Avenue
New Haven, CT 06520
•

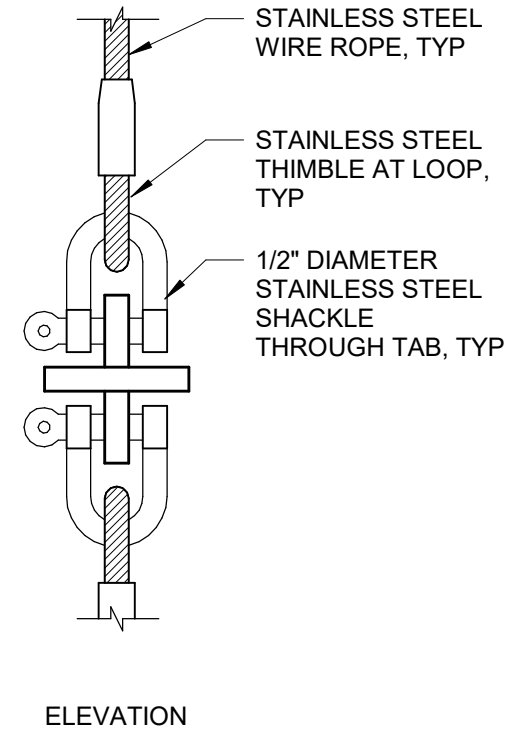
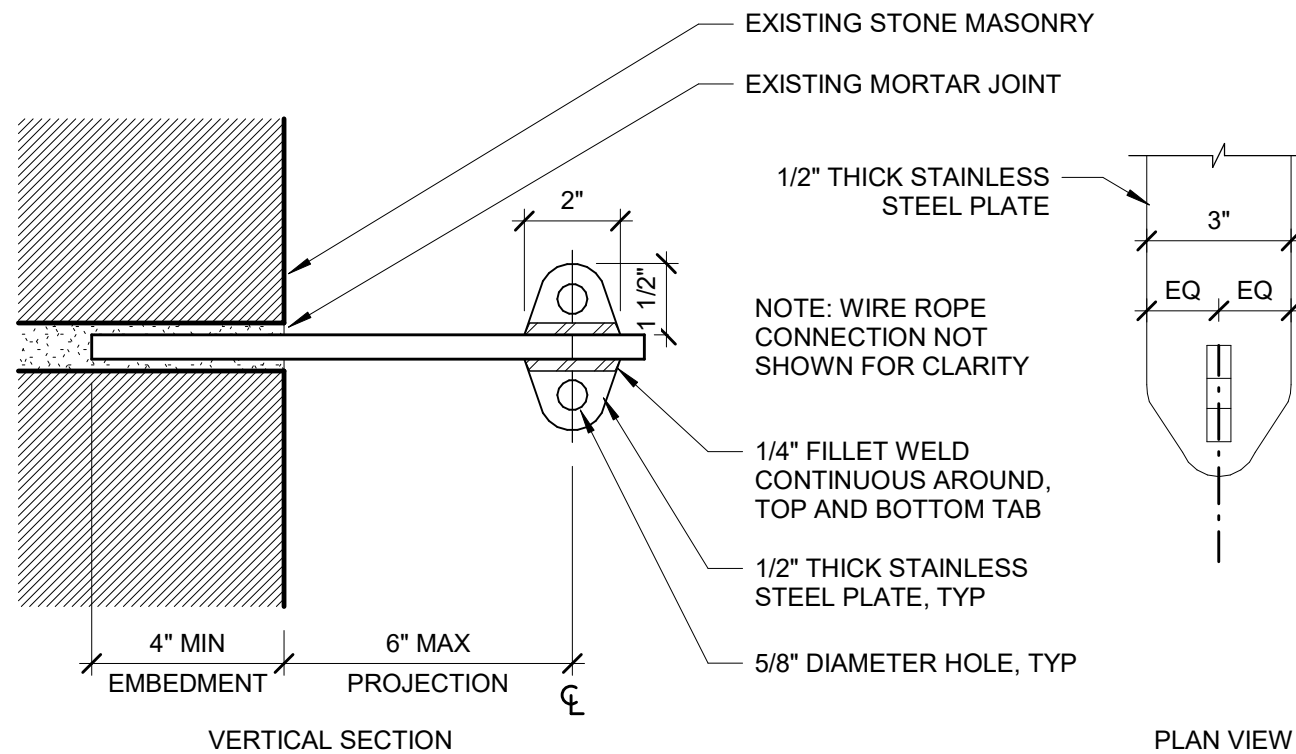
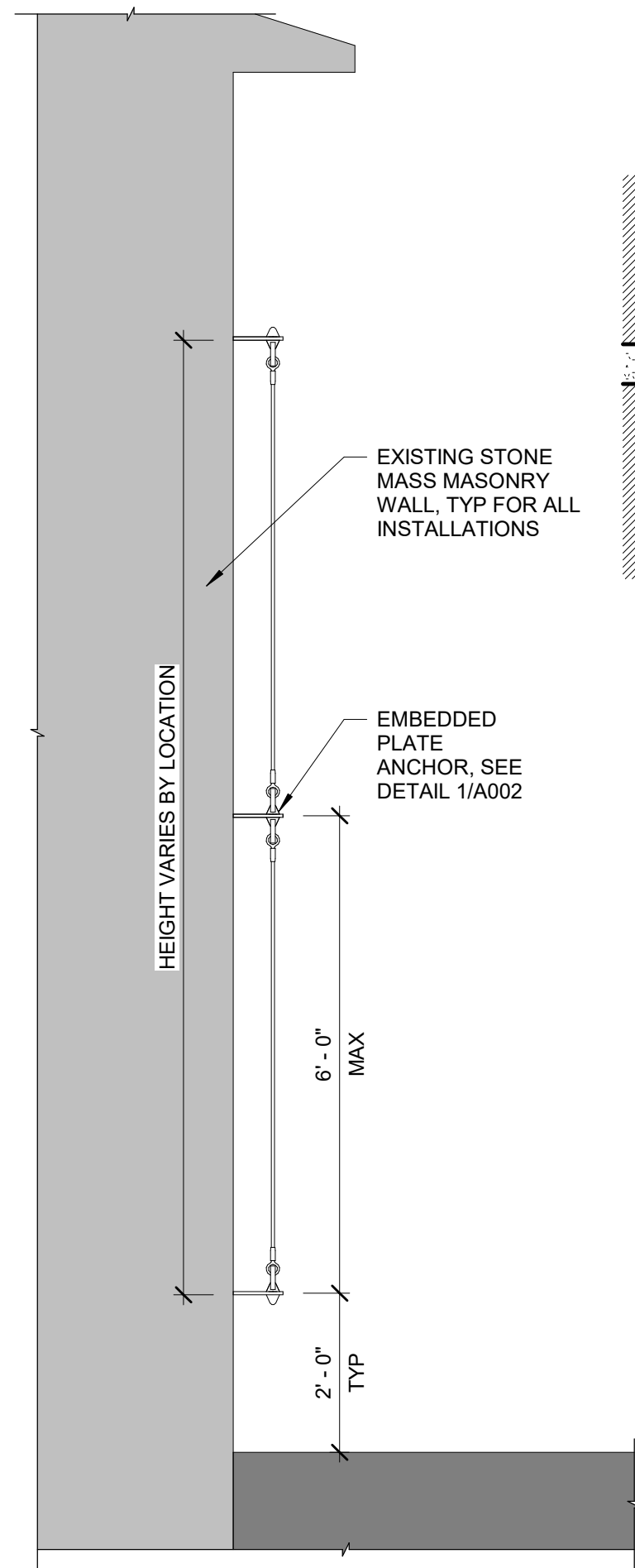
DBVW
ARCHITECTS
111 CHESTNUT STREET
PROVIDENCE, RI 02903
T: 401.831.1240 F: 401.331.1945
www.dbvw.com

FOR REFERENCE
ONLY NOT FOR
CONSTRUCTION

NO.	DATE	REVISION
ISSUE/REVISION		

PROJECT NAME	
PLANT SUPPORT PROTOTYPE	
BUILDING NAME & ADDRESS	
YALE UNIVERSITY NEW HAVEN, CT	
YALE PROJECT NUMBER	DBVW PROJECT NUMBER
19050901	1902

DRAWING TITLE	
COVER	
SCALE	DRAWN BY PO
SUBMISSION STUDY	DATE 06/11/2020
DRAWING NUMBER	
A000	



1 TYPE 2 ANCHOR - VERTICAL INSTALLATION ONLY
3" = 1'-0"

2 PLANT SUPPORT TYPE 2 - VERTICAL INSTALLATION ONLY
1/2" = 1'-0"

Yale

Yale University

Yale University
2 Whitney Avenue
New Haven, CT 06520

DBVW
ARCHITECTS

111 CHESTNUT STREET
PROVIDENCE, RI 02903
T: 401.831.1240 F: 401.331.1945
www.dbvw.com

FOR REFERENCE
ONLY NOT FOR
CONSTRUCTION

NO.	DATE	REVISION
ISSUE/REVISION		

PROJECT NAME

PLANT
SUPPORT
PROTOTYPE

BUILDING NAME & ADDRESS
YALE UNIVERSITY
NEW HAVEN, CT

YALE PROJECT NUMBER 19050901	DBVW PROJECT NUMBER 2010
---------------------------------	-----------------------------

DRAWING TITLE

SUPPORT TYPE 2 -
STEEL CABLE

SCALE As Indicated	DRAWN BY PO
-----------------------	----------------

SUBMISSION STUDY	DATE 06/11/2020
---------------------	--------------------

DRAWING NUMBER

A002

Plant Support Prototype Calculations

Type 1: Bronze Rod (Vertical and Horizontal)

Design Variables:

Contributing Width of Vine Spread	6.0	ft
Dead Weight of Vines	5.5	psf
Snow/Ice Surcharge on Vines	4.0	psf
Wind Load on Vines	5.0	psf

Material Properites:

Yield Strength of Bronze (Fy)	35.0	ksi
Elasticity of Bronze (E)	14000	ksi

Vertical Installations:			
Vertical Spacing Between Supports	6.0	ft	
Offset from face of Wall	6.0	in	
Flat Plate Bracket:			
Thickness of Plate	0.500	in	
Width of Plate	3.000	in	
Moment of Inertial (Ix)	0.031	in^4	
Section Modulus (Sx)	0.125	in^3	
Material Yield Strength (Fy)	35.0	ksi	Bronze
Material Elasticity E	14000.0	ksi	Bronze
Load on Bracket	342.0	lbs	
Bending Moment on Bracket	2052.0	in*lbs	Due to Vertical Load
Stress in Bracket	16416.0	psi	OK
Allowable Material Stress	21000.0	psi	
Deflection of Bracket	0.06	in	
Embedment Depth in Masonry	4.000	in	
Stress in Masonry	256.5	psi	
Vertical Pipe or Rod:			
Outside Diameter of Pipe or Rod	1.000	in	
Inside Diameter of Pipe or Rod	0.000	in	Solid Rod
Moment of Inertial (Ix)	0.049	in^4	
Section Modulus (Sx)	0.098	in^3	
Material Yield Strength (Fy)	35.0	ksi	Bronze
Material Elasticity E	14000.0	ksi	Bronze
Bending Moment in Pipe or Rod	1620.0	in*lbs	Due to Wind Load
Stress in Pipe or Rod	16509.6	psi	OK
Allowable Material Stress	21000.0	psi	
Deflection of Pipe or Rod	1.27	in	

Horizontal Installations:			
Horizontal Spacing Between Supports	4.5	ft	
Offset from face of Wall	6.0	in	
Horizontal Pipe or Rod:			
Outside Diameter of Pipe or Rod	1.000	in	
Inside Diameter of Pipe or Rod	0.000	in	Solid Rod
Moment of Inertial (Ix)	0.049	in^4	
Section Modulus (Sx)	0.098	in^3	
Material Yield Strength (Fy)	35.0	ksi	Bronze
Material Elasticity E	14000.0	ksi	Bronze
Bending Moment in Pipe or Rod	1731.4	in*lbs	Due to Vertical Load
Stress in Pipe or Rod	17644.6	psi	OK
Allowable Material Stress	21000.0	psi	
Deflection of Pipe or Rod	0.77	in	

Type 2: Stainless Steel Cable (Vertical Only)

Design Variables:

Contributing Width of Vine Spread	6.0	ft
Dead Weight of Vines	5.5	psf
Snow/Ice Surcharge on Vines	4.0	psf
Wind Load on Vines	5.0	psf

Material Properites:

Yield Strength of Stainless Steel (Fy)	30.0	ksi
Elasticity of Stainless Steel (E)	28000	ksi

Vertical Installations:			
Vertical Spacing Between Supports	6.0	ft	
Offset from face of Wall	6.0	in	
Flat Plate Bracket:			
Thickness of Plate	0.500	in	
Width of Plate	3.000	in	
Moment of Inertial (Ix)	0.031	in^4	
Section Modulus (Sx)	0.125	in^3	
Material Yield Strength (Fy)	30.0	ksi	Stainless
Material Elasticity E	28000.0	ksi	Stainless
Load on Bracket	342.0	lbs	
Bending Moment on Bracket	2052.0	in*lbs	Due to Vertical Load
Stress in Bracket	16416.0	psi	OK
Allowable Material Stress	18000.0	psi	
Deflection of Bracket	0.03	in	
Embedment Depth in Masonry	4.000	in	
Stress in Masonry	256.5	psi	

Yale University

Yale University
2 Whitney Avenue
New Haven, CT 06520

DBVW
ARCHITECTS

111 CHESTNUT STREET
PROVIDENCE, RI 02903
T: 401.831.1240 F: 401.331.1945
www.dbvw.com

FOR REFERENCE
ONLY NOT FOR
CONSTRUCTION

NO.	DATE	REVISION
ISSUE/REVISION		

PROJECT NAME

PLANT
SUPPORT
PROTOTYPE

BUILDING NAME & ADDRESS
YALE UNIVERSITY
NEW HAVEN, CT

YALE PROJECT NUMBER 19050901	DBVW PROJECT NUMBER 2010
---------------------------------	-----------------------------

DRAWING TITLE

PROTOTYPE
CALCULATIONS

SCALE 1/2" = 1'-0"	DRAWN BY BL
SUBMISSION STUDY	DATE 06/11/2020

DRAWING NUMBER

A003