G575 Lift Station Repairs

at the

UNITED STATES MARINE CORPS BASE
CAMP GEIGER, NORTH CAROLINA

July 23, 2026

A/E Contract: N40085-22-D-0002
Task Order No.: N40085-25-F-0675
Project No.: 26-0044

BASIS OF DESIGN

LIFT STATION G575

Final Design Submittal

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REFERENCE DOCUMENTS

All work will comply with the latest edition of the following codes and standards:

FC 1-300-09N	Navy and Marine Corps Design Procedures, with Change 1, 17 April 2025
UFC 3-201-01	Civil Engineering, 20 December 2022
UFC 3-240-01	Wastewater Collection and Treatment, with Change 4, 01 October 2024
UFC 3-250-01	Pavement Design for Roads and Parking Areas, 14 November 2016
UFC 3-301-01	Structural Engineering, Change 4, 3 June 2025
UFC 3-420-01	Plumbing Systems, 01 April 2021
UFC 3-501-01	Electrical Engineering, 27 November 2024
UFC 4-010-01	Minimum Antiterrorism Standards for Buildings, with Change 3, 24 May 2024
UFC 4-022-03	Security Fences and Gates, 01 October 2013

UTILITIES BASIS OF DESIGN

The following Federal DoD criteria govern the civil design herein:

FC 1-300-09N	Navy and Marine Corps Design Procedures, with Change 1, 17 April 2025
UFC 3-201-01	Civil Engineering
UFC 3-240-01	Wastewater Collection and Treatment, with Change 4, 01 October 2024
UFC 3-250-01	Pavement Design for Roads and Parking Areas, 14 November 2016
UFC 3-301-01	Structural Engineering, Change 4, 3 June 2025
UFC 3-420-01	Plumbing Systems, 01 April 2021
UFC 3-501-01	Electrical Engineering, 27 November 2024
UFC 4-010-01	Minimum Antiterrorism Standards for Buildings, with Change 3, 24 May 2024
UFC 4-022-03	Security Fences and Gates, 01 October 2013

EXISTING CONDITIONS

Lift Station G575 (Camp Geiger Lift Station)

This project consists of improvements to the existing G575 Lift Station. The lift station is located on the east side of the intersection of 6th St and G St, adjacent to Hwy 17 and 53 Bypass of Camp Geiger.

The existing lift station consists of a cast-in-place concrete wet well structure measuring approximately 26 feet by 34 feet, with a depth of approximately 23 feet. Adjacent to the wet well structure is an above ground precast structure measuring approximately 68 feet by 25 feet, which contains the pump valves and a generator room. Influent into the lift station is from a 30-inch diameter gravity sewer main which receives flow from several additional gravity sewer lines adjacent to the lift station. Discharge from the lift station is through approximately 3 miles of 16-inch diameter force main piping.

The wet well is a two-chambered wet well consisting of an influent chamber and wet well chamber with four (4) submersible sewage pumps. The influent chamber is divided into two channels. One channel contains an electric macerator (drum grinder/,muffin monster). The other channel contains a mechanical bar screen with a compactor shoot for solids disposal. Flow in the influent chamber can be directed to either or both channels by slide gates. Effluent enters one or two 18-inch diameter pipes, which directs flow to the adjacent wetwell chamber, which houses the submersible sewage pumps.

Existing pumps are Pentair/Fairbanks Morse. There are two (2) 71 HP pumps with a design operating condition of 3,000 GPM at 51 feet TDH, and two (2) 20 HP pumps with a design operating condition of 1,400 GPM at 32 feet TDH. Interior piping generally consists of 6-inch diameter DI for the small pumps (20 HP), and 12-inch diameter DI for the large pumps (71 HP). The pump valving also contains a 6-inch surge relief valve and 6-inch piping back to the wet well. Pump curves for the existing pumps are included as an attachment to this BOD document.

There is a 200 KW diesel generator located in a room on the west side of the building, and an electrical control room located between the generator room and the pump valve room. There is a meter vault located on the force main discharge piping on the opposite side of the building (east) from the generator room, along with bypass piping connections. Located adjacent to the generator room, there is an above ground fuel storage tank as well as a new outdoor generator set that has yet to be installed.

There is a monorail and hoist attached to wet well roof structure that is used to pull out the wet well equipment for maintenance and installation purposes.

A 6,000-gallon double-wall bioxide chemical storage tank is adjacent to the wet well, opposite of the electrical and pump valve room. During field investigations, it was noted that chemical tank was not in use.

Power supply to the Lift Station is 480V/3-Phase supplied by a 225 KVA pad mounted transformer.

PROPOSED IMPROVEMENTS

Lift Station G575 (Camp Geiger Lift Station)

Pumps

Proposed work consists of replacing all four (4) existing submersible sewage pumps. An analysis was performed comparing the lift station system curve against proposed pumps curves. Recommendations are to install two (2) new 35 HP pumps with a design operating point of 2,000 GPM at 50 feet of TDH, and two (2) new 110 HP pumps with a design operating point of 3,000 GPM at 87 feet of TDH.

The hydraulic analysis indicates that the small and large pumps do not operate efficiently if attempting to run at the same time. Control and operations should be such that either one or two small pumps run simultaneously, or one or two large pumps run simultaneously.

The new pumps will be installed with new 316 stainless steel guide rail systems, pump bases and elbows. Existing 6-inch diameter discharge piping and valves between the small pump discharge and force main connection will be replaced with 10-inch diameter piping and valves. The existing 12-inch diameter discharge piping for the large pumps and existing 16-inch diameter force main will remain unchanged. Pump curves for the proposed pumps and a summary of the pump selection analysis are included as an attachment to this BOD document.

Screens and Grinders

During field investigations, the existing solids removal system, both mechanical screen and macerator equipment, were noted to have been recently installed functioning as intended. Therefore, no new work is proposed for the lift station's solids removal system.

Manhole Repairs and New Gravity Sewer Pipe

Proposed gravity sewer system improvements include the replacement of five existing manholes and the installation of one new manhole, and the replacement of approximately 1,800 LF of gravity sewer main, ranging in size from 8-inch diameter to 30-inch diameter. New piping is proposed to be HDPE pipe.

Temporary bypass pumping will be required during construction of the new work. Recommended bypass flow requirements, number of duty pumps, backup pumps, length of temporary transfer piping, and pump HP

requirements are indicated on the project plans. The proposed design of the replacement gravity sewer system includes a combination of replace-in-place and parallel construction.

Structural

Proposed structural improvements include replacement of the existing overhead mounted trolley/hoist system with a new hoist system that will travel in the X and Y direction in the wet well and allow for removal of all pumps, valves, fittings, and macerator pump.

Once the crane system is finalized, structural review for the crane cut sheet will be performed to verify if this matches the design intent. The crane is currently assumed to be 2 tons capacity. Crane support beams are designed for 2 tons capacity with 25% vertical impact loading and additional lateral load of 20% rated capacity of the crane. Structural analysis is performed for verification that the existing concrete beam can support the new crane loading. New layout of the steel framing system is developed for additional movement of the crane in the wet well portion such that all equipment in the pit area can be removed with the hoist. The extent of the crane reach stays the same as the pedestal location is in the same grid line. New column/pedestal is added based on the updated beam layout for this multi-directional movement of crane.

Per section 706.2 (Addition or replacement of roofing or equipment) of the International existing building code (IEBC) Chapter 7 (Alteration - Level 1), any gravity load carrying structural element whose gravity load-carrying capacity is not decreased can support an increase in gravity load of not more than 10% without needing to be strengthened to comply with the current International building code(IBC). Structural engineers have verified that the new pump configuration and associated weight does not cross this 10% threshold for the lift station foundation loading, thus the foundation is considered technically compliant without requiring a full structural overhaul.

Electrical

Electrical work that is incidental to work performed under other divisions includes replacing the four existing wastewater pumps with higher capacity pumps. To accommodate this upgrade, the existing Adjustable Speed Drives (ASDs), currently installed in the existing Motor Control Center (MCC), will be replaced with larger units to account for the increase in driven load. The proposed replacements will be the same brand and model as existing - Allen Bradley PowerFlex 753 and a spare ASD of each size will be provided.

The capacity of the existing electrical distribution system has been evaluated, and the National Electrical Code load calculations attached indicate that the existing system has sufficient capacity to support the proposed increase in load. For the generator, a sizing analysis was conducted and the results demonstrate that the existing 230kW Standby Diesel Engine Generator sufficient capacity to support the increase in load. It should be noted that, concurrent to this ongoing design, a new generator and automatic transfer switch are being installed onsite to replace the existing units. It is expected that they will be in service before construction for this project commences. For the purposes of this report and project design, references to “existing” generator and transfer switch refer to the replacement equipment.

No measures for ASD-generated harmonics mitigation are provided in the existing installation. To meet IEEE 519 harmonics limitations in accordance with UFGS requirements, two options are available. The preferred method will be to replace the existing ASDs with low harmonic units utilizing passive filters. The

alternative is to install a remote-mounted active harmonics filter. The MCC vendor has advised that low harmonics ASDs cannot be retrofitted in the existing MCC. A remote-mounted active harmonics filter will, therefore, be provided, sized as shown in the attached Harmonic Distortion Analysis.

Additional scope items included a request for design of a lightning protection system and surge protective devices at key distribution equipment, where not currently equipped, to protect against line transients. Per government preference, an integral lightning system with lighting rods affixed to the roof, interconnected with bonding conductors, and connected to a grounding electrode via down-conductors, will not be provided. Rather, a Mast Lighting Protection System will be specified using masts constructed of wood. Regarding surge suppression, it was observed that the recently replaced motor control center was furnished with a surge protection device and the utility transformer is equipped with surge arresters on the primary termination. To further bolster surge protection, an additional surge protection device will be installed on the load side of the existing Main Disconnect.

Stantec was advised that there were repeated, unexplained, ASD failures at several lift station sites. This, based on discussions with plant staff, explains the government's request for a lightning protection system and surge protection measures. It was eventually understood that the failures were caused by corrosion on the ASD circuit boards induced by hydrogen sulfide liberated from the wet wells adjacent to the electrical rooms. To remedy this situation, the rooms were sealed, air conditioned, and air purifiers were installed in the electrical rooms. Stantec was advised by the plant staff that this remedy was successful, and they no longer experience ASD failures.

STORMWATER SYSTEM AND MANAGEMENT

The impervious surfaces for both areas will be less than or equal to the existing impervious surfaces for each area. As such, no stormwater control measures are anticipated.

EROSION & SEDIMENTATION CONTROL

An erosion and sedimentation control permit through NCDEQ is not expected as the disturbance area is less than 1.0 acre.

PERMITS

The following permits are anticipated to be required:
Sewer Extension Permit - NCDEQ

ATTACHMENTS

G575 Existing Pump Curves (Pentair/Fairbanks Morse)
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Appendix A

G575 Existing Pump Curves
(Pentair/Fairbanks Morse)

PENTAIR

Customer :
Project name : Default

Pump Performance Datasheet

Encompass 3.0 - 26.0.0

Item Number / Tags	: 001	Size	: 6" 5433MV
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: 6-5433MV-1800-T6C1C
Quote number	: 2785423	Date last saved	: 29 Jan 2026 9:43 AM

Operating Conditions

Flow, rated	: 1,400.0 USgpm
Differential head / pressure, rated (requested)	: 32.00 ft
Differential head / pressure, rated (actual)	: 32.05 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1183 rpm
Impeller diameter, rated	: 11.16 in
Impeller diameter, maximum	: 12.00 in
Impeller diameter, minimum	: 9.00 in
Efficiency	: 77.24 %
NPSH required / margin required	: 9.03 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 47 / 164 Metric units
Minimum Continuous Stable Flow	: 199.9 USgpm
Head, maximum, rated diameter	: 61.19 ft
Head rise to shutoff	: 91.22 %
Flow, best eff. point	: 1,174.8 USgpm
Flow ratio, rated / BEP	: 119.17 %
Diameter ratio (rated / max)	: 93.00 %
Head ratio (rated dia / max dia)	: 76.77 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 3.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

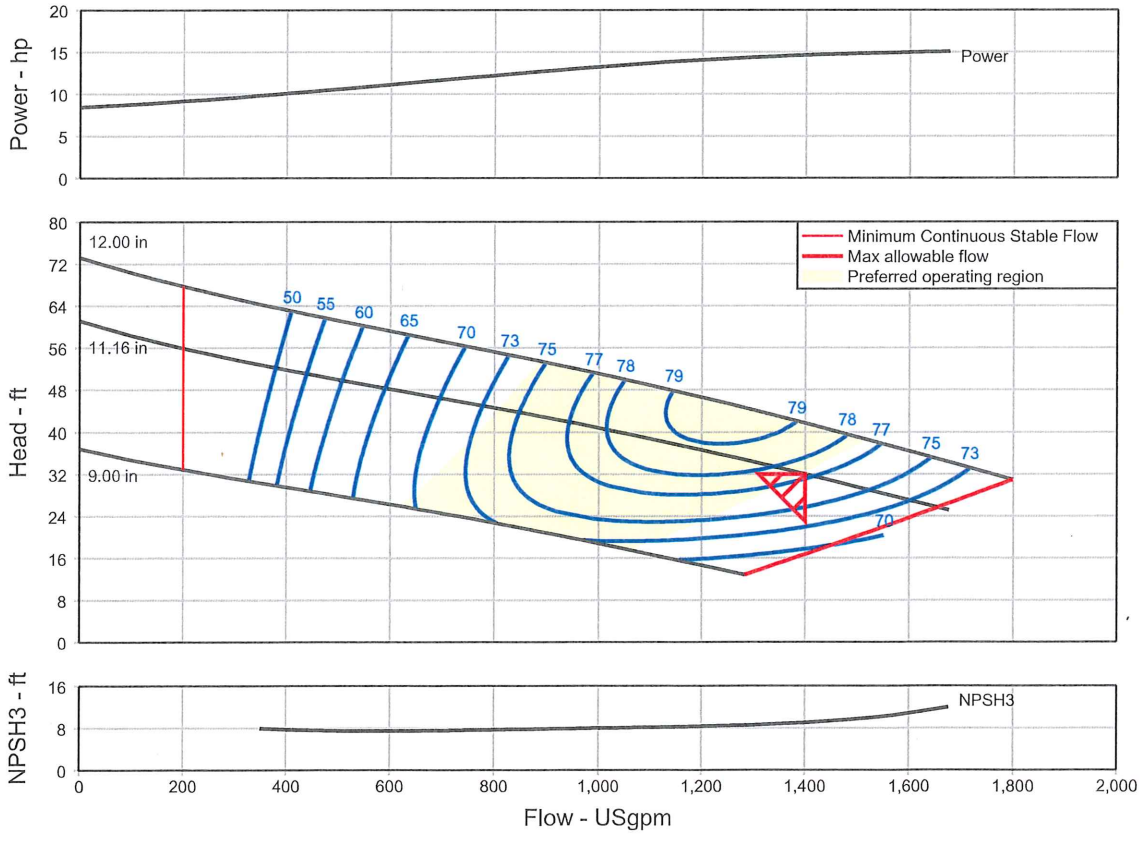
Material selected	: Cast Iron

Pressure Data

Maximum working pressure	: 26.48 psi.g
Maximum allowable working pressure	: 85.00 psi.g
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: 125.0 psi.g

Driver & Power Data (@Max density)

Driver sizing specification	: Max Power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 11.31 hp
Power, rated	: 14.64 hp
Power, maximum, rated diameter	: 15.07 hp
Minimum recommended motor rating	: 20.00 hp / 14.91 kW



PENTAIR

Customer :
Project name : Default

Pump Performance Datasheet

Encompass 3.0 - 26.0.0

Item Number / Tags	: 001	Size	: 12" 5731 (W, WD)
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: 12-57x1-1200-L12A1N Rev 102716
Quote number	: 2785423	Date last saved	: 29 Jan 2026 9:34 AM

Operating Conditions

Flow, rated	: 3,000.0 USgpm
Differential head / pressure, rated (requested)	: 51.00 ft
Differential head / pressure, rated (actual)	: 51.12 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1185 rpm
Impeller diameter, rated	: 12.97 in
Impeller diameter, maximum	: 13.87 in
Impeller diameter, minimum	: 12.00 in
Efficiency	: 71.05 %
NPSH required / margin required	: 26.96 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 86 / 135 Metric units
Minimum Continuous Stable Flow	: 2,014.5 USgpm
Head, maximum, rated diameter	: 68.01 ft
Head rise to shutoff	: 33.04 %
Flow, best eff. point	: 4,729.8 USgpm
Flow ratio, rated / BEP	: 63.43 %
Diameter ratio (rated / max)	: 93.51 %
Head ratio (rated dia / max dia)	: 78.13 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 4.50 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

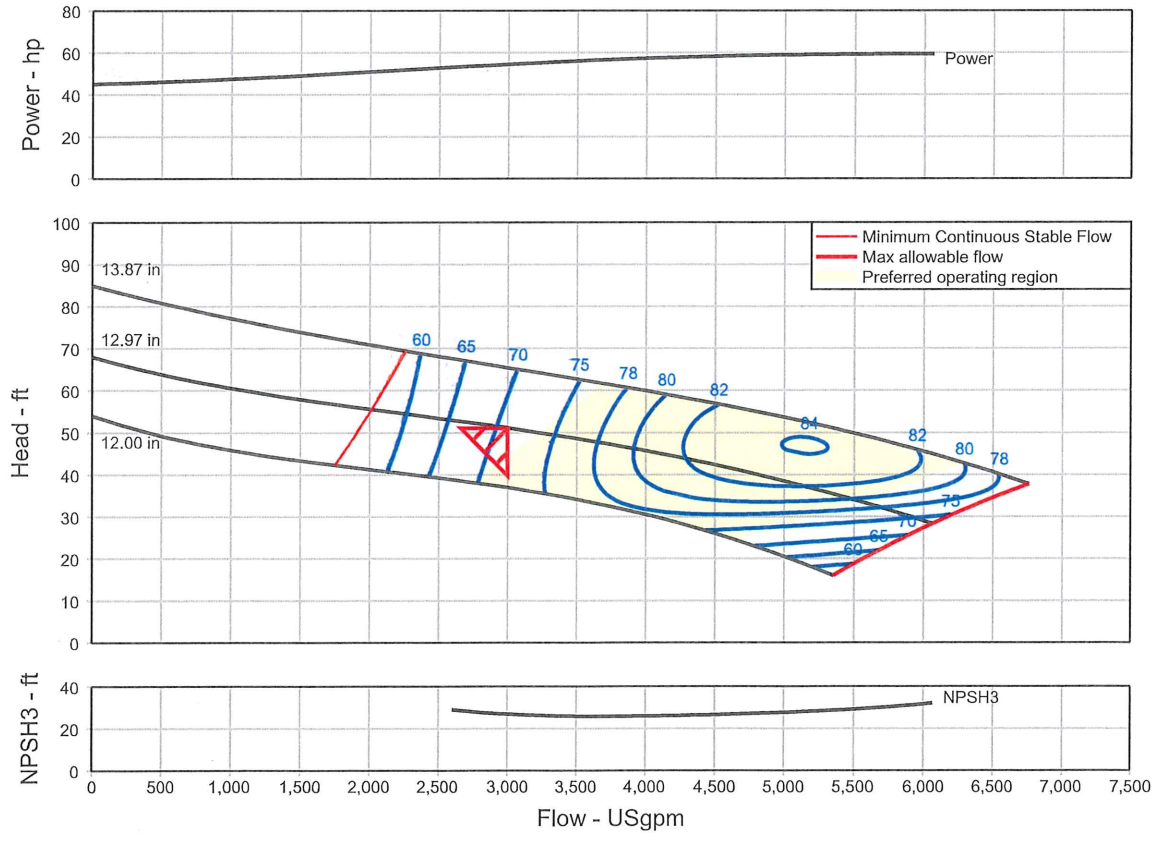
Material selected	: Cast Iron

Pressure Data

Maximum working pressure	: 29.43 psi.g
Maximum allowable working pressure	: 50.00 psi.g
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: 75.00 psi.g

Driver & Power Data (@Max density)

Driver sizing specification	: Max Power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 38.72 hp
Power, rated	: 54.49 hp
Power, maximum, rated diameter	: 59.46 hp
Minimum recommended motor rating	: 75.00 hp / 55.93 kW

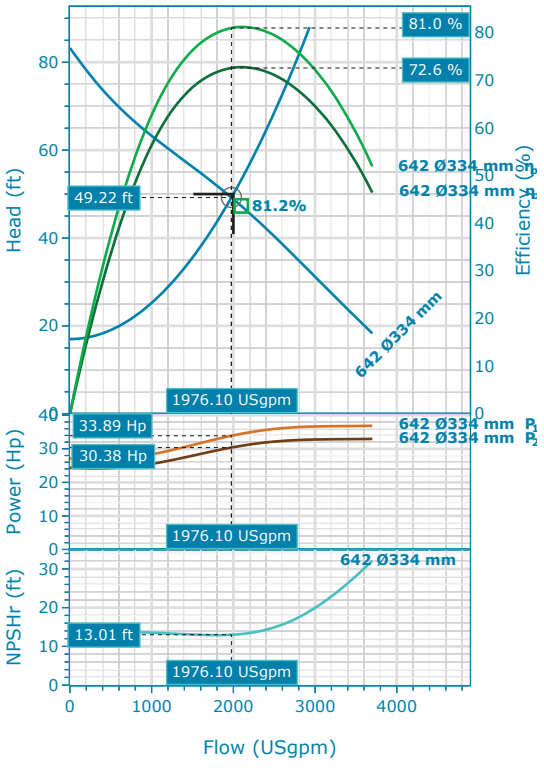


Appendix B

G575 Proposed Pump Curves (Flygt)

NP 3202 MT 3~ 642 | Configuration Summary

Flygt's self-cleaning non-clog N-pumps feature innovative designs and functions that deliver high sustained efficiency and the most reliable operation. This makes them the most reliable choice available for a broad range of wastewater applications for tough applications such as unscreened sewage, wastewater and sludge up to an 8 percent solids concentration. Impeller material available in Hardened cast Iron, Hard Iron and Stainless Steel to fit any wastewater application.



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

GENERAL

Explosion Proof	Max. Pumped Media Temp.
Yes	104 °F
Approval	Impeller Diameter
FM	334 mm

MATERIAL AND COATING

Impeller Material
Hard-Iron
Volute Material
Grey Cast Iron

MOTOR

Rated Voltage	Motor Efficiency Class
460 V	Standard
Coupling	Rated Power
D	35 Hp

INSTALLATION

Installation Type
P - Semi-Permanent, Wet

NP 3202 MT 3~ 642 | Product Details

Description

N 3202

The Flygt N-series are equipped with the Flygt invented N-technology with its innovative self-cleaning impeller. Solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet where it will be guided by a relief groove through the pump housing. This ensures a high sustained total efficiency over time. Due to the mechanical self-cleaning design, a sludge concentration of solids up to 8% can easily be pumped. The pump can easily be installed in either permanently or temporary submerged, or horizontally or vertically dry installations.

Flexible and Modular Design

The modular hydraulic design enables customization of the hydraulics to meet the requirements of many applications.

- Replaceable wear ring in two materials, gray iron or Hard Iron, for different operation conditions
- Hardened gray iron impeller for typical wastewater applications
- Hard-Iron impeller for heavy duty wastewater applications containing abrasive and corrosive content
- Chopper ring intended for tough wastewater applications where cutting is required due to long fibres and solid concentrations up to 10-12%
- Stainless steel impeller for special applications that require duplex stainless steel

Robust and Reliable

- Short shaft overhang reduces shaft deflection and increases seal and bearing life
- Class H Motor designed for submersible use. Heat is concentrated to the stator core for improved cooling properties.
- The Plug-in seal with Active Seal system eliminates the risk associated with incorrect installation and careless handling. All in one unit. Available in Tungsten carbide (WCCR) or Silicone carbide (SiC) depending on pumped media.
- Motor cable SUBCAB® specially developed for submersible use
- Offers flexible cooling systems, e.g. closed-loop cooling system, media cooled or external cooling that allows full motor potential in dry installations.
- Premium brand bearings, greased for life, ensures a minimum of 50 000 hours of duty
- Leakage sensor and motor temperature sensor as standard

The N 3202 is available with the following options

- ATEx, FM, CSA-approvals
- Premium efficiency motors
- Hard Iron hydraulic design
- Stainless Steel hydraulic design
- Vibration-sensor, extended motor temperature sensors, additional leakage-sensor, current-sensor and pump memory
- Compatible with SmartRun® Wastewater pump controller
- Compatible with MAS 801 monitoring system

Product Features

- State-of-the-art wastewater pump with N-technology
- Sustained high efficiency pumping with energy savings up to 25%
- Flexible and modular design
- Robust and reliable

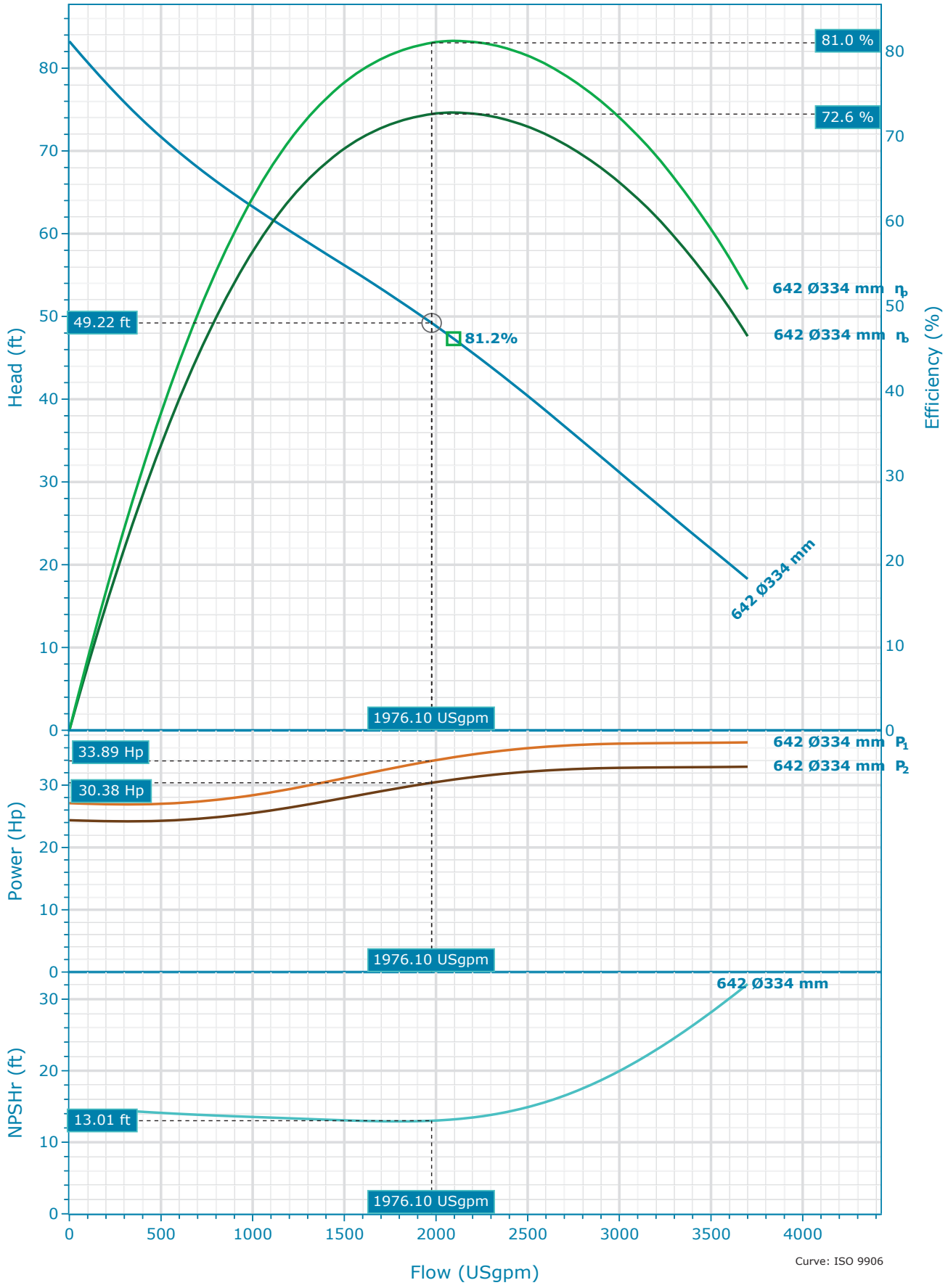
Construction Materials

Impeller Material	Volute Material	Stator Cover Material
Hard-Iron	Grey Cast Iron	-

Motor

Rated Power	Number Of Phases	Start Current Ratio	Motor Issue
35 Hp	3	5.69	12
Motor Denomination	Rated Motor Speed	Insulation Class	Locked Rotor Code
30-18-6AA	1,170 RPM	H	F
Motor Efficiency Class	Rated Voltage	Approval	Max starts per hour
Standard	460 V	FM	30
Version Code	Rated Current	Total moment of inertia	Power Factor 100%
095	43 A	9.06 ft^2lbf	0.86
Frequency	Start Current	Type of duty	Power Factor 75%
60 Hz	243 A	S1	0.83
Max P2 (1x)	Starting Current, Direct Starting	Stator Variant	Power Factor 50%
32.95 Hp	243 A	1	0.75
Number Of Poles	Starting Current, Star Delta	Motor Module	Efficiency 100%
6	81 A	150	89.1 %
			Efficiency 75%
			90 %
			Efficiency 50%
			89.6 %

NP 3202 MT 3~ 642 | Hydraulic Data & Performance Curve



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

Project:	Created By:	Created On:	Last Update:
NP 3202 MT 3~ 642	Vincent Bischoff	2/20/26	-

Selection

Series N 3000	Curve Code 642
Name NP 3202 MT 3~ 642	Impeller Diameter 334 mm
Frequency 60 Hz	Inlet Diameter 250 mm
Total Flow 2,000 USgpm	Outlet Diameter 8 in
Total Head 50 ft	Number Of Vanes 2
Pump Flow 2,000 USgpm	
Pump Head 50 ft	
System Type Single Pump	
Operating Pumps 1	
Standby Pumps No Standby Pump	

Fluid and Operating Conditions

Fluid Type Water	Density 62.43 lb/ft³
Fluid Temperature 39.2 °F	Dynamic Viscosity 1.57 cP
Specific Gravity 1	Fluid Vapor Pressure 0.12 psi
	Atmospheric Pressure 14.7 psi
	Elevation 0 ft
	Ambient Temperature 68 °F
	NPSH Available 33.68 ft
	Submergence 0 ft

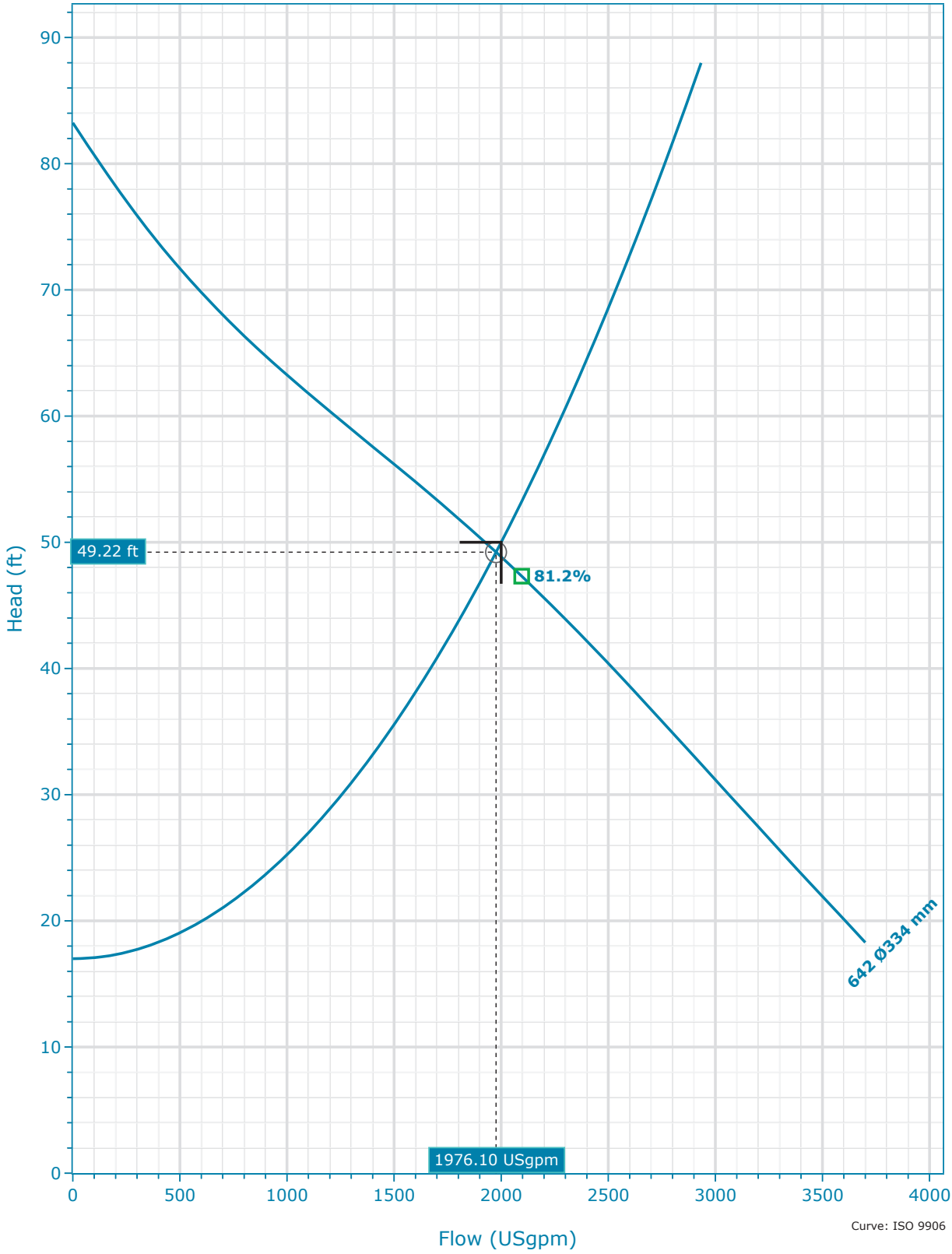
Design Point

Flow 1,976.1 USgpm	Shaft power (P2) 30.38 Hp
Head 49.22 ft	NPSHR 13.01 ft
Overall Efficiency (ηo) 72.6 %	Speed 1,174 RPM
Pump Efficiency (ηp) 80.99 %	Static Head 17 ft
Input Power (P1) 33.89 Hp	Flow To BEP Ratio 94.29 %

Design Curve

Rated Speed 60 Hz	BEP Flow 2,095.82 USgpm
Max Flow 3,699.9 USgpm	BEP Head 47.31 ft
H@QMin 83.24 ft	Max P2 32.95 Hp
H@QMax 18.29 ft	Specific Energy 0.0002 kWh/USgal
BEP 81.21 %	

NP 3202 MT 3~ 642 | Duty Analysis

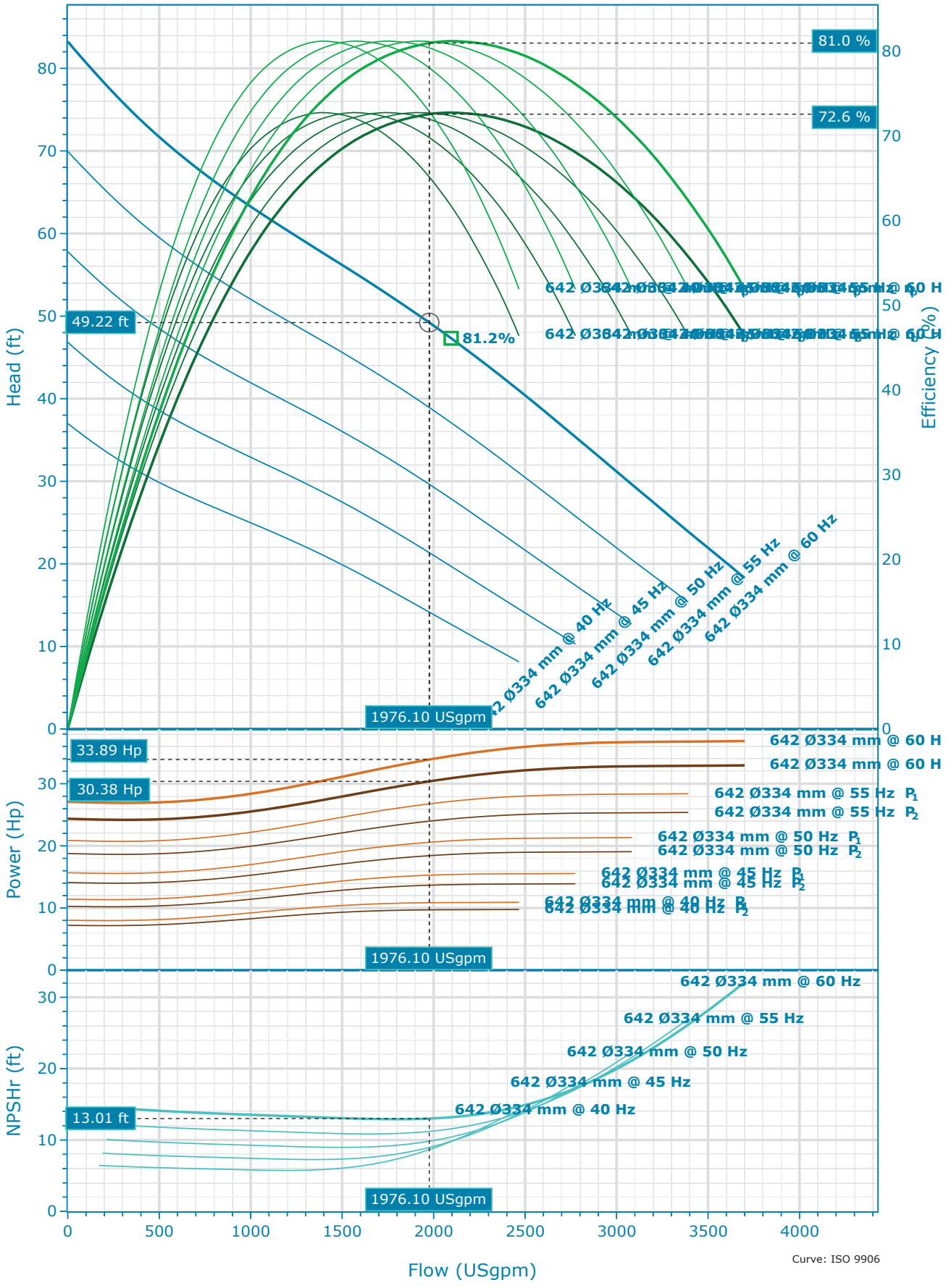


Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

Name	Q (1x) [USgpm]	H (1x) [ft]	P2 (1x) [Hp]	Q [USgpm]	H [ft]	P2 [Hp]	ηp [%]	SE [kWh/USgal]	NPSHr [ft]
DP @ 1x	1,976.1	49.22	30.38	1,976.1	49.22	30.38	80.99	0.0002	13.01

Project:	Created By:	Created On:	Last Update:
NP 3202 MT 3~ 642	Vincent Bischoff	2/20/26	-

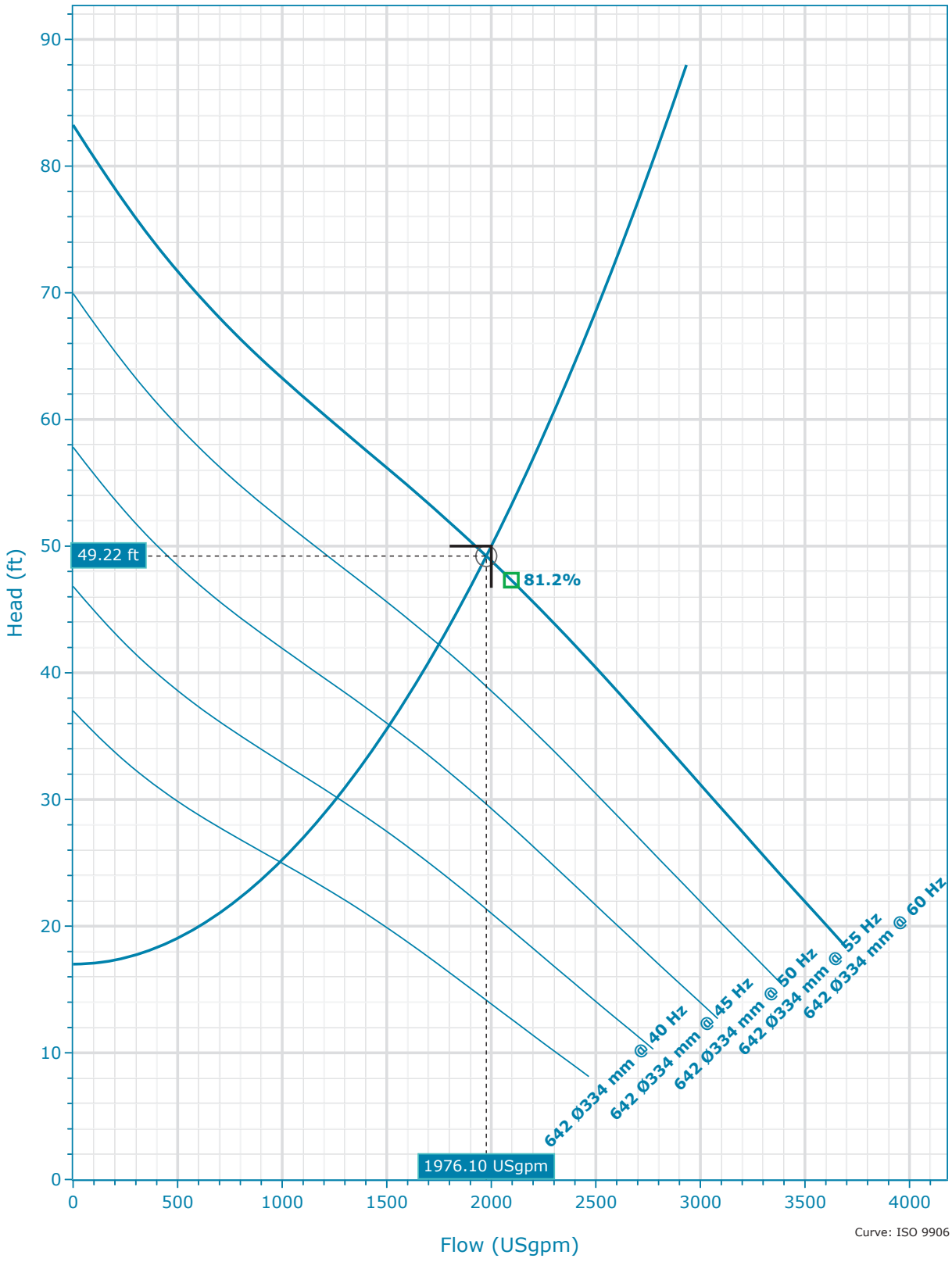
NP 3202 MT 3~ 642 | Variable Speed Curve



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

Project:	Created By:	Created On:	Last Update:
NP 3202 MT 3~ 642	Vincent Bischoff	2/20/26	-

NP 3202 MT 3~ 642 | Variable Speed Analysis



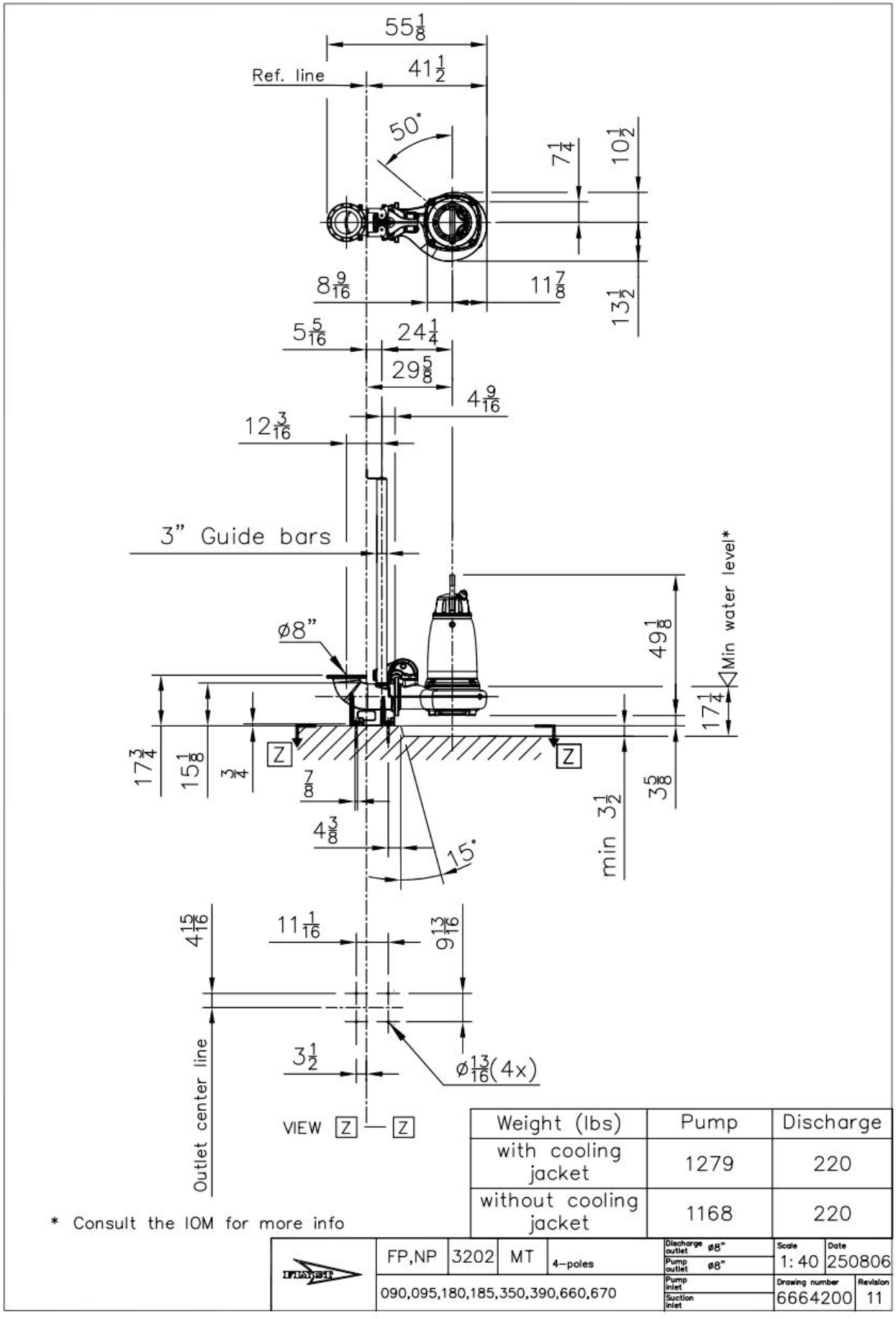
Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

Name	Speed	Q (1x) [USgpm]	H (1x) [ft]	P2 (1x) [Hp]	Q [USgpm]	H [ft]	P2 [Hp]	ηp [%]	SE [kWh/USgal]	NPSHr [ft]
DP @ 1x	40 Hz	989.15	25.07	8.25	989.15	25.07	8.25	76.01	0.0001	5.81
DP @ 1x	45 Hz	1,262.42	30.15	12.21	1,262.42	30.15	12.21	78.88	0.0001	7.28

Project:	Created By:	Created On:	Last Update:
NP 3202 MT 3~ 642	Vincent Bischoff	2/20/26	-

DP @ 1x	50 Hz	1,512.45	35.87	17.13	1,512.45	35.87	17.13	80.1	0.0002	8.97
DP @ 1x	55 Hz	1,748.85	42.23	23.16	1,748.85	42.23	23.16	80.68	0.0002	10.88
DP @ 1x	60 Hz	1,976.1	49.22	30.38	1,976.1	49.22	30.38	80.99	0.0002	13.01

NP 3202 MT 3~ 642 | Dimensional Data & Drawing



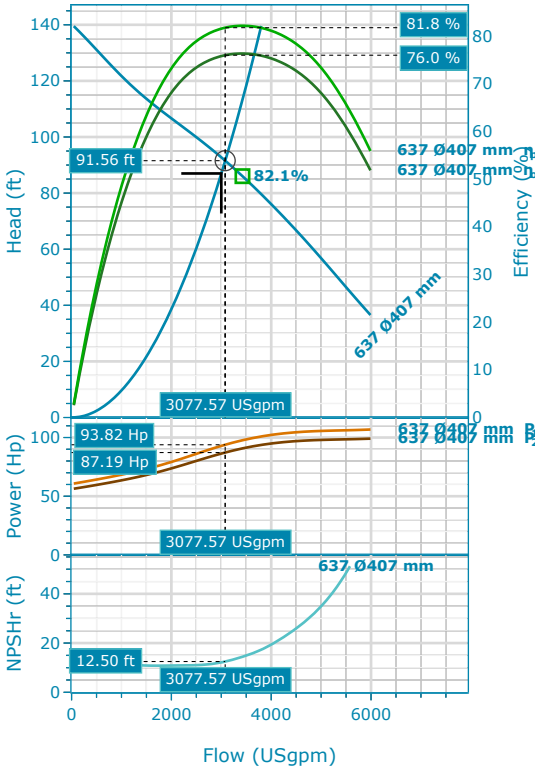
Weight (lbs)	Pump	Discharge
with cooling jacket	1279	220
without cooling jacket	1168	220

* Consult the IOM for more info

FLYGT	FP,NP	3202	MT	4-poles	Discharge outlet ø8" / Pump outlet ø8"	Scale 1:40	Date 250806
	090,095,180,185,350,390,660,670				Pump inlet / Suction inlet	Drawing number 6664200	Revision 11

NP 3315 MT 3~ 637 | Configuration Summary

Flygt's self-cleaning non-clog N-pumps feature innovative designs and functions that deliver high sustained efficiency and the most reliable operation. This makes them the most reliable choice available for a broad range of wastewater applications for tough applications such as unscreened sewage, wastewater and sludge up to an 8 percent solids concentration. Impeller material available in Hardened cast Iron, Hard Iron and Stainless Steel to fit any wastewater application.



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

GENERAL

Explosion Proof	Max. Pumped Media Temp.
Yes	104 °F
Approval	Impeller Diameter
CSA	407 mm

MATERIAL AND COATING

Impeller Material
Hard-Iron
Volute Material
Grey Cast Iron

MOTOR

Rated Voltage	Motor Efficiency Class
460 V	Standard
Coupling	Rated Power
D	110 Hp

INSTALLATION

Installation Type
P - Semi-Permanent, Wet

NP 3315 MT 3~ 637 | Product Details

Description

N 3315

Wastewater N-Technology Pump

Flygt N-pumps take on the toughest applications and get the job done. Every component is designed and manufactured to deliver sustained high efficiency. Thanks to patented N-technology with its innovative self-cleaning impeller, Flygt N-pumps deliver the highest total efficiency. They lower your energy bill and reduce unplanned maintenance costs. That adds up to total peace of mind – and big savings over the long term.
Most solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet.
Due to the mechanical self-cleaning design, a sludge concentration up to 8% can easily be pumped.

Flexible and Modular Design

This self-cleaning pump features innovative functions that make it the best choice for a broad range of applications. The modular hydraulic design enables you to tailor the hydraulics to meet the requirements of virtually any application.

- Replaceable wear ring in two materials, gray iron or Hard-Iron, for different operation conditions
- Hardened gray iron impeller for typical wastewater applications
- Hard-Iron impeller for abrasive and corrosive applications
- Short shaft overhang reduces shaft deflection and increases seal and bearing life
- Motor designed for submersible use. Heat is concentrated to the stator core for improved cooling properties.
- The double mechanical seal system consists of two sets of mechanical shaft seals that work independently to provide double security. Available in Tungsten carbide (WCCR) or Silicone carbide (SiC) depending on pumped media. Motor cable SUBCAB® specially developed for submersible use.
- Offers flexible cooling systems, e.g. closed loop cooling system, media cooled or external cooling.

Product Features

- State-of-the-art wastewater pump with N-technology
- Sustained high efficiency with energy savings up to 25%
- Flexible and modular design
- Robust and reliable

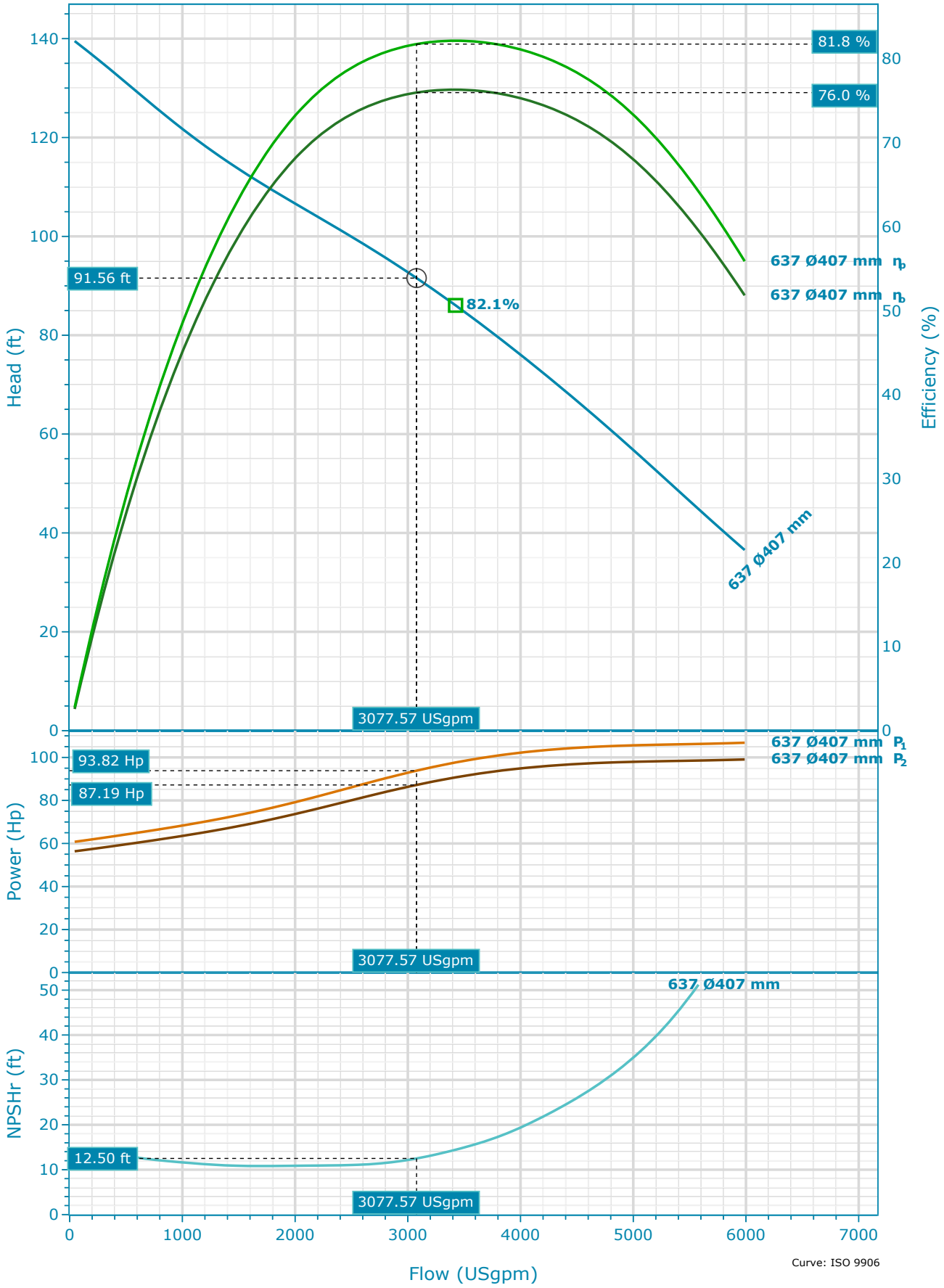
Construction Materials

Impeller Material	Volute Material	Stator Cover Material
Hard-Iron	Grey Cast Iron	-

Motor

Rated Power 110 Hp	Number Of Phases 3	Start Current Ratio 7.03	Motor Issue 13
Motor Denomination 35-35-6AA	Rated Motor Speed 1,185 RPM	Insulation Class H	Locked Rotor Code H
Motor Efficiency Class Standard	Rated Voltage 460 V	Approval CSA	Max starts per hour 15
Version Code 095	Rated Current 137 A	Total moment of inertia 38.28 ft²lbf	Power Factor 100% 0.81
Frequency 60 Hz	Start Current 965 A	Type of duty S1	Power Factor 75% 0.76
Max P2 (1x) 99.04 Hp	Starting Current, Direct Starting 965 A	Stator Variant 1	Power Factor 50% 0.66
Number Of Poles 6	Starting Current, Star Delta 321.67 A	Motor Module 121	Efficiency 100% 92.5 %
			Efficiency 75% 93 %
			Efficiency 50% 92.7 %

NP 3315 MT 3~ 637 | Hydraulic Data & Performance Curve



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

Project:	Created By:	Created On:	Last Update:
NP 3315 MT 3~ 637	Vincent Bischoff	2/23/26	-

Selection

Series N 3000	Curve Code 637
Name NP 3315 MT 3~ 637	Impeller Diameter 407 mm
Frequency 60 Hz	Inlet Diameter 250 mm
Total Flow 3,000 USgpm	Outlet Diameter 10 in
Total Head 87 ft	Number Of Vanes 3
Pump Flow 3,000 USgpm	
Pump Head 87 ft	
System Type Single Pump	
Operating Pumps 1	
Standby Pumps No Standby Pump	

Fluid and Operating Conditions

Fluid Type Water	Density 62.43 lb/ft³
Fluid Temperature 39.2 °F	Dynamic Viscosity 1.57 cP
Specific Gravity 1	Fluid Vapor Pressure 0.12 psi
	Atmospheric Pressure 14.7 psi
	Elevation 0 ft
	Ambient Temperature 68 °F
	NPSH Available 33.68 ft
	Submergence 0 ft

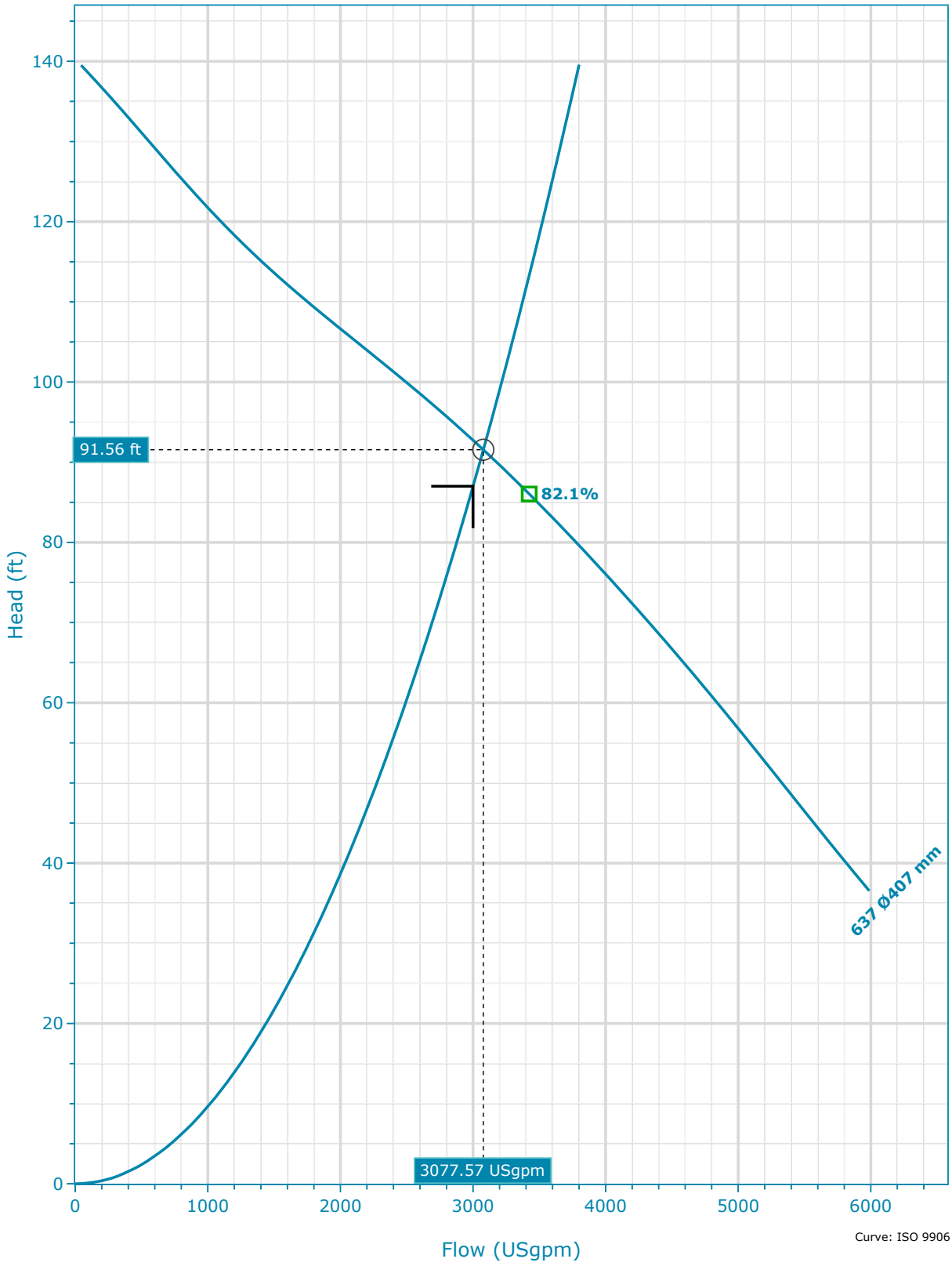
Design Point

Flow 3,077.57 USgpm	Shaft power (P2) 87.19 Hp
Head 91.56 ft	NPSHR 12.5 ft
Overall Efficiency (ηo) 75.98 %	Speed 1,188 RPM
Pump Efficiency (ηp) 81.75 %	Flow To BEP Ratio 89.89 %
Input Power (P1) 93.82 Hp	

Design Curve

Rated Speed 60 Hz	BEP Flow 3,423.71 USgpm
Max Flow 5,988.44 USgpm	BEP Head 86.03 ft
H@QMin 139.51 ft	Max P2 99.04 Hp
H@QMax 36.55 ft	Specific Energy 0.0004 kWh/USgal
BEP 82.15 %	

NP 3315 MT 3~ 637 | Duty Analysis



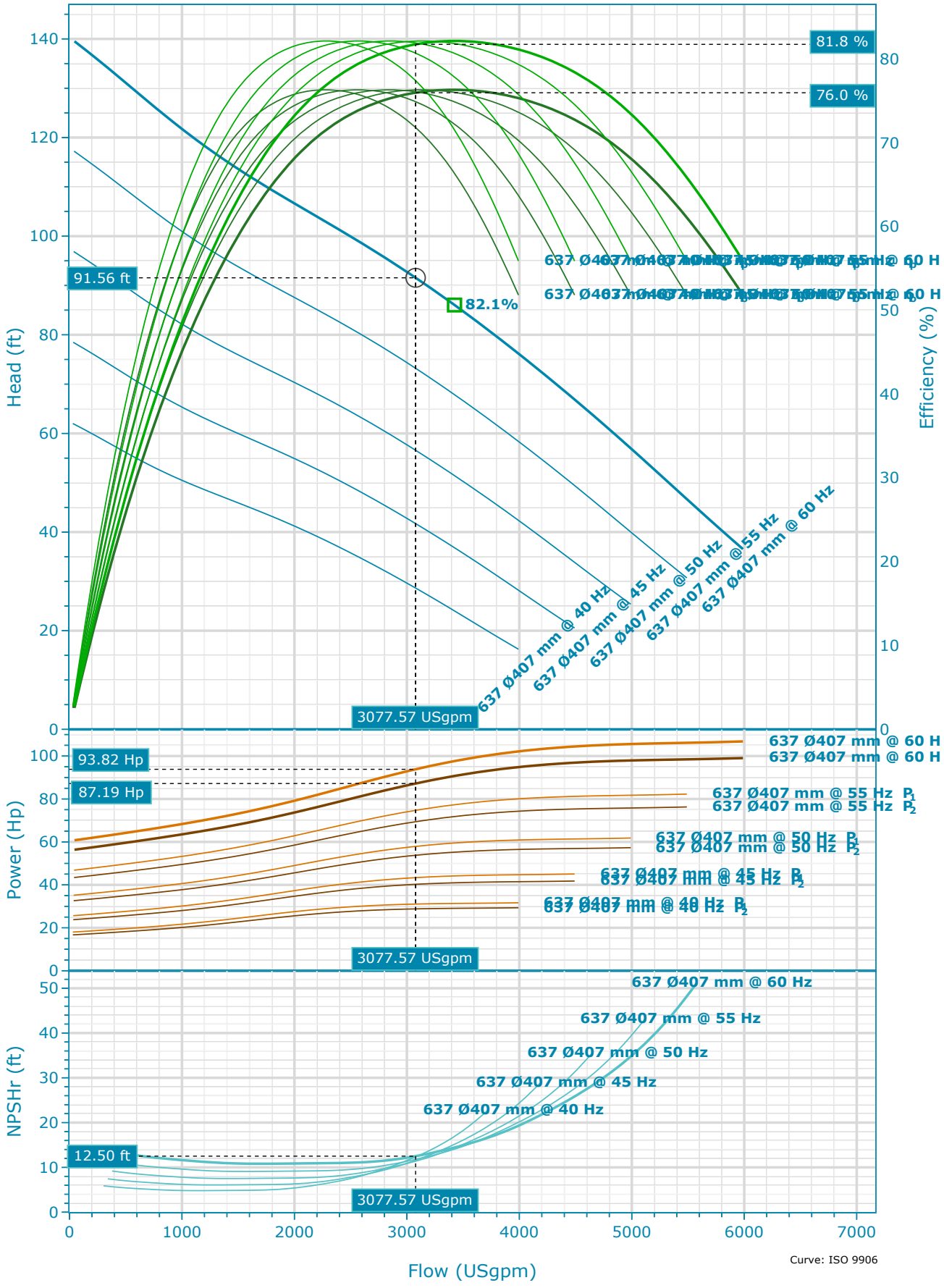
Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

Name	Q (1x) [USgpm]	H (1x) [ft]	P2 (1x) [Hp]	Q [USgpm]	H [ft]	P2 [Hp]	ηp [%]	SE [kWh/USgal]	NPSHr [ft]
DP @ 1x	3,077.57	91.56	87.19	3,077.57	91.56	87.19	81.75	0.0004	12.5

Project:	Created By:	Created On:	Last Update:
NP 3315 MT 3~ 637	Vincent Bischoff	2/23/26	-

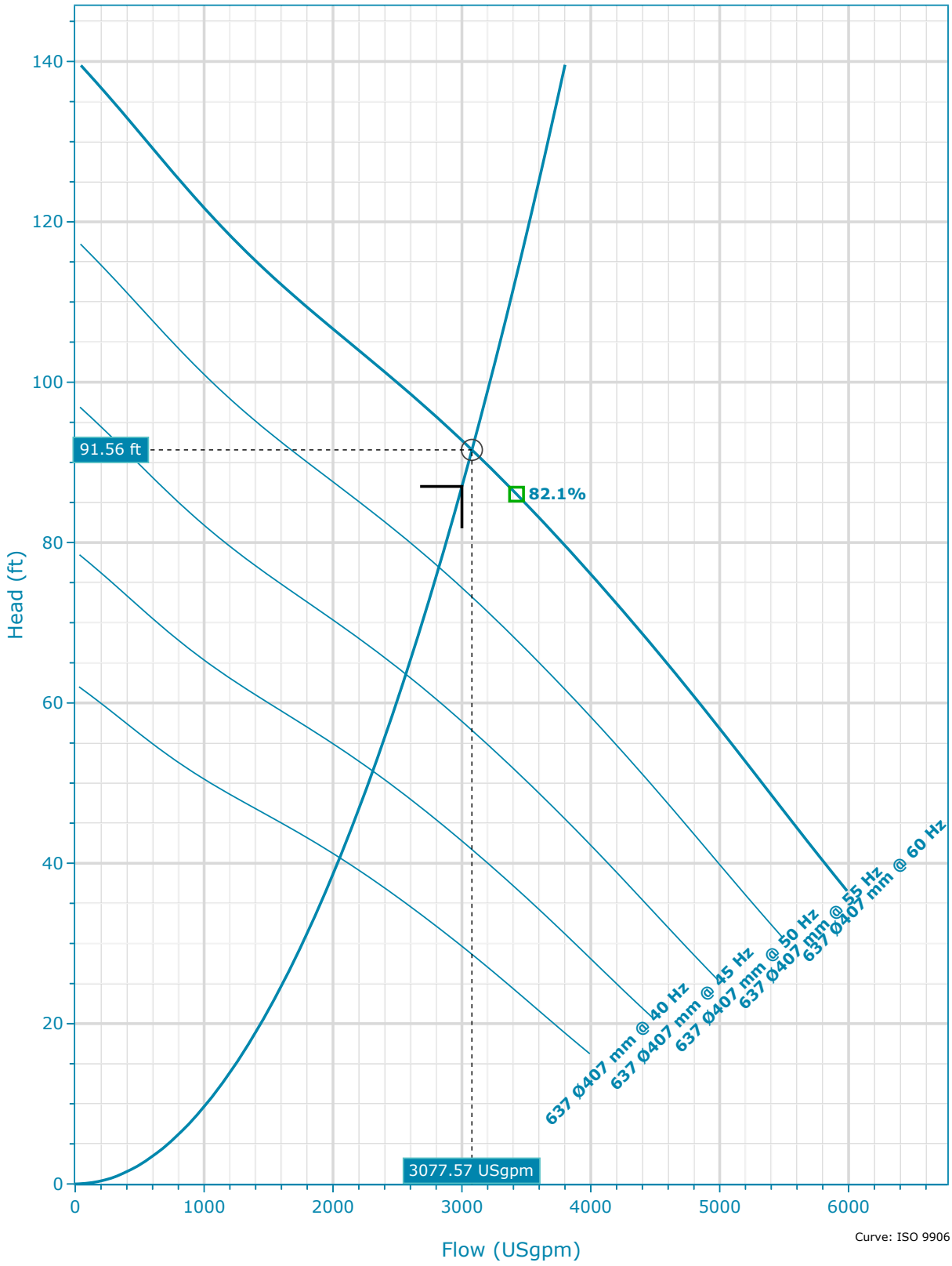
NP 3315 MT 3~ 637 | Variable Speed Curve



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

Project:	Created By:	Created On:	Last Update:
NP 3315 MT 3~ 637	Vincent Bischoff	2/23/26	-

NP 3315 MT 3~ 637 | Variable Speed Analysis



Curve: ISO 9906

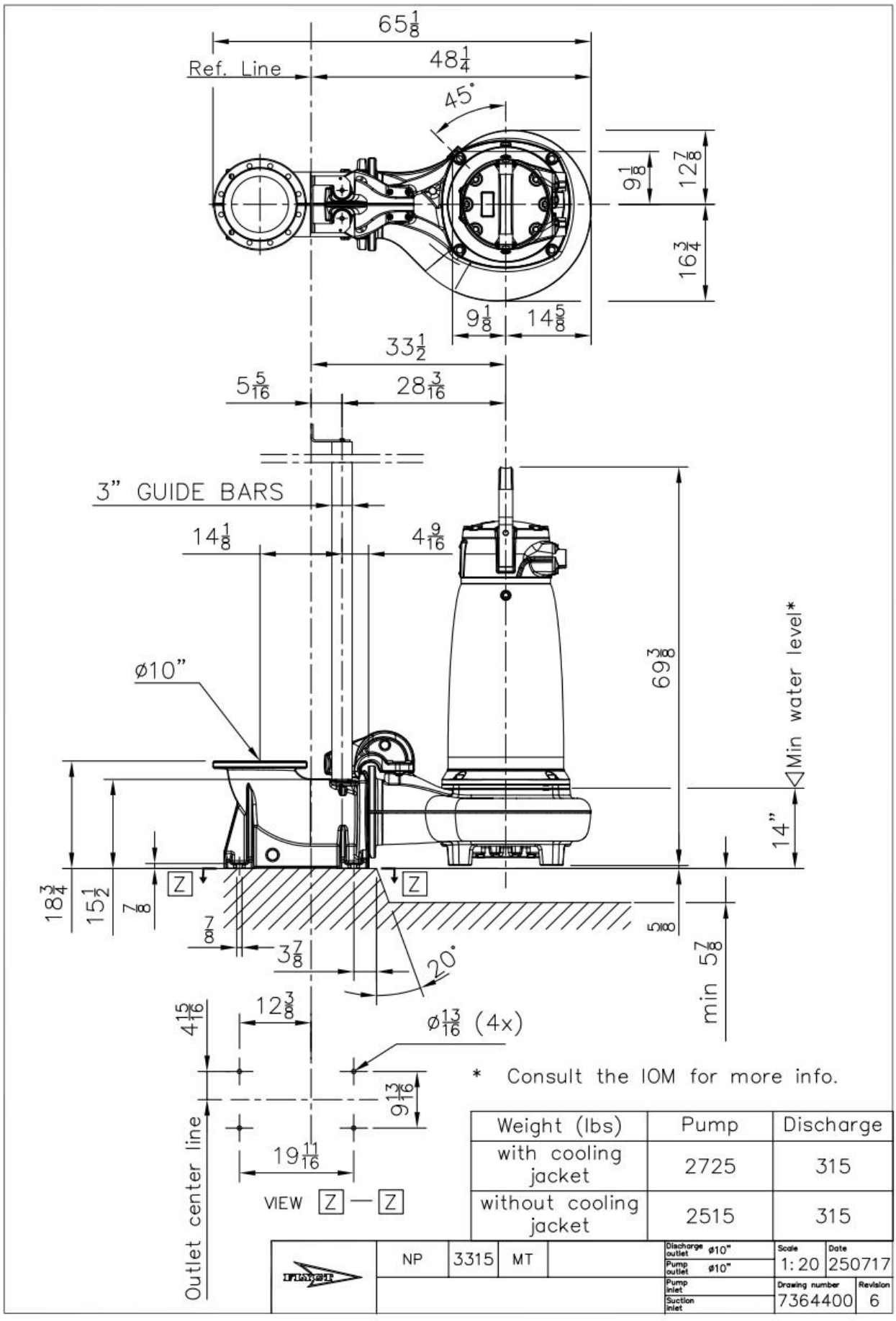
Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

Name	Speed	Q (1x) [USgpm]	H (1x) [ft]	P2 (1x) [Hp]	Q [USgpm]	H [ft]	P2 [Hp]	ηp [%]	SE [kWh/USgal]	NPSHr [ft]
DP @ 1x	40 Hz	2,051.71	40.69	25.83	2,051.71	40.69	25.83	81.75	0.0002	5.56
DP @ 1x	45 Hz	2,308.18	51.5	36.78	2,308.18	51.5	36.78	81.75	0.0002	7.03

Project:	Created By:	Created On:	Last Update:
NP 3315 MT 3~ 637	Vincent Bischoff	2/23/26	-

DP @ 1x	50 Hz	2,564.64	63.58	50.46	2,564.64	63.58	50.46	81.75	0.0003	8.68
DP @ 1x	55 Hz	2,821.11	76.93	67.16	2,821.11	76.93	67.16	81.75	0.0003	10.51
DP @ 1x	60 Hz	3,077.57	91.56	87.19	3,077.57	91.56	87.19	81.75	0.0004	12.5

NP 3315 MT 3~ 637 | Dimensional Data & Drawing



Weight (lbs)	Pump	Discharge
with cooling jacket	2725	315
without cooling jacket	2515	315

FLYGT	NP	3315	MT	Discharge outlet ø10" / Pump outlet ø10" / Pump inlet / Suction inlet	Scale 1:20 / Date 250717	Drawing number 7364400 / Revision 6

Appendix C

G575 Pump Selection Analysis Summary

G575 Lift Station Pump Selection Analysis
26-0044 G575

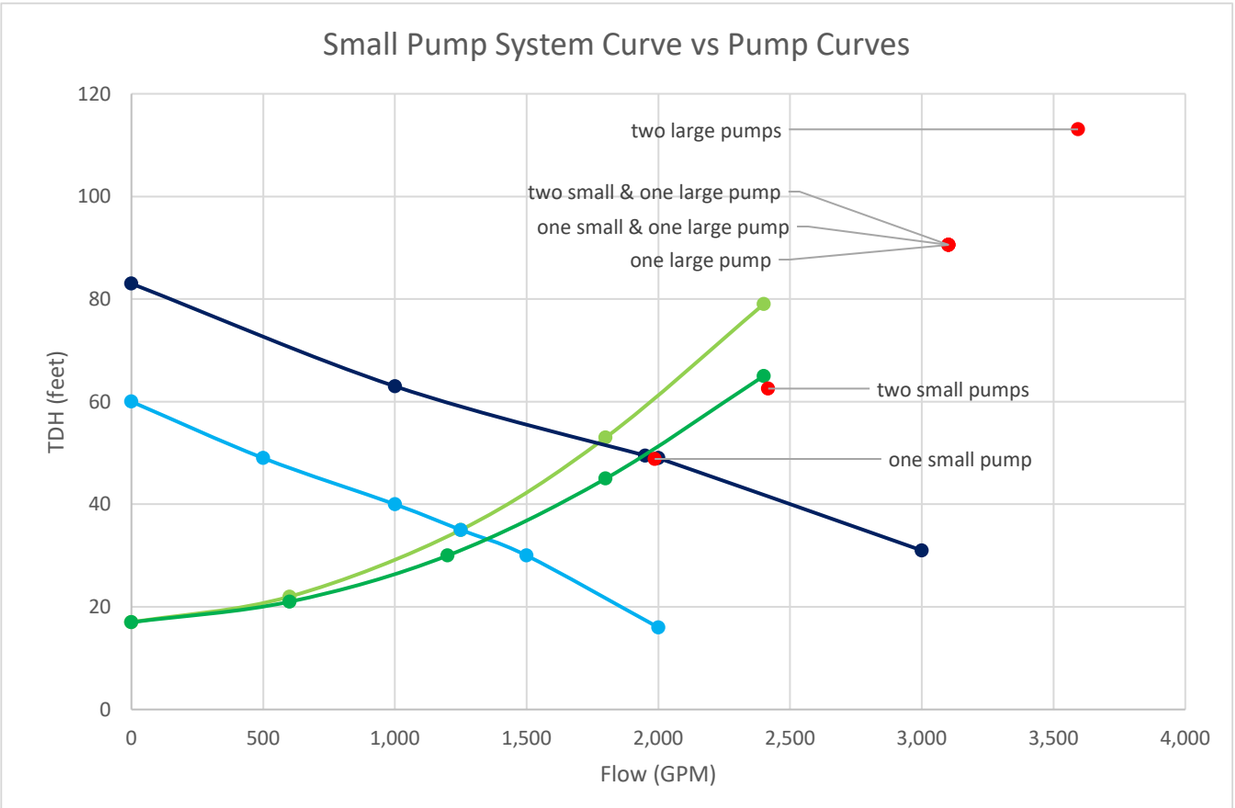
Small Pump System Curve (6" Piping)	
Flow (GPM)	TDH (feet)
0	17
600	22
1,250	35
1,800	53
2,400	79

Small Pump System Curve (10" Piping)	
Flow (GPM)	TDH (feet)
0	17
600	21
1,200	30
1,800	45
2,400	65

Existing Pump (Fairbanks Morse)	
6" 5433 MV 20 HP	
Flow (GPM)	TDH (feet)
0	60
500	49
1,000	40
1,250	**35**
1,500	30
2,000	16

Proposed Pump (Flygt)	
8" NP3202 MT 3 / 35HP / 1174 RPM	
Flow (GPM)	TDH (feet)
0	83
1,000	63
1,950	**50**
2,000	49
3,000	31

Percent Change in Flow	
Existing Pump Flow	1,250
Proposed Pump Flow	1,950
Percent Change	**56.00%**



Hydraulic Model Results with Proposed Pumps			
Flow (GPM)	TDH (feet)	Scenario	Notes
1,986	49	one small pump	
2,417	63	two small pumps	
3,102	91	one large pump	
3,102	91	two small & one large pump	small pumps unable to run, flow is for one large pump only
3,102	91	one small & one large pump	small pump unable to run, flow is for one large pump only
3,593	113	two large pumps	

G575 Lift Station Pump Selection Analysis
26-0044 G575

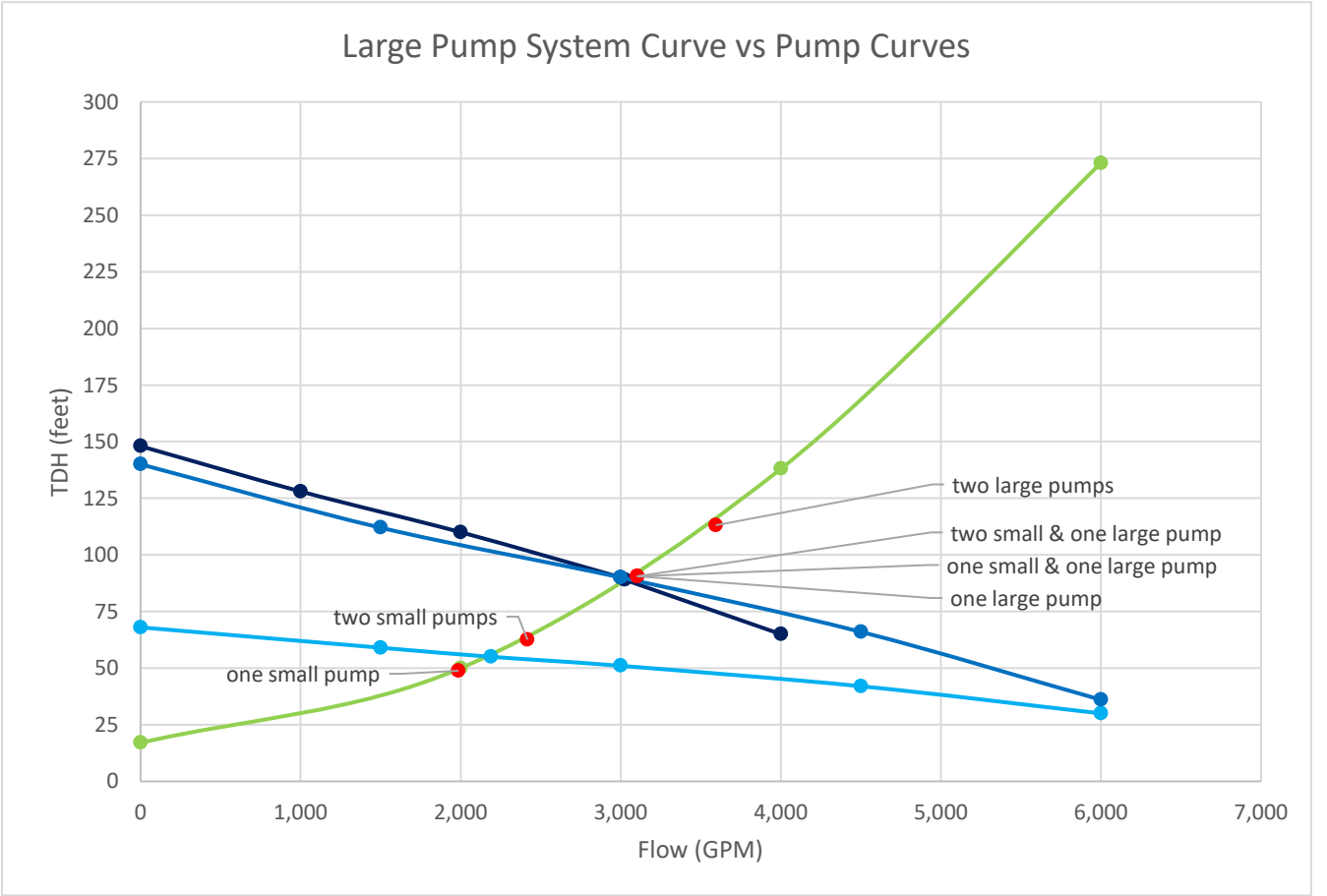
System Curve (Large)	
Flow (GPM)	TDH (feet)
0	17
2,000	50
4,000	138
6,000	273

Existing Pump (Fairbanks Morse)	
12" 5731 W/WD 75 HP	
Flow (GPM)	TDH (feet)
0	68
1,500	59
2,190	**55**
3,000	51
4,500	42
6,000	30

Proposed Pump (Flygt)	
10" NP3315 MT 3 / 110HP / 1185 RPM	
Flow (GPM)	TDH (feet)
0	140
1,500	112
3,000	90
4,500	66
6,000	36

Proposed Pump (Flygt)	
8" NP3231/675 3 / 110HP / 1185 RPM	
Flow (GPM)	TDH (feet)
0	148
1,000	128
2,000	110
3,000	90
3,025	**89**
4,000	65

Percent Change in Flow	
Existing Pump Flow	2,190
Proposed Pump Flow	3,025
Percent Change	**38.13%**



Hydraulic Model Results with Proposed Pumps			
Flow (GPM)	TDH (feet)	Scenario	Notes
1,986	49	one small pump	
2,417	63	two small pumps	
3,102	91	one large pump	
3,102	91	two small & one large pump	small pumps unable to run, flow is for one large pump only
3,102	91	one small & one large pump	small pump unable to run, flow is for one large pump only
3,593	113	two large pumps	

Appendix D

G575 Sewer System Design Calculations

Proposed Sewer System Piping Capacity and Design
Lift Station G575

Segment	Pipe Diameter	$Area_{Full}$	$Area_{Half}$	R_{full}	R_{half}	Slope	n	Q_{full}	Q_{full}	Q_{full}	V_{full}	Q_{half}	Q_{half}	Q_{half}	V_{half}	X	Y	S	Upstream MH	Upstream MH	Upstream MH	Downstream MH	Downstream MH	Downstream MH	NOTES
	(inches)	(sf)	(sf)					(cfs)	(MGD)	(GPM)	(fps)	(cfs)	(MGD)	(GPM)	(fps)				Invert	Rim	Height	Invert	Rim	Height	
New MH 6 (North Upstream of Existing MH 4) to New MH 4	18	1.77	0.88	0.38	0.38	0.0200	0.013	14.85	**9.596**	**6,664**	8.406	7.42	**4.798**	**3,332**	4.203	300	6	0.02	9.66	0	-9.66	3.66	13.24	9.58	Upstream elevation and length are assumptionss
New MH 5 (South Upstream of Existing MH 4) to New MH 4	24	3.14	1.57	0.50	0.50	0.0008	0.013	6.19	**4.002**	**2,779**	1.972	3.10	**2.001**	**1,390**	0.986	400	0.3	0.0008	3.43	15.18	11.75	3.13	13.24	10.11	
MH 4 to MH 1	30	4.91	2.45	0.63	0.63	0.0019	0.013	17.73	**11.460**	**7,958**	3.614	8.87	**5.730**	**3,979**	1.807	155	0.29	0.0019	3.45	13.24	9.79	3.16	14.29	11.13	
West Upstream of MH 1 to MH 1	8	0.35	0.17	0.17	0.17	0.0233	0.013	1.84	**1.190**	**827**	5.279	0.92	**0.595**	**413**	2.639	80	1.86	0.0233	5.02	14.53	9.51	3.16	14.29	11.13	
MH 1 to MH 2	30	4.91	2.45	0.63	0.63	0.0038	0.013	25.38	**16.404**	**11,392**	5.173	12.69	**8.202**	**5,696**	2.587	60	0.23	0.0038	3.16	14.29	11.13	2.93	13.7	10.77	
SW Upstream of MH 3 to MH 3	8	0.35	0.17	0.17	0.17	0.0250	0.013	1.91	**1.234**	**857**	5.474	0.95	**0.617**	**429**	2.737	200	5	0.025	14.7		-14.7	9.7	14.18	4.48	Upstream elevation and length are assumptionss
S Upstream of MH 3 to MH 3	8	0.35	0.17	0.17	0.17	0.0238	0.013	1.86	**1.204**	**836**	5.342	0.93	**0.602**	**418**	2.671	210	5	0.0238	14.7		-14.7	9.7	14.18	4.48	Upstream elevation and length are assumptionss
MH 3 to MH 2	8	0.35	0.17	0.17	0.17	0.1260	0.013	4.29	**2.771**	**1,924**	12.288	2.14	**1.385**	**962**	6.144	50	6.3	0.126	9.23	14.18	4.95	2.93	13.7	10.77	
FM Vault to Wetwell	12	0.79	0.39	0.25	0.25	0.0200	0.013	5.04	**3.255**	**2,260**	6.415	2.52	**1.627**	**1,130**	3.208	300	6	0.02	8.93		-8.93	2.93	13.7	10.77	Pipe size, upstream elevation and length are assumptionss

Chezy-Manning equation used to calculate Q_{full} and Q_{half}. Values then compared with Required Flow to determine capacity and flow velocities for selected pipe diameter.

Chezy-Manning formula: $$\frac{1.49 \times Area \times (r_H)^{2/3} \times (S)^{1/2}}{n}$$

Appendix E

G575 Structural Calculations

Stantec Consulting Services Inc.
801 Jones Franklin Road, Suite 300, Raleigh NC 27606-3394

Pump Station G575
RTA SET – Structural Calculations

July 23 , 2026

The following calculations are included in this submittal package:

1. Design Load Summary
    a. Load and Code Summary
    b. ASCE Design Hazards Report Risk Category III
    c. Component and Cladding Wind Load Monoslope Roof

2. Existing Roof Framing Analysis
    a. Existing Monorail Support Plan
    b. Existing Beam ID Plan Locations
    c. Existing Monorail Support Beam
    d. Existing Monorail Support Column (In Plane Loading)
    e. Existing Monorail Support Column (Out of Plane Loading)
    f. Existing Monorail Support Pier Foundation
    g. Existing Monorail Support Pier
    h. Existing Roof Beam (Ref.B1)
    i. Existing Roof Beam (Ref.B2)
    j. Existing Roof Beam (Ref.B3)
    k. Existing Roof Beam Check (Ref.B1) with New Load Path
    l. Existing Roof Beam Check (Ref.B2) with New Load Path
    m. Existing Roof Column

3. New Framing Analysis
    a. New Beam ID Plan Locations
    b. New Biaxial Rail Support Beam B1
    c. New Biaxial Rail Support Beam B2 (Bending Check – 17’ Span)
    d. New Biaxial Rail Support Beam B2 (Shear Check – 17’ Span)
    e. New Biaxial Rail Support Beam B2 (Torsion Check – 17’ Span)
    f. New Biaxial Rail Support Beam B3 (Bending Check – 17’ Span)
    g. New Biaxial Rail Support Beam B3 (Shear Check – 17’ Span)
    h. New Biaxial Rail Support Beam B3 (Torsion Check – 17’ Span)
    i. New Crane Beam Section
    j. New Biaxial Rail Crane Beam B4 (Moment Check)
    k. New Biaxial Rail Crane Beam B4 (Shear Check)
    l. New Biaxial Rail Support Column (In Plane Loading)
    m. New Biaxial Rail Support Column (Out of Plane Loading)
    n. New Biaxial Rail Support Pier Foundation
    o. New Biaxial Rail Support Pier
    p. New Baseplate Design

THIS CALCULATION PACKAGE CONTAINS 108 PAGE DOCUMENT.

Load and Code Summary

Codes References

- UFC 1-200-01 DOD BUILDING CODE, DECEMBER 17, 2024
- UFC 3-301-01 STRUCTURAL ENGINEERING, JUNE 3, 2025
- UFC 4-010-01 DOD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS, MAY 24, 2024
- 2024 INTERNATIONAL BUILDING CODE, 2024 IBC
- ACI 350-20 CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES
- ASCE/SEI 7-22 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES
- ACI 301-20 SPECIFICATIONS FOR STRUCTURAL CONCRETE
- ACI 318-19 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
- AISI S100-16 (2020) w/S2-20 THE NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD FORMED STEEL STRUCTURAL MEMBERS
- ANSI/AISC 360-22 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS
- AWS D1.1 STRUCTURAL WELDING CODE - STEEL
- AWS D1.3 STRUCTURAL WELDING CODE - SHEET STEEL
- TMS 402/602-22 BUILDING CODE REQUIREMENTS AND SPECIFICATION FOR MASONRY STRUCTURES

Material Strengths and Assumptions

- Existing Structure Material Strength Assumptions
    - Concrete Strength f'c
        - f'c = 4,000 psi for liquid bearing concrete tank walls and slab
        - f'c = 4,000 psi for all concrete not otherwise specified
        - f'c = 3,000 psi for footings
        -
    - Reinforcing Bars
        - fy = 60,000 psi for ASTM A 615 Grade 60, deformed

- New Construction Material Strengths
    - Weight of concrete = 150 pcf
    - f'c = 4,000 psi for all concrete not otherwise specified
    - fy = 60,000 psi (reinforcement)

Dead Load

- Roof Collateral Dead Load = 66.0 psf

Live Load

- Roof = 20 psf
- Ground Floor = 100 psf
- Stairs = 100 psf
- Mechanical/Electrical Rooms = 125 psf

Snow Load

- Ground Snow Load = 35 psf
- Snow Exposure Factor = 0.9
- Thermal Factor = 1.0

Wind Load

- Wind Speed (Ultimate) = 148 mph
- Wind Speed (10 YEAR MRI) = 80 mph
- Risk Category = III
- Exposure Category = C
- Internal Pressure Coefficient (Open) = $\pm$ 0.00

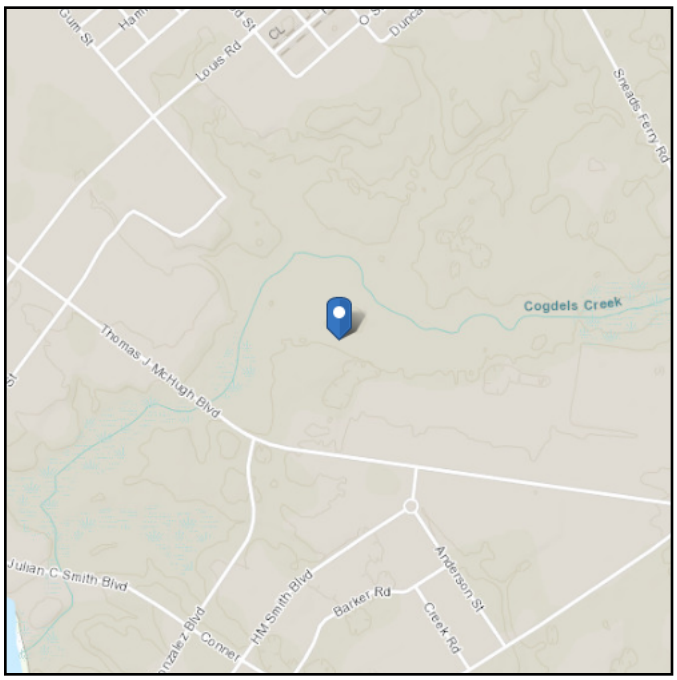
Seismic Load

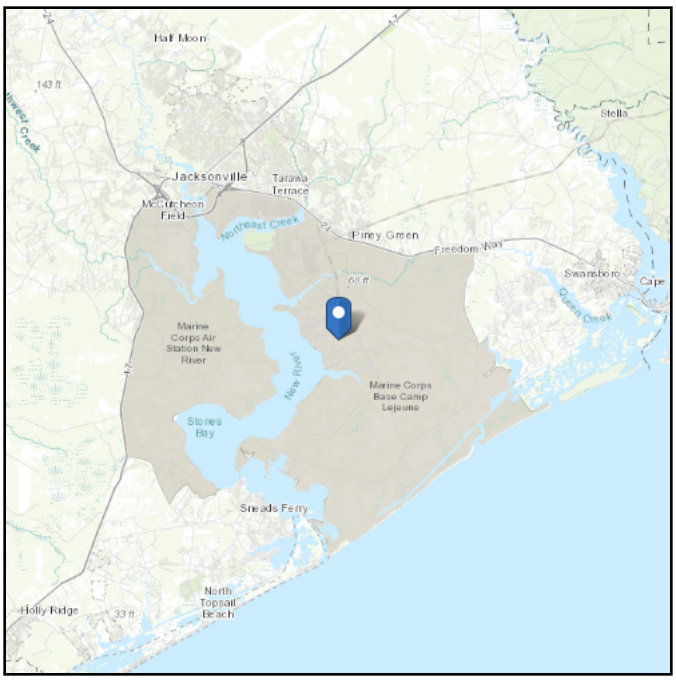
- Risk Category = III
- Importance Factor = 1.25
- S_s = 0.170
- S_1 = 0.059
- S_{DS} = 0.140
- S_{D1} = 0.083
- Seismic Design Category = B

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-22	**Latitude:**	34.657175
Risk Category:	III	**Longitude:**	-77.329687
Soil Class:	D - Stiff Soil	**Elevation:**	9.26218506673112 ft (NAVD 88)





Wind

Results:

Wind Speed	148 Vmph
10-year MRI	80 Vmph
25-year MRI	96 Vmph
50-year MRI	108 Vmph
100-year MRI	118 Vmph
300-year MRI	130 Vmph
700-year MRI	139 Vmph
1,700-year MRI	148 Vmph
3,000-year MRI	153 Vmph
10,000-year MRI	164 Vmph
100,000-year MRI	179 Vmph
1,000,000-year MRI	196 Vmph

Data Source: ASCE/SEI 7-22, Fig. 26.5-1C and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Wed Mar 04 2026

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-22 Standard. Wind speeds correspond to approximately a 3% probability of exceedance in 50 years (annual exceedance probability = 0.000588, MRI = 1,700 years). Values for 10-year MRI, 25-year MRI, 50-year MRI and 100-year MRI are Service Level wind speeds, all other wind speeds are Ultimate wind speeds.

Site is in a hurricane-prone region as defined in ASCE/SEI 7-22 Section 26.2. Glazed openings shall be protected against wind-borne debris as specified in Section 26.12.3.

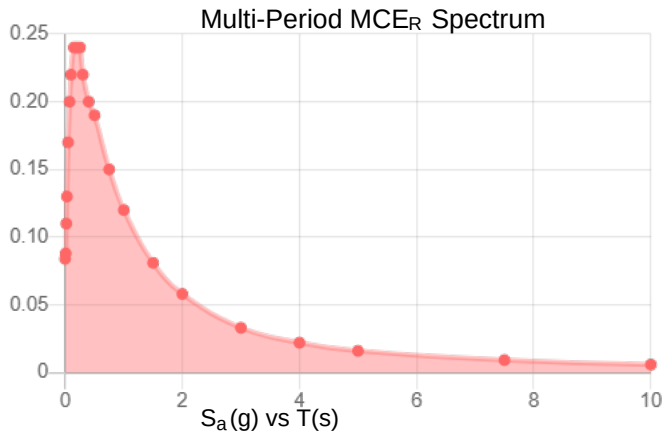
Seismic

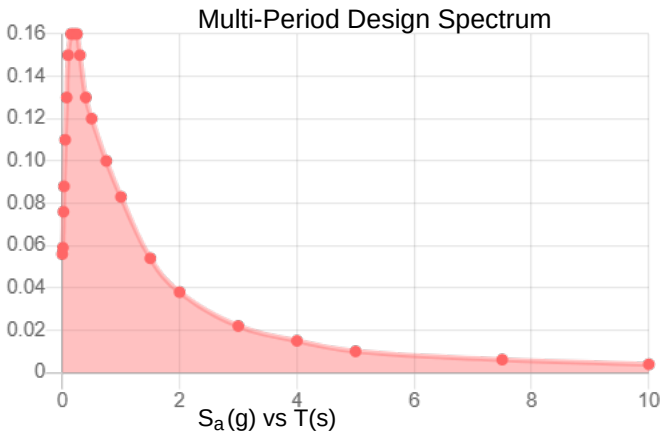
Site Soil Class: D - Stiff Soil

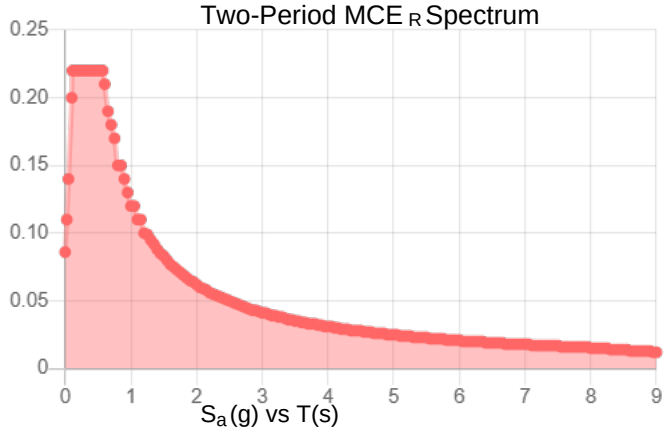
Results:

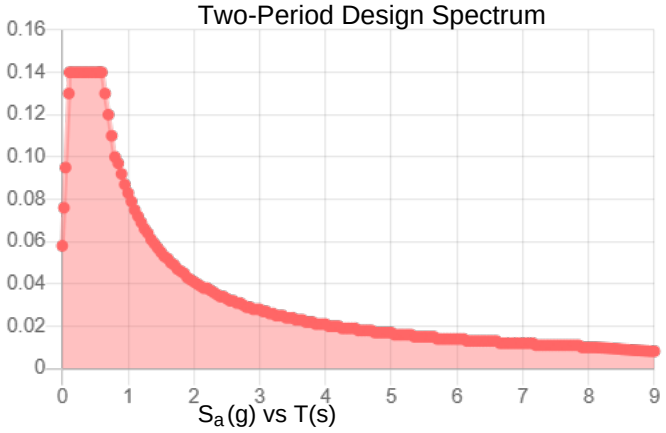
PGA_M :	0.079	T_L :	8
S_{MS} :	0.22	S_S :	0.17
S_{M1} :	0.12	S_1 :	0.059
S_{DS} :	0.14	V_{S30} :	260
S_{D1} :	0.083		

Seismic Design Category: B









MCER Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: **Wed Mar 04 2026**

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

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STRUCTURAL CALCULATIONS

FOR

MBF - Camp Lejeune Lift Stations

Code Search

Code: ASCE 7 - 22

Occupancy:

Occupancy Group = U Utility & Miscellaneous

Risk Category & Importance Factors:

Risk Category =	III
Wind Factor =	1.00
Snow Factor =	1.00
Seismic Importance factor =	1.25

Type of Construction:

Fire Rating:

Roof =	0.0 hr
Floor =	0.0 hr

Building Geometry:

Roof angle (θ)	0.13 / 12	0.6 deg
Building length	42.0 ft	
Least width	26.0 ft	
Mean Roof Ht (h)	28.0 ft	
Parapet ht above grd	0.0 ft	
Minimum parapet ht	0.0 ft	
hb for Elevated bldg	0.0 ft	

Live Loads:

Roof 0 to 200 sf: 20 psf
200 to 600 sf: 24 - 0.02Area, but not less than 12 psf
over 600 sf: 12 psf

Roofs used for roof gardens	100 psf

Floor:

Typical Floor	50 psf
Partitions	15 psf
Corridors above first floor	80 psf
Lobbies & first floor corridors	100 psf
Stairs and exit ways	100 psf

NAVFAC
Camp Lejeune
North Carolina
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JOB TITLE	MBF - Camp Lejeune Lift Stations		
	G575		
JOB NO.	175578902	**SHEET NO.**	
CALCULATED BY	TJF	**DATE**	6/16/26
CHECKED BY	AA	**DATE**	6/16/26

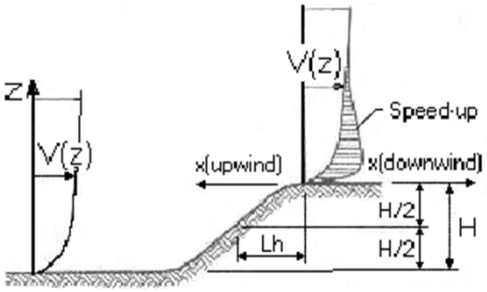
Wind Loads : ASCE 7- 22

Ultimate Wind Speed	148 mph
Nominal Wind Speed	114.6 mph
Risk Category	III
Exposure Category	C
Enclosure Classif.	Open Building
Internal pressure	+/-0.00
Bldg Directionality (Kd)	0.85
Kh MWFRS<=60	0.967
Kh all other	0.967
Type of roof	Monoslope

Topographic Factor (Kzt)

Topography		Flat
Hill Height	(H)	0.0 ft
Half Hill Length	(Lh)	0.0 ft
Actual H/Lh	=	0.00
Use H/Lh	=	0.00
Modified Lh	=	0.0 ft
From top of crest: x =		0.0 ft
Bldg up/down wind?		downwind

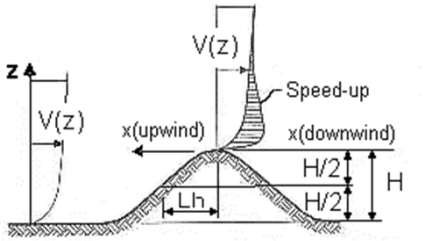
H< 15ft;exp C
∴ Kzt=1.0



ESCARPMENT

H/Lh= 0.00 K_1 = 0.000
x/Lh = 0.00 K_2 = 0.000
z/Lh = 0.00 K_3 = 1.000

At Mean Roof Ht:
$Kzt = (1+K_1K_2K_3)^2$ = 1.00



2D RIDGE or 3D AXISYMMETRICAL HILL

Gust Effect Factor

h =	28.0 ft
B =	26.0 ft
/z (0.6h) =	16.8 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).
If building h/B>4 then may be flexible and should be investigated.
h/B = 1.08

G = 0.85 Using rigid structure default

Rigid Structure

$\bar{e}$ =	0.20
ℓ =	500 ft
z_{min} =	15 ft
c =	0.20
g_Q, g_v =	3.4
L_z =	436.8 ft
Q =	0.92
I_z =	0.22
G =	**0.89** use G = 0.85

Flexible or Dynamically Sensitive Structure

Natural Frequency (η_1) =	0.7 Hz				
Damping ratio (β) =	0.01				
/b =	0.660				
/α =	0.156				
Vz =	128.9				
N_1 =	2.37				
R_n =	0.081				
R_h =	0.660	η =	0.699	h =	28.0 ft
R_B =	0.678	η =	0.649		
R_L =	0.244	η =	3.512		
g_R =	4.104				
R =	1.524				
Gf =	1.478				

Ground Elevation Factor (Ke)

Grd level above sea level = 0 ft
Constant = 0.00256
0.00256Ke = 0.00256

Ke = 1.0000

Enclosure Classification

Test for Enclosed Building: Ao < 0.01Ag or 4 sf, whichever is smaller

Test for Open Building: All walls are at least 80% open.
Ao ≥ 0.8Ag

Test for Partially Enclosed Building: Predominately open on one side only

	Input			Test	
Ao	500.0	sf	Ao ≥ 1.1Aoi	NO	
Ag	600.0	sf	Ao > 4sf or 0.01Ag	YES	
Aoi	1000.0	sf	Aoi / Agi ≤ 0.20	YES	Building is NOT Partially Enclosed
Agi	10000.0	sf			

Conditions to qualify as Partially Enclosed Building. Must satisfy all of the following:
Ao ≥ 1.1Aoi
Ao > smaller of 4sf or 0.01 Ag
Aoi / Agi ≤ 0.20
Where:
Ao = the total area of openings in a wall that receives positive external pressure.
Ag = the gross area of that wall in which Ao is identified.
Aoi = the sum of the areas of openings in the building envelope (walls and roof) not including Ao.
Agi = the sum of the gross surface areas of the building envelope (walls and roof) not including Ag.

Test for Partially Open Building: A building that does not qualify as open, enclosed or partially enclosed.
(This type building will have same wind pressures as an enclosed building.)

Reduction Factor for large volume partially enclosed buildings (Ri) :

If the partially enclosed building contains a single room that is unpartitioned , the internal pressure coefficient may be multiplied by the reduction factor Ri.

Total area of all wall & roof openings (Aog): SF
Unpartitioned internal volume (Vi) : CF

Ri = 1.00

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Camp Lejeune
North Carolina
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JOB TITLE MBF - Camp Lejeune Lift Stations
G575
JOB NO. 175578902 SHEET NO.
CALCULATED BY TJF DATE 6/16/26
CHECKED BY AA DATE 6/16/26

Ultimate Wind Pressures

Wind Loads - Components & Cladding : h ≤ 60'

Open Building - procedure doesn't apply

Base pressure (qh) =	54.2 psf	Kh =	0.967		~~100.0 ft~~	~~30.0 ft~~
(Kd qh) =	**46.1 psf**	h =	28.0 ft	0.2h = 5.6 ft	~~100.0 ft~~	
Minimum parapet ht =	0.0 ft	0.6h =	16.8 ft		~~100.0 ft~~	
Roof Angle (θ) =	0.6 deg	GCpi =	+/-0.00			
Type of roof =	Monoslope	Kd qi = Kd qh =	46.1 psf			

Roof

	GCp				Surface Pressure (psf)				User input	
Area	10 sf	100 sf	500 sf	1000 sf	10 sf	100 sf	500 sf	1000 sf	50 sf	200 sf
Negative Zone 1	-1.70	-1.29	-1.00	-1.00	-78.3	-59.4	-46.1	-46.1	-65.1	-53.6
Negative Zone 1'	-0.90	-0.90	-0.55	-0.40	-41.5	-41.5	-25.4	-18.4	-41.5	-34.5
Negative Zone 2	-2.30	-1.77	-1.40	-1.40	-106.0	-81.6	-64.5	-64.5	-88.9	-74.2
Negative Zone 3	-3.20	-2.14	-1.40	-1.40	-147.5	-98.6	-64.5	-64.5	-113.3	-83.9
Positive All Zones	0.30	0.20	0.20	0.20	16.0	16.0	16.0	16.0	16.0	16.0
Overhang Zone 1&1'	-1.70	-1.60	-1.00	-1.00	-78.3	-73.7	-46.1	-46.1	-75.1	-61.8
Overhang Zone 2	-2.30	-1.59	-1.10	-1.10	-106.0	-73.4	-50.7	-50.7	-83.2	-63.6
Overhang Zone 3	-3.20	-1.96	-1.10	-1.10	-147.5	-90.5	-50.7	-50.7	-107.6	-73.4

Overhang pressures in the table above assume an internal pressure coefficient (Gcpi) of 0.0
Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 0 psf)

Parapet

Kd qp = 0.0 psf

		Surface Pressure (psf)						User input
Solid Parapet Pressure		10 sf	20 sf	50 sf	100 sf	200 sf	500 sf	50 sf
CASE A:	Zone 2 :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Zone 3 :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CASE B:	Interior zone :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Corner zone :	0.0	0.0	0.0	0.0	0.0	0.0	0.0

wall a = 3.0 ft

Walls

	GCp				Surface Pressure at h				User input	
Area	20 sf	100 sf	200 sf	500 sf	20 sf	100 sf	200 sf	500 sf	100 sf	200 sf
Negative Zone 4	-0.90	-0.80	-0.76	-0.70	-41.5	-36.9	-34.9	-32.3	-36.9	-34.9
Negative Zone 5	-1.80	-1.40	-1.23	-1.00	-82.9	-64.5	-56.6	-46.1	-64.5	-56.6
Positive Zone 4 & 5	0.90	0.75	0.69	0.60	41.5	34.6	31.6	27.6	34.6	31.6

NOTE: Negative zones 4 & 5 pressures apply to all heights. Positive pressures vary with height, see below.

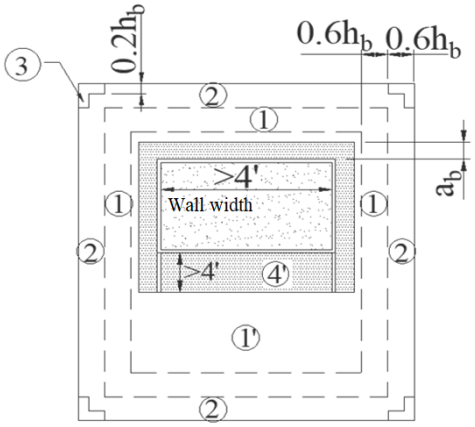
Wall surface pressure at 'z'				Positive zone 4 & 5 (psf)				User input	
z	Kz	Kzt	qz (psf)	20	100	200	500	100 sf	200 sf
0 to 15'	0.85	1.00	40.6	36.5	30.4	27.8	24.3	30.4	27.8
20.0 ft	0.90	1.00	43.0	38.7	32.3	29.5	25.8	32.3	29.5
25.0 ft	0.94	1.00	45.0	40.5	33.8	30.9	27.0	33.8	30.9
h = 28.0 ft	0.97	1.00	46.1	41.5	34.6	31.6	27.6	34.6	31.6
ridge = 28.1 ft	0.97	1.00	46.1	41.5	34.6	31.6	27.7	34.6	31.6

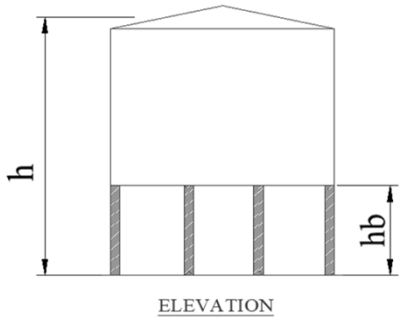
Bottom Horizontal Surface of Elevated Buildings

Base pressure (qh) =	0.97	h =	28.0 ft	a =	16.80
(Kd qh) =	**40.6 psf**	hb =	0.0 ft	2a =	33.60
	5.0 ft	z =	7.0 ft		

	GCp				Surface Pressure (psf)				User input	
Area	10 sf	20 sf	100 sf	500 sf	10 sf	20 sf	100 sf	500 sf	50 sf	200 sf
Negative Zone 1	-1.40	-1.31	-1.11	-0.90	-56.8	-53.2	-44.9	-36.5	-48.5	-41.3
Negative Zone 2	-2.30	-2.18	-1.89	-1.60	-93.3	-88.3	-76.6	-64.9	-81.6	-71.6
Negative Zone 3	-3.20	-3.04	-2.67	-2.30	-129.8	-123.4	-108.3	-93.3	-114.8	-101.9
Positive Zones 1-3	-	-	-	-	16.0	16.0	16.0	16.0	16.0	16.0
Negative Zone 4'	-0.90	-0.90	-0.80	-0.70	-36.5	-36.5	-32.5	-28.4	-34.2	-30.7
Positive Zone 4'	0.90	0.90	0.75	0.60	36.5	36.5	30.4	24.3	33.0	27.8

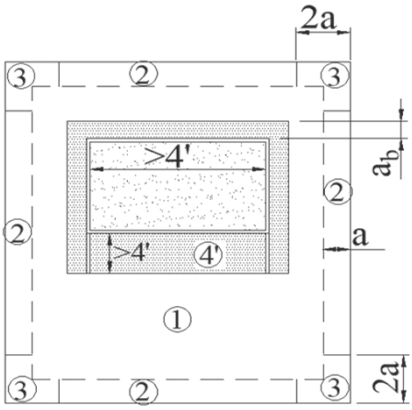
Negative pressures are downward

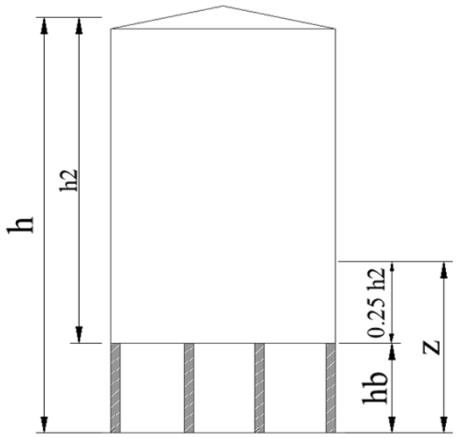




ELEVATION

Building Bottom Plan: h ≤ 60' and alternate design 60'<h<90'

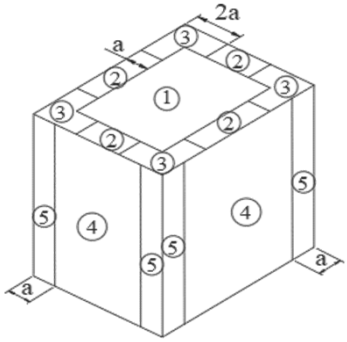




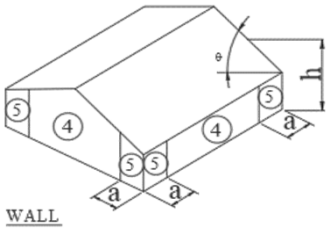
ELEVATION

Building Bottom Plan: h> 60 feet

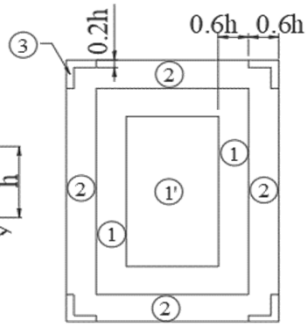
Location of C&C Wind Pressure Zones - ASCE 7-22



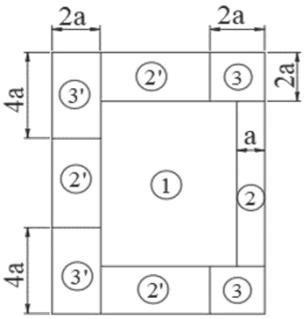
Roofs w/ θ ≤ 10°
and all walls
h > 60'



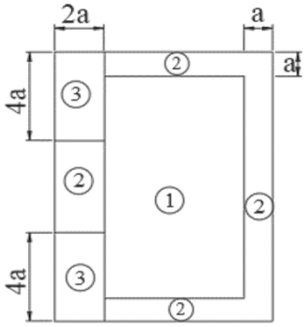
Walls h ≤ 60'
& alt design h<90'



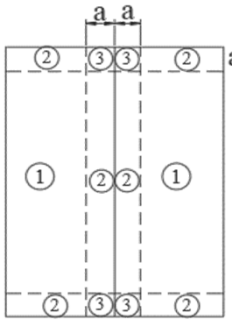
Multispan Gable & Sawtooth ≤ 10°
& Gable θ ≤ 7 degrees &
Monoslope ≤ 3 degrees
h ≤ 60' & alt design h<90'



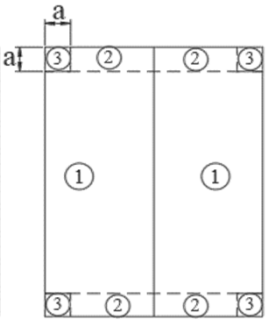
Monoslope roofs
3° < θ ≤ 10°
h ≤ 60' & alt design h<90'



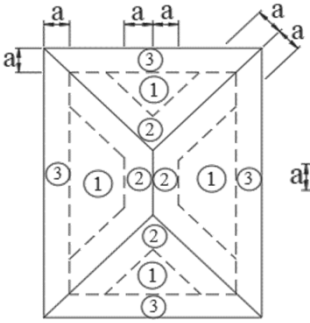
Monoslope roofs
10° < θ ≤ 30°
h ≤ 60' & alt design h<90'



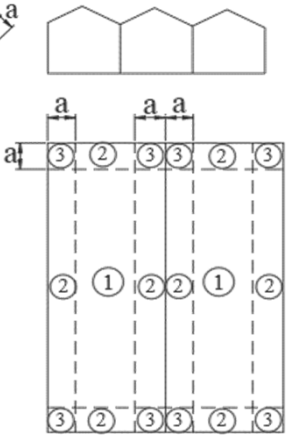
Gable 7° < θ ≤ 27°



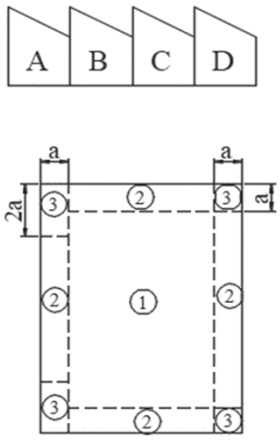
Gable 27° < θ ≤ 45°



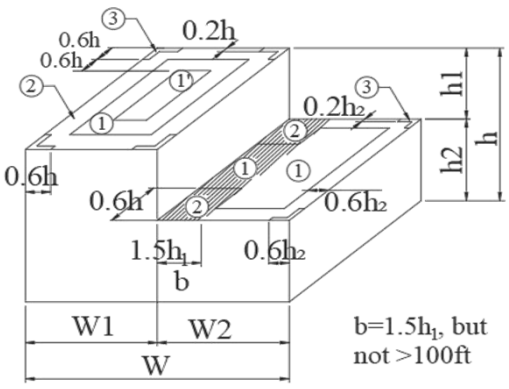
Hip 7° < θ ≤ 45°

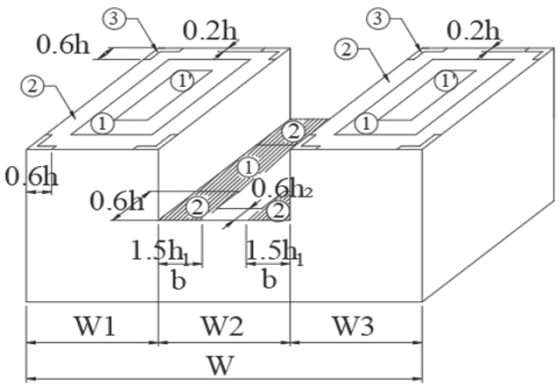


Multispan gable 10° < θ ≤ 45°
h ≤ 60' & alt design h<90'



Sawtooth 10° < θ ≤ 45°
h ≤ 60' & alt design h<90'

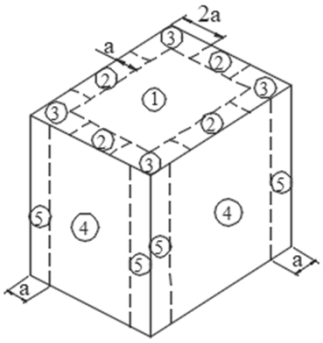




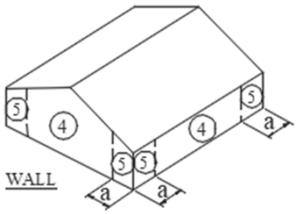
Stepped roofs θ ≤ 3°
h ≤ 60' & alt design h<90'

Note: The hatched area indicates where roof positive pressures are equal to the adjacent wall positive pressure.

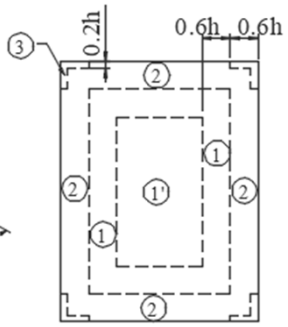
Location of C&C Wind Pressure Zones - ASCE 7-16

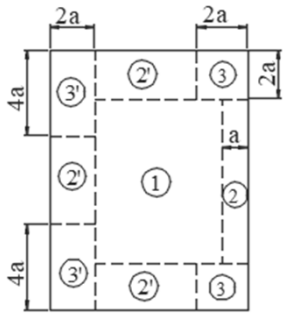


Roofs w/ θ ≤ 10°
and all walls
h > 60'



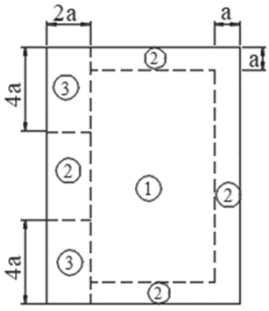
Walls h ≤ 60'
& alt design h<90'



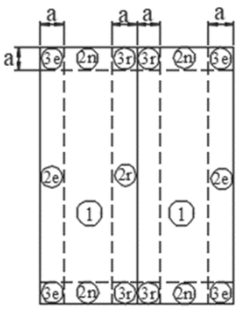


Multispan Gable & Sawtooth ≤ 10°
and Gable θ ≤ 7 degrees &
Monoslope ≤ 3 degrees
h ≤ 60' & alt design h<90'

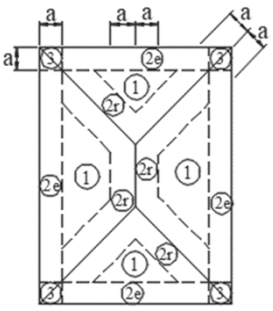
Monoslope roofs
3° < θ ≤ 10°
h ≤ 60' & alt design h<90'



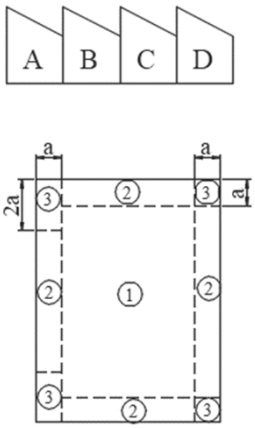
Monoslope roofs
10° < θ ≤ 30°
h ≤ 60' & alt design h<90'



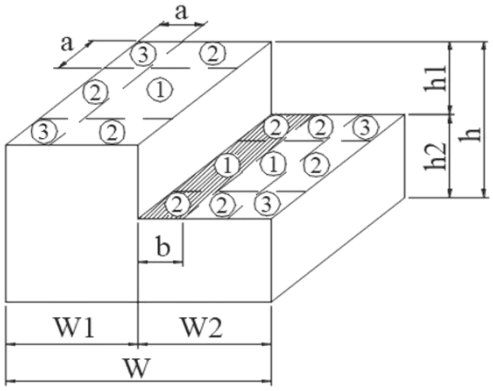
Multispan Gable > 10°
& Gable 7° < θ ≤ 45°



Hip 7° < θ ≤ 27°

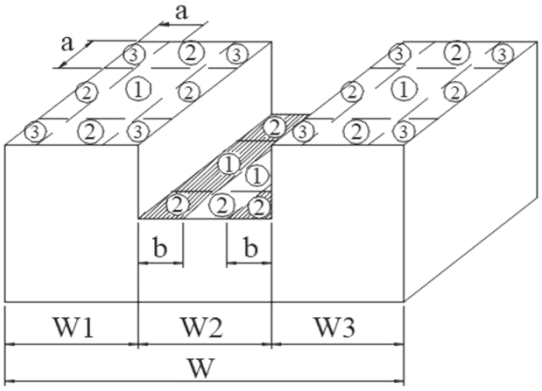


Sawtooth 10° < θ ≤ 45°
h ≤ 60' & alt design h<90'



Note: The hatched area indicates where roof positive pressures are equal to the adjacent wall positive pressure.

Stepped roofs θ ≤ 3°
h ≤ 60' & alt design h<90'

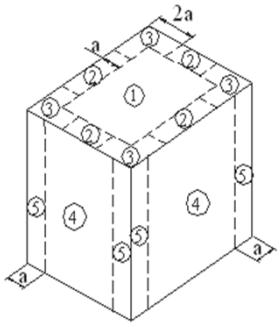


Note: The stepped roof zones above are as shown in ASCE 7-16 . Prior editions didn't show zones, but the notes sent you to the low slope gable figure. The note in ASCE 7-16 still sends you to the low slope gable figure, but for some reason the zones shown are per editions prior to ASCE 7-16. Therefore, the above zones may be a code mistake and the correct zone locations may be per the low slope gable roof shown at the top of this page.

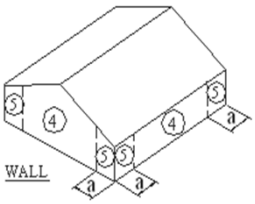
NAVFAC
Camp Lejeune
North Carolina
--

JOB TITLE	MBF - Camp Lejeune Lift Stations		
	G575		
JOB NO.	175578902	**SHEET NO.**	
CALCULATED BY	TJF	**DATE**	6/16/26
CHECKED BY	AA	**DATE**	6/16/26

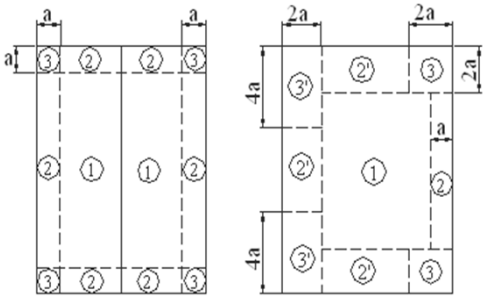
Location of C&C Wind Pressure Zones - ASCE 7-10 & earlier



Roofs w/ θ ≤ 10°
and all walls
h > 60'

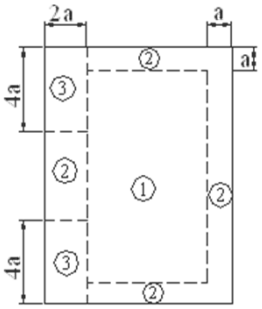


Walls h ≤ 60'
& alt design h<90'

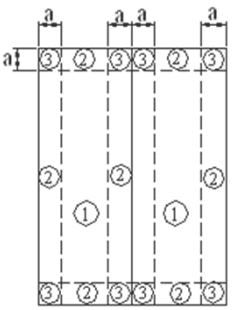


Gable & Sawtooth ≤ 10 degrees
& Gable θ ≤ 7 degrees &
Monoslope ≤ 3 degrees
h ≤ 60' & alt design h<90'

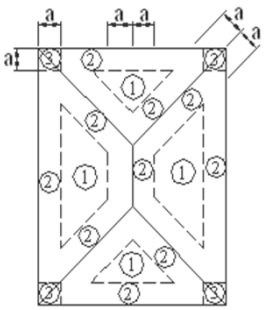
Monoslope roofs
3° < θ ≤ 10°
h ≤ 60' & alt design h<90'



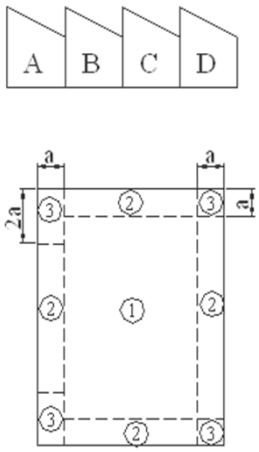
Monoslope roofs
10° < θ ≤ 30°
h ≤ 60' & alt design h<90'



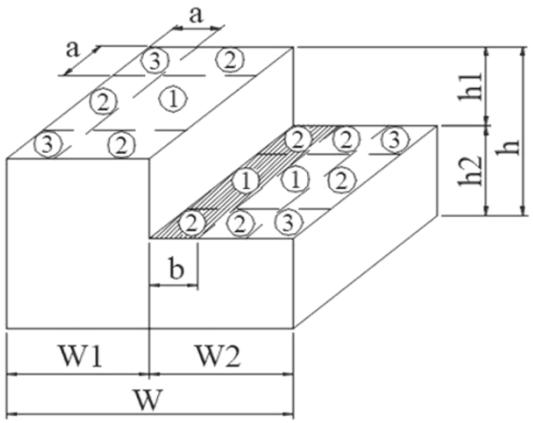
Multispan Gable > 10°
& Gable 7° < θ ≤ 45°

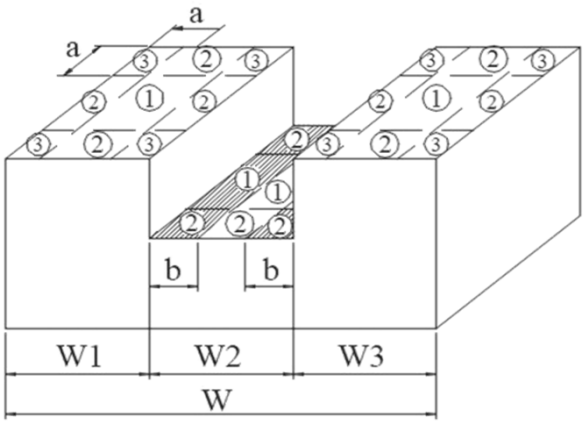


Hip 7° < θ ≤ 27°



Sawtooth 10° < θ ≤ 45°
h ≤ 60' & alt design h<90'





Stepped roofs θ ≤ 3°
h ≤ 60' & alt design h<90'

Note: The hatched area indicates where roof positive pressures are equal to the adjacent wall positive pressure.

NAVFAC
Camp Lejeune
North Carolina
--

JOB TITLE MBF - Camp Lejeune Lift Stations
G575
JOB NO. 175578902 SHEET NO.
CALCULATED BY TJF DATE 6/16/26
CHECKED BY AA DATE 6/16/26

Wind Loads - Open Buildings

Ultimate Wind Pressures

Type of roof = Monoslope Free Roofs
Wind Flow = Clear

G = 0.85
Roof Angle = 0.6 deg

NOTE: The code requires the MWFRS be designed for a minimum pressure of 16 psf.

Main Wind Force Resisting System

Kz = Kh = 0.967

Base pressure (qh) = 54.2 psf
(Kd qh) = **46.1 psf**

Roof pressures - Wind Normal to Ridge

Procedure not allowed h/L is greater than 1.0

Wind Flow	Load Case		Wind Direction γ = 0 & 180 deg	
			Cnw	Cnl
Clear Wind Flow	A	Cn =	1.20	0.30
		p =	47.0 psf	11.8 psf
	B	Cn =	-1.10	-0.10
		p =	-43.1 psf	-3.9 psf

NOTE: 1). Cnw and Cnl denote combined pressures from top and bottom roof surfaces.
2). Cnw is pressure on windward half of roof. Cnl is pressure on leeward half of roof.
3). Positive pressures act toward the roof. Negative pressures act away from the roof.

Roof pressures - Wind Parallel to Ridge, γ = 90 deg

Wind Flow	Load Case		Horizontal Distance from Windward Edge		
			≤ h	>h ≤ 2h	> 2h
Clear Wind Flow	A	Cn =	-0.80	-0.60	-0.30
		p =	-31.3 psf	-23.5 psf	-11.8 psf
	B	Cn =	0.80	0.50	0.30
		p =	31.3 psf	19.6 psf	11.8 psf

h = 28.0 ft
2h = 56.0 ft

Fascia Panels -Horizontal pressures

qp = 46.1 psf

Windward fascia: 69.1 psf (GCpn = +1.5)
Leeward fascia: -46.1 psf (GCpn = -1.0)

Components & Cladding - roof pressures

Procedure not allowed h/L is greater than 1.0

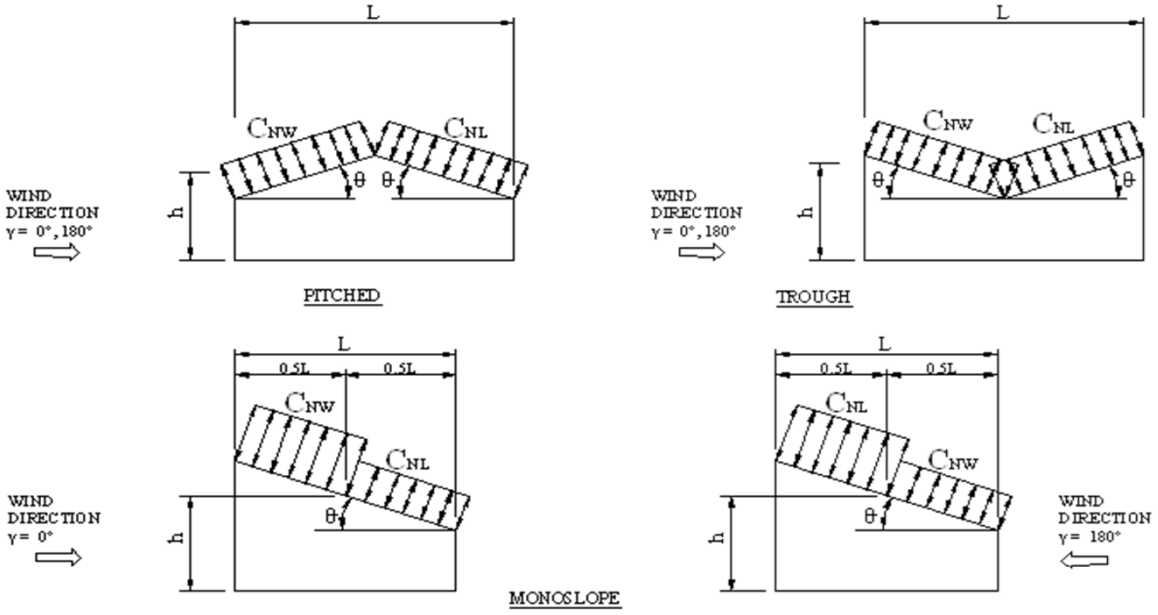
Kz = Kh = 0.97
Base pressure (qh) = **46.1 psf**
G = 0.85

a = 3.0 ft

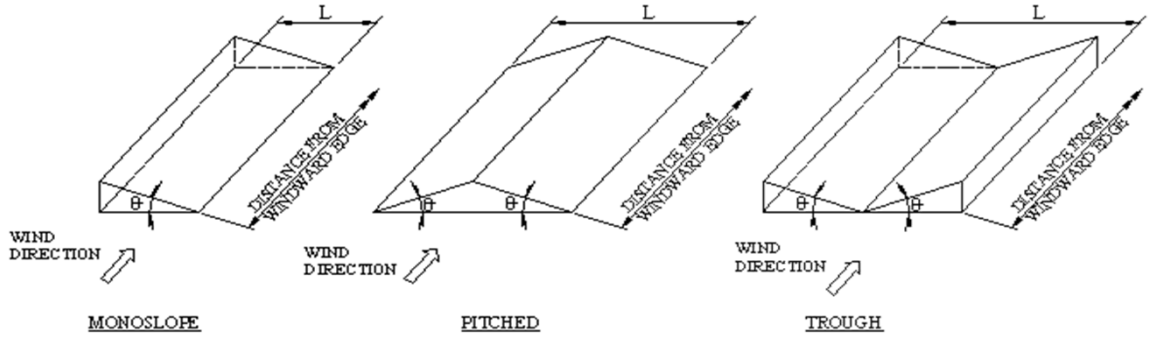
a^2 = 9.0 sf
$4a^2$ = 36.0 sf

	Effective Wind Area	Clear Wind Flow					
		zone 3		zone 2		zone 1	
		positive	negative	positive	negative	positive	negative
C_N	≤ 9 sf	2.46	-3.37	1.85	-1.73	1.23	-1.12
	>9, ≤ 36 sf	1.85	-1.73	1.85	-1.73	1.23	-1.12
	> 36 sf	1.23	-1.12	1.23	-1.12	1.23	-1.12
Wind pressure	≤ 9 sf	96.5 psf	-132.1 psf	72.4 psf	-67.8 psf	48.2 psf	-44.0 psf
	>9, ≤ 36 sf	72.4 psf	-67.8 psf	72.4 psf	-67.8 psf	48.2 psf	-44.0 psf
	> 36 sf	48.2 psf	-44.0 psf	48.2 psf	-44.0 psf	48.2 psf	-44.0 psf

Location of Open Building Wind Pressure Zones

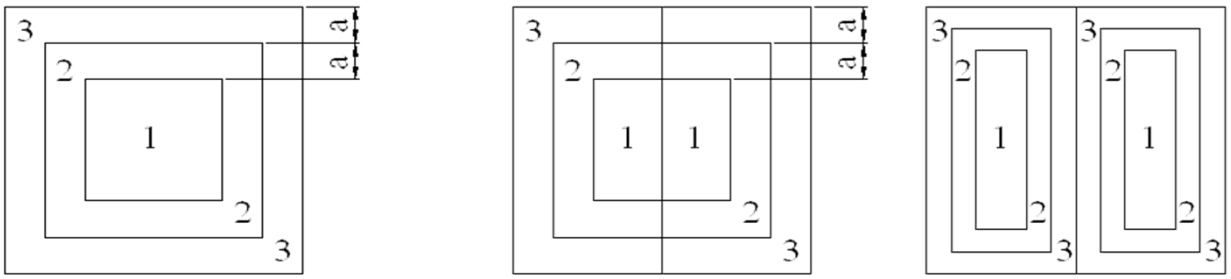


WIND DIRECTION $\gamma = 0°, 180°$

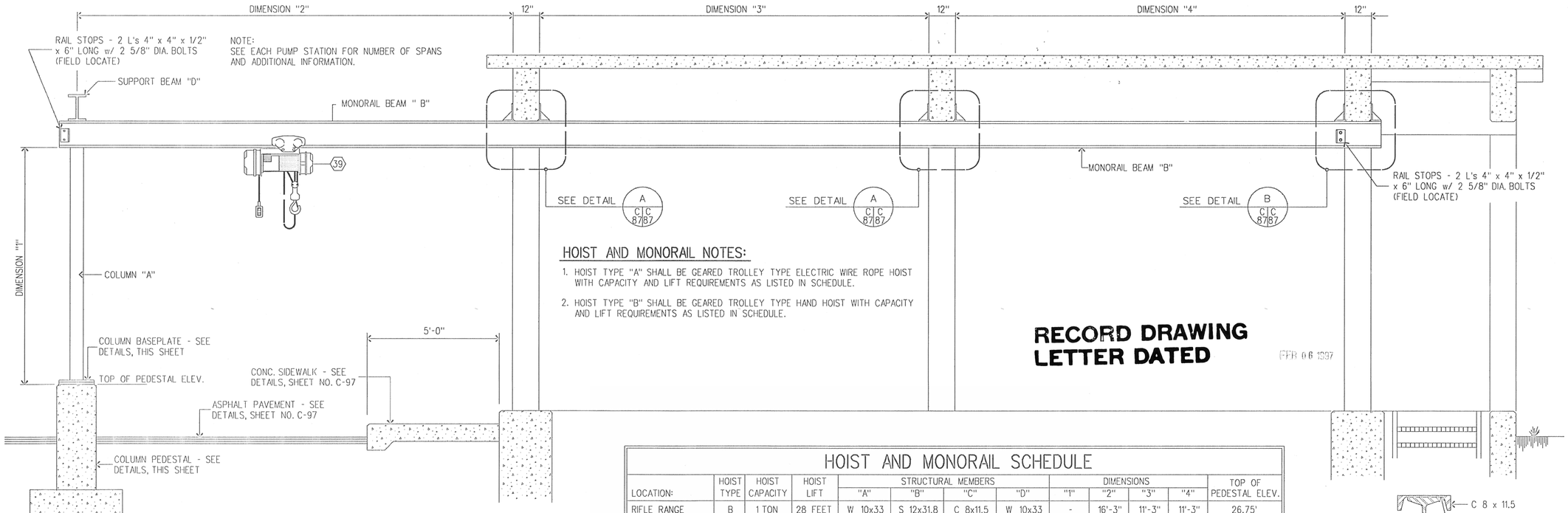


WIND DIRECTION $\gamma = 90°$

MAIN WIND FORCE RESISTING SYSTEM



COMPONENTS AND CLADDING



SECTION - MONORAIL SYSTEM

SCALE: 1/2" = 1'-0"

HOIST AND MONORAIL NOTES:

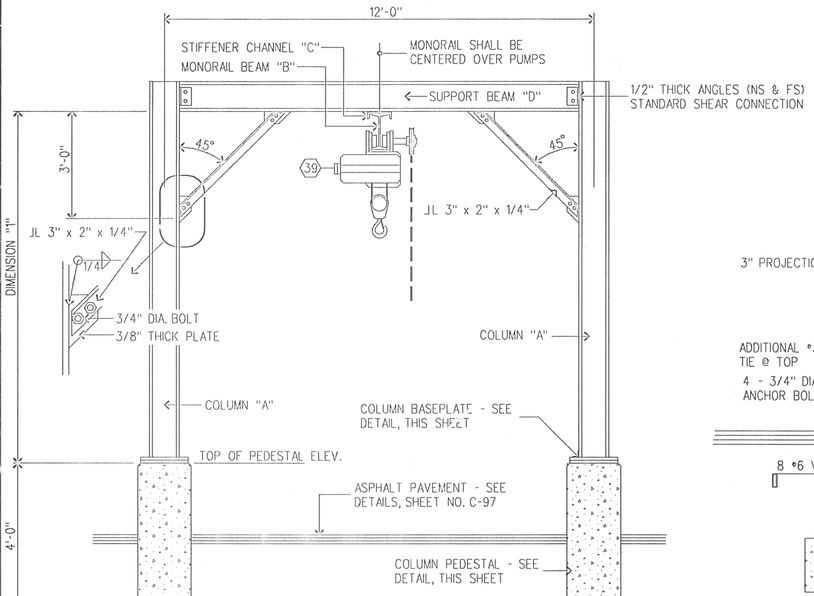
1. HOIST TYPE "A" SHALL BE GEARED TROLLEY TYPE ELECTRIC WIRE ROPE HOIST WITH CAPACITY AND LIFT REQUIREMENTS AS LISTED IN SCHEDULE.
2. HOIST TYPE "B" SHALL BE GEARED TROLLEY TYPE HAND HOIST WITH CAPACITY AND LIFT REQUIREMENTS AS LISTED IN SCHEDULE.

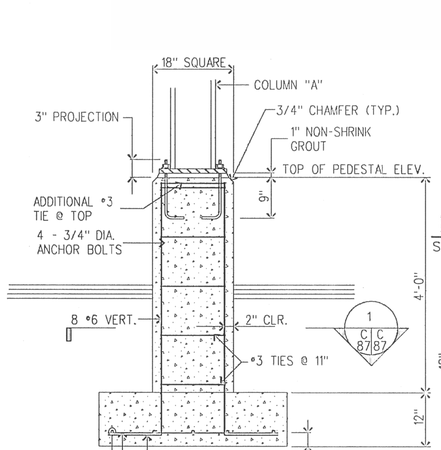
RECORD DRAWING LETTER DATED

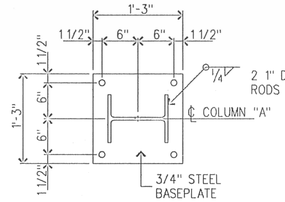
FEB 06 1997

HOIST AND MONORAIL SCHEDULE

LOCATION:	HOIST TYPE	HOIST CAPACITY	HOIST LIFT	STRUCTURAL MEMBERS "A"	"B"	"C"	"D"	DIMENSIONS "1"	"2"	"3"	"4"	TOP OF PEDESTAL ELEV.
RIFLE RANGE	B	1 TON	28 FEET	W 10x33	S 12x31.8	C 8x11.5	W 10x33	-	16'-3"	11'-3"	11'-3"	26.75'
U.S. 17	B	1 TON	28 FEET	W 10x33	S 12x31.8	C 8x11.5	W 10x33		16'-3"	11'-3"	11'-3"	74.00'
CAMP JOHNSON	A	2 TON	35 FEET	W 10x33	S 12x31.8	C 8x11.5	W 10x33		16'-6"	14'-9"	14'-9"	17.00'
CAMP GEIGER	A	2 TON	35 FEET	W 10x33	S 12x31.8	C 8x11.5	W 10x33		16'-6"	14'-9"	14'-9"	17.00'
SNEADS FERRY	A	2 TON	35 FEET	W 10x33	S 12x31.8	C 8x11.5	W 10x33		16'-6"	14'-9"	14'-9"	24.00'
COURTHOUSE BAY	A	2 TON	35 FEET	W 10x33	S 12x31.8	C 8x11.5	W 10x33		16'-6"	14'-9"	14'-9"	9.00'
TARAWA TERRACE	A	3 TON	35 FEET	W 10x33	S 12x31.8	C 8x11.5	W 10x33		16'-6"	14'-9"	14'-9"	18.00'
TARAWA TERRACE	A	3 TON	35 FEET	W 10x33	S 12x31.8	C 8x11.5	W 10x33		16'-6"	14'-9"	14'-9"	18.00'

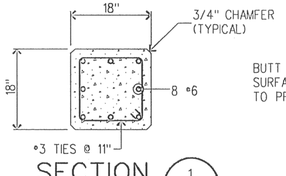






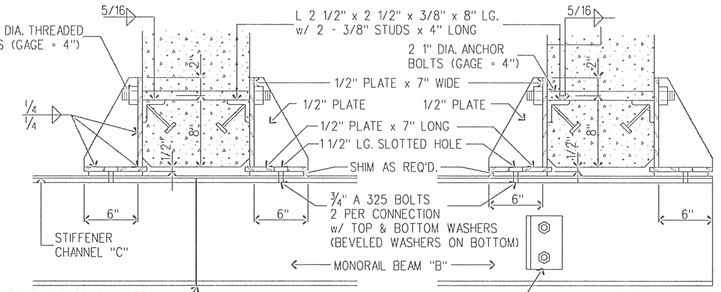
DETAIL - COLUMN BASEPLATE

SCALE: 1"=1'-0"



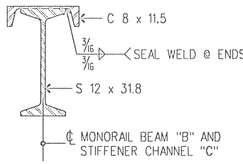
SECTION

SCALE: 3/4"=1'-0"



DETAIL A C|C 87/87 SCALE: 1 1/2"=1'-0"

DETAIL B C|C 87/87 SCALE: 1 1/2"=1'-0"



DETAIL E C|C 87/87 SCALE: 1 1/2"=1'-0"

1'-4" 0 1'-4" 2'-8" 4'-0" 5'-4" 6'-8"

As Built

REVISIONS			
DESCRIPTION	DATE	APPROVED

W.R.M. DESIGN
J.W.A. DRAWN
B.V.P. CHECK
J.R.T. PROJECT MGR.
PROJECT MANAGER
FIRE PROTECTION
QUALITY CONTROL
BRANCH MANAGER
DESIGN DIRECTOR

DAVIS & FLOYD, INC.
ENGINEERS / ARCHITECTS
GREENWOOD, SOUTH CAROLINA
A/E CONTRACT NO. N 62470-91-C-6578

ACTIVITY - SATISFACTORY TO
APPROVED
DATE
OF EFD SOUTHDIV, NAVFACENGCOM

8/8/94

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 17402 JOHN W. JERRY, JR. 7/12/94

NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA
DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL STATION
CAMP LEJEUNE, NORTH CAROLINA
MARINE CORPS BASE:

BASEWIDE WASTE TREATMENT UPGRADE - PHASE I
MONORAIL AND HOISTS
PLANS, SECTION, DETAILS AND SCHEDULES

CODE I.D. NO. 80091 | SIZE D
SCALE: AS NOTED
EFD NO. 376532
STA. PROJ. NO. P-947
SPEC. NO. 05-92-2159
CONTRACT NO.

FINAL SUBMITTAL

BEAM SCHEDULE

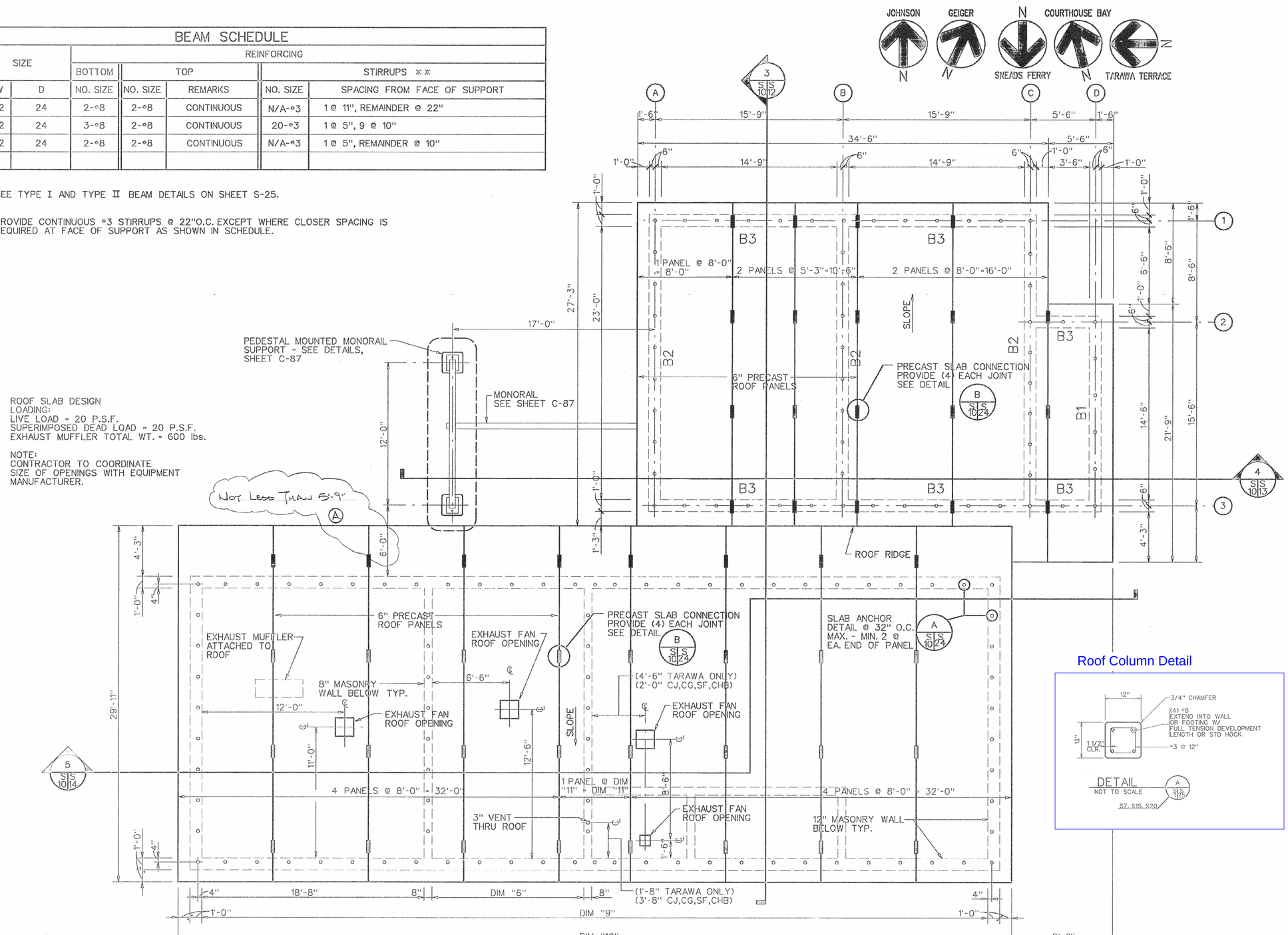
MARK	TYPE*	SIZE		REINFORCING				
				BOTTOM	TOP		STIRRUPS **	
		W	D	NO. SIZE	NO. SIZE	REMARKS	NO. SIZE	SPACING FROM FACE OF SUPPORT
B1	I	12	24	2-#8	2-#8	CONTINUOUS	N/A-#3	1 @ 11", REMAINDER @ 22"
B2	I	12	24	3-#8	2-#8	CONTINUOUS	20-#3	1 @ 5", 9 @ 10"
B3	II	12	24	2-#8	2-#8	CONTINUOUS	N/A-#3	1 @ 5", REMAINDER @ 10"

* SEE TYPE I AND TYPE II BEAM DETAILS ON SHEET S-25.

** PROVIDE CONTINUOUS #3 STIRRUPS @ 22"O.C. EXCEPT WHERE CLOSER SPACING IS REQUIRED AT FACE OF SUPPORT AS SHOWN IN SCHEDULE.

ROOF SLAB DESIGN
LOADING:
LIVE LOAD = 20 P.S.F.
SUPERIMPOSED DEAD LOAD = 20 P.S.F.
EXHAUST MUFFLER TOTAL WT. = 600 lbs.

NOTE:
CONTRACTOR TO COORDINATE
SIZE OF OPENINGS WITH EQUIPMENT
MANUFACTURER.



Roof Column Detail

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED
4	As Built	11/11/98	JWA

DAVIS & FLOYD, INC.
ENGINEERS / ARCHITECTS
GREENWOOD, SOUTH CAROLINA
N.C. CERTIFICATE NO. C-0446 — (803) 229-2202 — FAX (803) 229-6578
APPROVED — ACTIVITY — SATISFACTORY TO — DATE 8/8/94

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 13918 DAVID MICHAEL

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION — NORFOLK, VIRGINIA
NAVAL STATION — CAMP LEJEUNE, NORTH CAROLINA
MARINE CORPS BASE

BASEWIDE WASTE TREATMENT UPGRADE - PHASE I

TARAWA TERRACE, CAMP JOHNSON, CAMP GEIGER, SNEADS FERRY, COURTHOUSE BAY PUMP STATIONS
ROOF PLAN

CODE I.D. NO. 80091	SIZE D
SCALE:	GRAPHIC
EFD NO.	376571
STA. PROJ. NO.	P-947
SPEC. NO.	05-92-2159

FINAL SUBMITTAL

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Monorail Support Beam

Code References

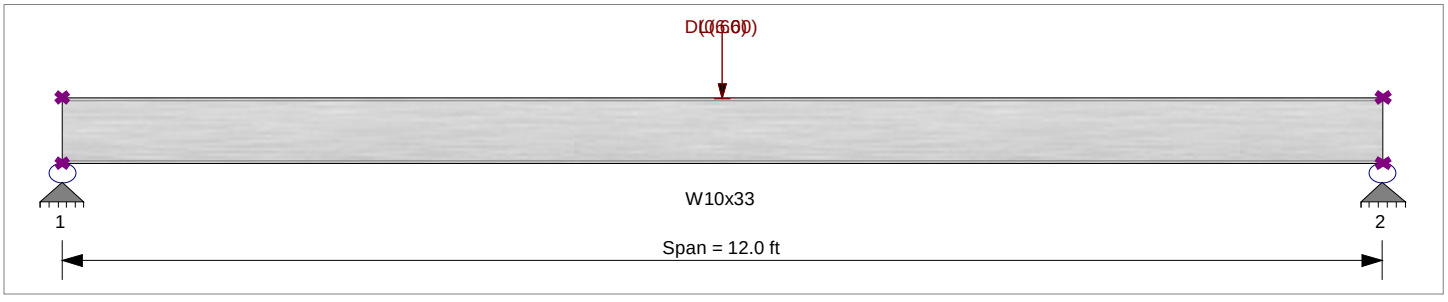
Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combination Set : ASCE 7-22 / IBC 2024

Rho (or Omega) = 1.00

Material Properties

Analysis Method : Load Resistance Factor Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : L = 6.0 k @ 6.0 ft, (Crane Load)
Point Load : D = 0.660 k @ 6.0 ft, (Crane Framing)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.219 : 1	Maximum Shear Stress Ratio =	0.064 : 1
Section used for this span	W10x33	Section used for this span	W10x33
Mu : Applied	31.889 k-ft	Vu : Applied	5.434 k
Mn * Phi : Allowable	145.500 k-ft	Vn * Phi : Allowable	84.651 k
Load Combination	+1.20D+1.60L	Load Combination	+1.20D+1.60L
		Location of maximum on span	12.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.076 in	Ratio =	1,905	>=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.087 in	Ratio =	1655	>=180	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values max Mu +	max Mu -	Mu Max	Mnx	Phi*Mnx	Cb	Rm	Summary of Shear Values VuMax	Vnx	Phi*Vnx
+1.40D													
Dsgn. L = 12.00 ft	1	0.025	0.009	3.60		3.60	161.67	145.50	1.27	1.00	0.74	84.65	84.65
+1.20D+1.60L													
Dsgn. L = 12.00 ft	1	0.219	0.064	31.89		31.89	161.67	145.50	1.31	1.00	5.43	84.65	84.65
+1.20D+L													
Dsgn. L = 12.00 ft	1	0.145	0.043	21.09		21.09	161.67	145.50	1.31	1.00	3.63	84.65	84.65
+1.20D													
Dsgn. L = 12.00 ft	1	0.021	0.007	3.09		3.09	161.67	145.50	1.27	1.00	0.63	84.65	84.65
+0.90D													
Dsgn. L = 12.00 ft	1	0.016	0.006	2.32		2.32	161.67	145.50	1.27	1.00	0.48	84.65	84.65

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+L	0.0870	6.034		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	3.528	3.528
Max Upward from Load Combinations	3.528	3.528

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Monorail Support Beam

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from Load Cases	3.000	3.000
D Only	0.528	0.528
+D+L	3.528	3.528
+D+0.750L	2.778	2.778
+0.60D	0.317	0.317
L Only	3.000	3.000

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Monorail Support Column (In Plane Loading)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **W10x33**

Analysis Method :	Load Resistance Factor
Steel Stress Grade	A-992, High Strength, Low Alloy, Fy = 50 ksi
Fy : Steel Yield	50.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	12.750 ft
Top & Bottom Fixity	Top Free, Bottom Fixed
Brace condition :	

Unbraced Length for buckling ABOUT X-X Axis = 12.750 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 12.750 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 420.750 lbs * Dead Load Factor
AXIAL LOADS . . .
Crane Framing: Axial Load at 12.750 ft, D = 1.0 k
Crane Load: Axial Load at 12.750 ft, L = 3.0 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.02346** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Pu	6.505	k
0.9 * Pn	277.284	k
Mu-x	0.0	k-ft
0.9 * Mn-x :	134.228	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	52.50	k-ft

PASS Maximum Shear Stress Ratio **0.0** : 1

Load Combination	0.0	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Vu : Applied	0.0	k
Vn * Phi : Allowable	0.0	k

Maximum Load Reactions . .

Top along X-X	0.030 k
Bottom along X-X	1.170 k
Top along Y-Y	0.150 k
Bottom along Y-Y	5.850 k

Maximum Load Deflections . . .

Along Y-Y 0.007101 in at 8.591 ft above base
for load combination :+D+L

Along X-X 0.01086 in at 8.591 ft above base
for load combination :+D+L

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W10x33

Steel Section Properties : W10x33

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

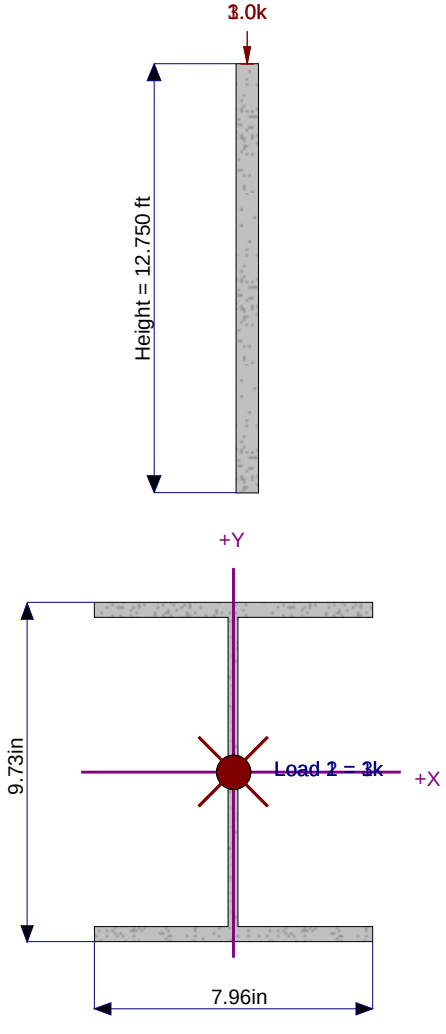
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Monorail Support Column (In Plane Loading)

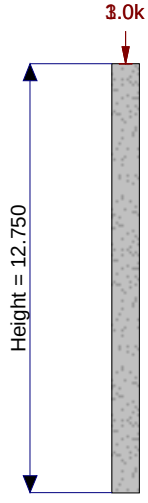
Depth	=	9.730 in	I xx	=	171.00 in^4	J	=	0.583 in^4
Web Thick	=	0.290 in	S xx	=	35.00 in^3	Cw	=	791.00 in^6
Flange Width	=	7.960 in	R xx	=	4.190 in			
Flange Thick	=	0.435 in	Zx	=	38.800 in^3			
Area	=	9.710 in^2	I yy	=	36.600 in^4			
Weight	=	33.000 plf	S yy	=	9.200 in^3	Wno	=	18.500 in^2
Kdesign	=	0.935 in	R yy	=	1.940 in	Sw	=	16.000 in^4
K1	=	0.750 in	Zy	=	14.000 in^3	Qf	=	7.750 in^3
rts	=	2.200 in				Qw	=	18.900 in^3
Ycg	=	0.000 in						

Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis



Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Monorail Support Column (Out of Plane Loading)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **W10x33**

Analysis Method :	Load Resistance Factor
Steel Stress Grade	A-992, High Strength, Low Alloy, Fy = 50 ksi
Fy : Steel Yield	50.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	12.750 ft
Top & Bottom Fixity	Top Free, Bottom Fixed
Brace condition :	

Unbraced Length for buckling ABOUT X-X Axis = 12.750 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 12.750 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 420.750 lbs * Dead Load Factor
AXIAL LOADS . . .
Crane Framing: Axial Load at 12.750 ft, D = 1.0 k
Crane Load: Axial Load at 12.750 ft, L = 3.0 k
BENDING LOADS . . .
Lat. Point Load at 12.750 ft creating Mx-x, L = 2.0 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2921** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Pu	6.505	k
0.9 * Pn	277.284	k
Mu-x	-40.80	k-ft
0.9 * Mn-x :	145.50	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	52.50	k-ft

PASS Maximum Shear Stress Ratio **0.03780** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Vu : Applied	3.20	k
Vn * Phi : Allowable	84.651	k

Maximum Load Reactions . .

Top along X-X	0.030 k
Bottom along X-X	1.170 k
Top along Y-Y	0.150 k
Bottom along Y-Y	5.850 k

Maximum Load Deflections . . .

Along Y-Y 0.007101 in at 8.591 ft above base
for load combination :+D+L

Along X-X 0.01086 in at 8.591 ft above base
for load combination :+D+L

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W10x33

Steel Section Properties : W10x33

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

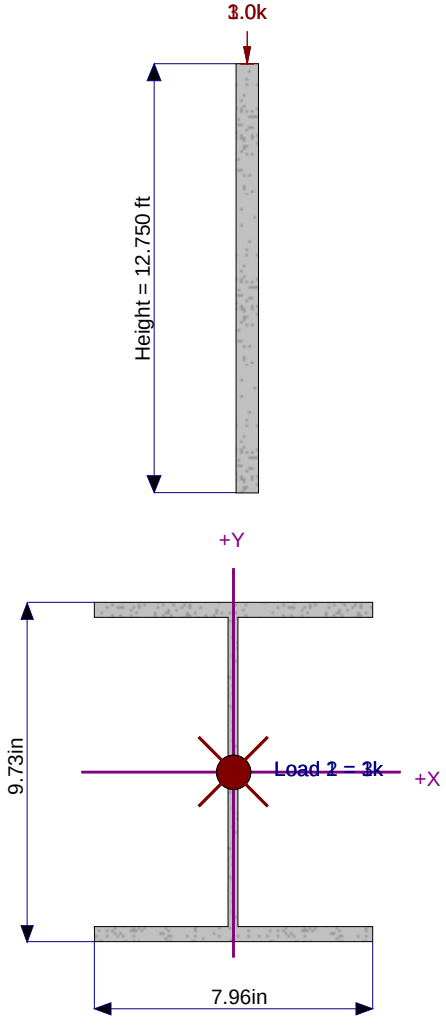
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Monorail Support Column (Out of Plane Loading)

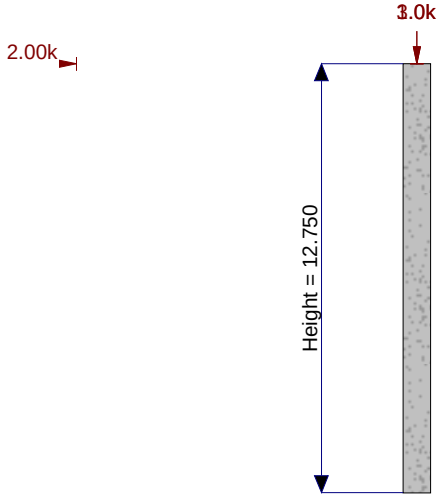
Depth	=	9.730 in	I xx	=	171.00 in^4	J	=	0.583 in^4
Web Thick	=	0.290 in	S xx	=	35.00 in^3	Cw	=	791.00 in^6
Flange Width	=	7.960 in	R xx	=	4.190 in			
Flange Thick	=	0.435 in	Zx	=	38.800 in^3			
Area	=	9.710 in^2	I yy	=	36.600 in^4			
Weight	=	33.000 plf	S yy	=	9.200 in^3	Wno	=	18.500 in^2
Kdesign	=	0.935 in	R yy	=	1.940 in	Sw	=	16.000 in^4
K1	=	0.750 in	Zy	=	14.000 in^3	Qf	=	7.750 in^3
rts	=	2.200 in				Qw	=	18.900 in^3
Ycg	=	0.000 in						

Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis



Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-Existing Monorail Support Pier Foundation

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combinations Used : ASCE 7-22 / IBC 2024

Rho (or Omega) = 1.00

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	Yes
Use Pedestal wt for stability, mom & shear	:	Yes

Soil Design Values

Allowable Soil Bearing	=	2.0	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	Yes	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	3.0	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

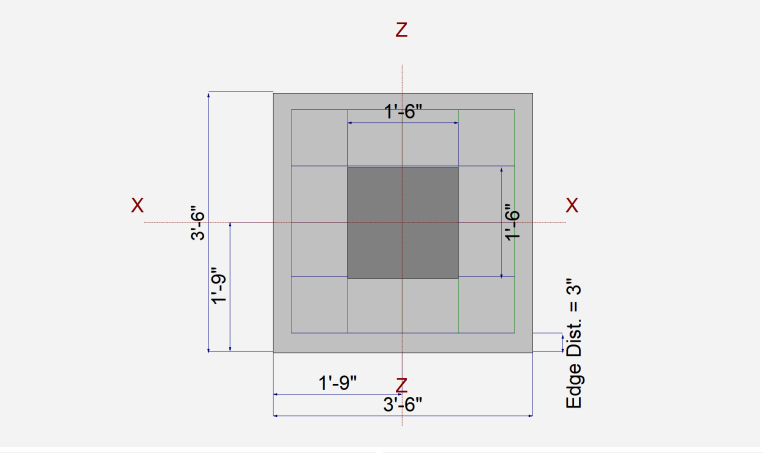
Width parallel to X-X Axis	=	3.50 ft
Length parallel to Z-Z Axis	=	3.50 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	18.0 in
pz : parallel to Z-Z Axis	=	18.0 in
Height	=	48.0 in

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



Bottom Reinforcing

Bars parallel to X-X Axis (resisting Z Flexure)

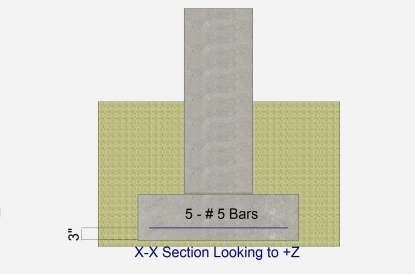
Number of Bars	=		5
Reinforcing Bar Size	=	#	5

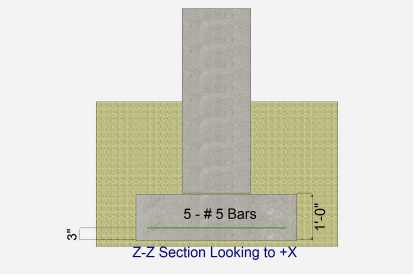
Bars parallel to Z-Z Axis (resisting X Flexure)

Number of Bars	=		5
Reinforcing Bar Size	=	#	5

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in





Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Monorail Support Pier Foundation

Applied Loads

		D	Lr	L	S	W	E	H
P : Column Load	=	1.000	0.000	3.000	0.000	0.000	0.000	0.000 k
OB : Overburden	=	0.000	0.000	0.000	0.000	0.000	0.000	0.000 ksf
M-xx	=	0.000	0.000	0.000	0.000	0.000	0.000	0.000 k-ft
M-zz	=	0.000	0.000	0.000	0.000	0.000	0.000	0.000 k-ft
V-x	=	0.000	0.000	1.200	0.000	0.000	0.000	0.000 k
V-z	=	0.000	0.000	0.000	0.000	0.000	0.000	0.000 k

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7431	Soil Bearing	1.594 ksf	2.145 ksf	+D+L about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	2.707	Overturning - Z-Z	6.0 k-ft	16.242 k-ft	+D+L
PASS	4.143	Sliding - X-X	1.20 k	4.972 k	+D+L
PASS	999.0	Sliding - Z-Z	0.0 k	4.072 k	D Only
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.04989	Z Flexure (+X) Bot Tens	0.8516 k-ft/ft	17.070 k-ft/ft	+1.20D+1.60L
PASS	0.006058	Z Flexure (-X) Bot Tens	0.1034 k-ft/ft	17.070 k-ft/ft	+1.40D
	0.585	Min Steel X Flexure Bottom	0.259 in2/ft	0.443 in2/ft	n/a
PASS	0.01667	X Flexure (+Z) Bot Tens	0.2845 k-ft/ft	17.070 k-ft/ft	+1.20D+1.60L
PASS	0.01667	X Flexure (-Z) Bot Tens	0.2845 k-ft/ft	17.070 k-ft/ft	+1.20D+1.60L
	0.585	Min Steel Z Flexure Bottom	0.259 in2/ft	0.443 in2/ft	n/a
PASS		Z Flexure (+X) Top Tens	k-ft/ft	k-ft/ft	
PASS	Undefined	Z Flexure (-X) Top Tens	k-ft/ft	k-ft/ft	+1.20D+1.60L
	0.000	Min Steel X Flexure Top	0.259 in2/ft	0.000 in2/ft	n/a
PASS		X Flexure (+Z) Top Tens	k-ft/ft	k-ft/ft	
PASS		X Flexure (-Z) Top Tens	k-ft/ft	k-ft/ft	
	0.000	Min Steel Z Flexure Top	0.000 in2/ft	0.000 in2/ft	n/a
PASS	0.08101	1-way Shear (+X)	4.261 psi	52.601 psi	+1.20D+1.60L
PASS	0.01889	1-way Shear (-X)	0.9936 psi	52.601 psi	+1.20D+1.60L
PASS	0.02455	1-way Shear (+Z)	1.291 psi	52.601 psi	+1.20D+1.60L
PASS	0.02455	1-way Shear (-Z)	1.291 psi	52.601 psi	+1.20D+1.60L
PASS	0.02704	2-way Punching	4.444 psi	164.317 psi	+1.20D+1.60L

Top reinforcing mat required (see 'Bending' tab).

Hand check required for anchor pullout.

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.145	n/a	0.0	0.5128	0.5128	n/a	n/a	0.239
X-X, +D+L	2.145	n/a	0.0	0.7577	0.7577	n/a	n/a	0.353
X-X, +D+0.750L	2.145	n/a	0.0	0.6964	0.6964	n/a	n/a	0.325
X-X, +0.60D	2.145	n/a	0.0	0.3077	0.3077	n/a	n/a	0.144
Z-Z, D Only	2.145	0.0	n/a	n/a	n/a	0.5128	0.5128	0.239
Z-Z, +D+L	2.145	7.758	n/a	n/a	n/a	0.0	1.594	0.743
Z-Z, +D+0.750L	2.145	6.330	n/a	n/a	n/a	0.07299	1.320	0.615
Z-Z, +0.60D	2.145	0.0	n/a	n/a	n/a	0.3077	0.3077	0.144

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	0.0 k-ft	Infinity	OK
X-X, +D+L	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750L	None	0.0 k-ft	Infinity	OK
X-X, +0.60D	None	0.0 k-ft	Infinity	OK
Z-Z, D Only	None	0.0 k-ft	Infinity	OK
Z-Z, +D+L	6.0 k-ft	16.242 k-ft	2.707	OK
Z-Z, +D+0.750L	4.50 k-ft	14.930 k-ft	3.318	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-Existing Monorail Support Pier Foundation

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Z-Z, +0.60D	None	0.0 k-ft	Infinity	OK

All units k

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, D Only	0.0 k	4.072 k	999.0	OK
X-X, +D+L	1.20 k	4.972 k	4.143	OK
X-X, +D+0.750L	0.90 k	4.747 k	5.274	OK
X-X, +0.60D	0.0 k	3.318 k	999.0	OK
Z-Z, D Only	0.0 k	4.072 k	999.0	OK
Z-Z, +D+L	0.0 k	4.972 k	999.0	OK
Z-Z, +D+0.750L	0.0 k	4.747 k	999.0	OK
Z-Z, +0.60D	0.0 k	3.318 k	999.0	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.1034	+Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +1.40D	0.1034	-Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +1.20D+1.60L	0.2845	+Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +1.20D+1.60L	0.2845	-Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +1.20D+L	0.2111	+Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +1.20D+L	0.2111	-Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +1.20D	0.08863	+Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +1.20D	0.08863	-Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +0.90D	0.06648	+Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
X-X, +0.90D	0.06648	-Z	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
Z-Z, +1.40D	0.1034	-X	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
Z-Z, +1.40D	0.1034	+X	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
Z-Z, +1.20D+1.60L	0.8516	+X	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
Z-Z, +1.20D+L	0.5508	+X	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
Z-Z, +1.20D	0.08863	-X	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
Z-Z, +1.20D	0.08863	+X	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
Z-Z, +0.90D	0.06648	-X	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK
Z-Z, +0.90D	0.06648	+X	Bottom	0.2592	ACI 7.6.1.1	0.4429	17.070	OK

One Way Shear X

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.47 psi	0.47 psi	0.47 psi	52.60 psi	0.01	OK
+1.20D+1.60L	0.99 psi	4.26 psi	4.26 psi	52.60 psi	0.08	OK
+1.20D+L	0.81 psi	2.73 psi	2.73 psi	52.60 psi	0.05	OK
+1.20D	0.40 psi	0.40 psi	0.40 psi	52.60 psi	0.01	OK
+0.90D	0.30 psi	0.30 psi	0.30 psi	52.60 psi	0.01	OK

One Way Shear Z

Load Combination...	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.47 psi	0.47 psi	0.47 psi	52.60 psi	0.01	OK
+1.20D+1.60L	1.29 psi	1.29 psi	1.29 psi	52.60 psi	0.02	OK
+1.20D+L	0.96 psi	0.96 psi	0.96 psi	52.60 psi	0.02	OK
+1.20D	0.40 psi	0.40 psi	0.40 psi	52.60 psi	0.01	OK
+0.90D	0.30 psi	0.30 psi	0.30 psi	52.60 psi	0.01	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	1.54 psi	164.32 psi	0.01	OK
+1.20D+1.60L	4.44 psi	164.32 psi	0.03	OK
+1.20D+L	3.14 psi	164.32 psi	0.02	OK
+1.20D	1.32 psi	164.32 psi	0.01	OK
+0.90D	0.99 psi	164.32 psi	0.01	OK

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-Existing Monorail Support Pier

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

f'c : Concrete 28 day streng	=	3.0 ksi
E =	=	3,122.0 ksi
Density	=	150.0 pcf
β	=	0.0
fy - Main Rebar	=	60.0 ksi
E - Main Rebar	=	29,000.0 ksi
Allow. Reinforcing Limits		*ASTM A615 Bars Used*
Min. Reinf.	=	1.0 %
Max. Reinf.	=	8.0 %
Seismic Design Category	=	C

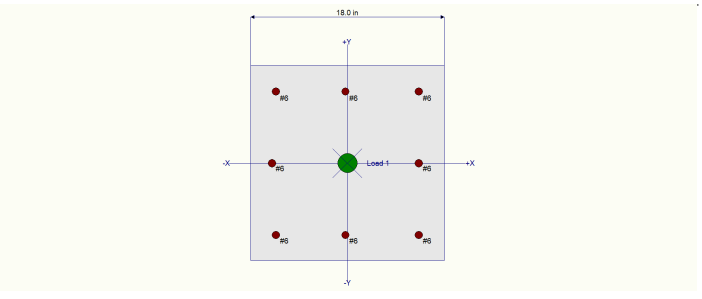
Overall Column Height = 4.0 ft
End Fixity Top Free, Bottom Fixed

Brace condition for deflection (buckling) along colur
X-X (width) axis :
Unbraced Length for buckling ABOUT X-X Axis = 4.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 4.0 ft, K = 1.0

Column Cross Section

Column Dimensions : 18.0in Square Column, Column Edge to Rebar Edge Cover = 2.0in

Column Reinforcing : 4 - #6 bars @ corners,, 1 - #6 bars top & bottom between corner bars, 1 - #6 bars left & right between corner



Applied Loads

Entered loads are factored per load combinations specified by user.

Column self weight included : 1,350.0 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 4.0 ft above base, D = 1.0, L = 3.0 k
BENDING LOADS . . .
Lat. Point Load at 4.0 ft creating Mx-x, L = 1.20 k

DESIGN SUMMARY

Load Combination	0.0
Location of max.above base	0.0 ft

Maximum Stress Ratio **0.0 : 1**
Ratio = (Pu^2+Mu^2)^.5 / (PhiPn^2+PhiMn^2)^.5

Pu =	0.0 k	φ * Pn =	0.0 k
Mu-x =	0.0 k-ft	φ * Mn-x =	0.0 k-ft
Mu-y =	0.0 k-ft	φ* Mn-y =	0.0 k-ft
Mu Angle =	deg	φ =	
Mu at Angle =	k-ft	φMn at Angle =	k-ft

Pn & Mn values located at Pu-Mu vector intersection with capacity curve

Column Capacities . .

Pnmax : Nominal Max. Compressive Axial Capac	0.0 k
Pnmin : Nominal Min. Tension Axial Capacity	k
φ Pn, max : Usable Compressive Axial Capacity	0.0 k
φ Pn, min : Usable Tension Axial Capacity	k

Maximum SERVICE Load Reactions .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Deflections . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination : 0.0
Along X-X 0.0 in at 0.0 ft above base
for load combination : 0.0

General Section Informatio β = 0.0 θ = 0.0
ρ : % Reinforcing 0.0 % Rebar < Min of 1.0 %
Reinforcing Area 0.0 in^2
Concrete Area 0.0 in^2

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Monorail Support Pier

Governing Load Combination Results

Governing Factored Load Combination	Moment X-X	Moment Y-Y	Dist. from base ft	Axial Load k Pu	φ * Pn	Bending Analysis k-ft δx	δx * Mux	δy	δy * Muy	Alpha (deg)	δ Mu	φ Mn	Utilization Ratio

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top

Maximum Moment Reactions

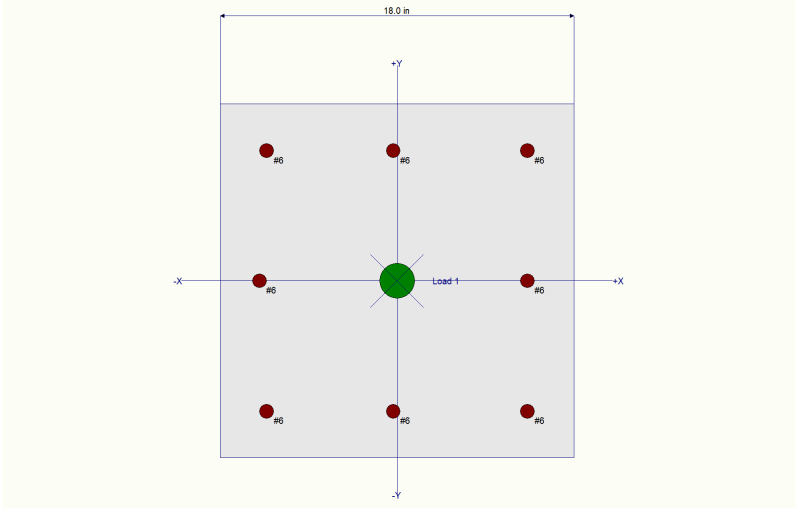
Note: Only non-zero reactions are listed.

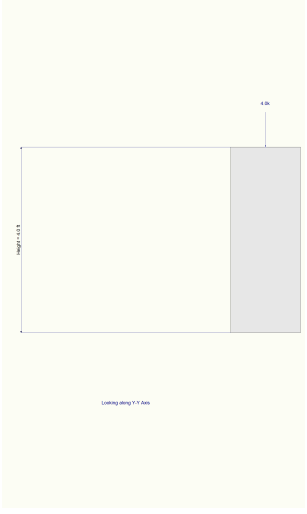
Load Combination	Moment About X-X Axis @ Base	@ Top	Moment About Y-Y Axis @ Base	@ Top

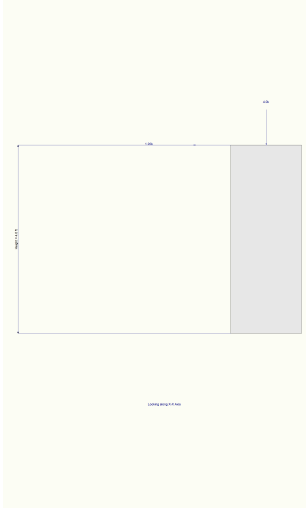
Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

Sketches







Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B1)

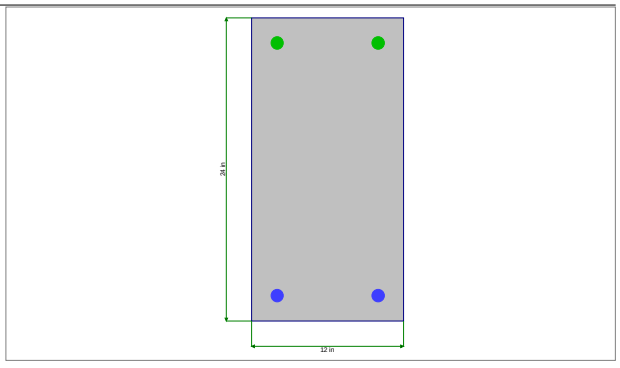
Code References

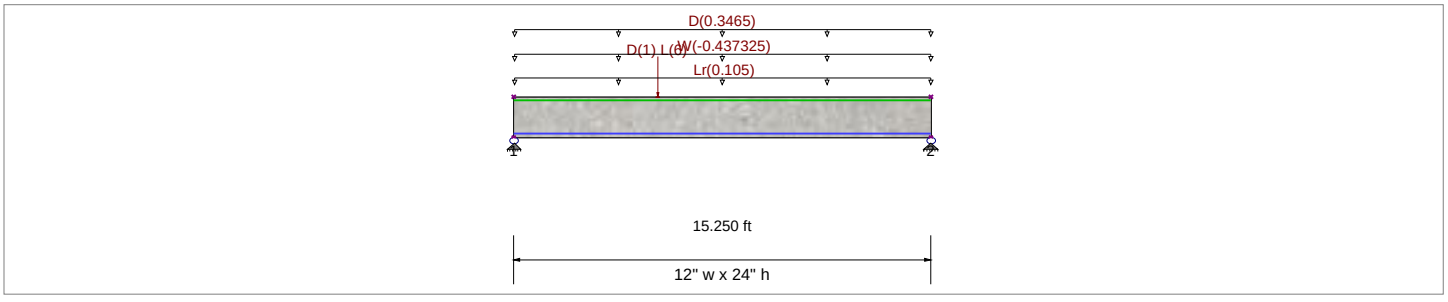
Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combination Set : ASCE 7-22 / IBC 2024 Rho (or Omega) = 1.00

General Information

f'c	=	4.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 *λ * f'c 1/2	=	503.12 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β 1	=	0.8250
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#8 at 2.0 in from Bottom, from 0.0 to 15.250 ft in this span 2-#8 at 2.0 in from Top, from 0.0 to 15.250 ft in this spa

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : Lr = 0.020 ksf, Tributary Width = 5.250 ft, (RLL (20psf))
Uniform Load : W = -0.08330 ksf, Tributary Width = 5.250 ft, (Wind Zone 3 (-83.3psf, Ae>100sf))
Uniform Load : D = 0.0660 ksf, Tributary Width = 5.250 ft, (Precast Roof System (66psf))
Point Load : D = 1.0, L = 6.0 k @ 5.250 ft, (Crane Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.393** : 1	Design Limits		
Section used for this span	**Typical Section**	Tensile Strain >= Min Strain Limit	(Section 9.3.3.1)	
Mu : Applied	58.602 k-ft	0.02705 in / in >=	0.00507 in / in	OK
Mn * Phi : Allowable	149.020 k-ft	As Provided >= As,min	(Section 9.6.1.2)	
Location of maximum on span	5.250 ft	1.580 in^2 >=	0.885 in^2	OK
Span # where maximum occurs	Span # 1			

Maximum Deflection

Max Downward Transient Deflection	0.016 in	Ratio =	11760	>=360.0	W Only
Max Upward Transient Deflection	-0.012 in	Ratio =	14845	>=360.0	L Only
Max Downward Total Deflection	0.047 in	Ratio =	3861	>=180.0	Span: 1 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+0.750Lr+0.750L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	9.444	7.347

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B1)

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from Load Combinations	9.444	7.347
Max Upward from Load Cases	5.509	5.198
Max Downward from all Load Conditions (Resisting Uplift)	-3.335	-3.335
Max Downward from Load Cases (Resisting Uplift)	-3.335	-3.335
+D+H	5.509	5.198
+D+L+H	9.444	7.263
+D+Lr+H	6.310	5.998
+D+0.70S+H	5.509	5.198
+D+0.750Lr+0.750L+H	9.061	7.347
+D+0.750L+0.5250S+H	8.460	6.746
+D+0.60W+H	3.508	3.197
+D+0.750Lr+0.750L+0.450W+H	7.560	5.846
+D+0.750L+0.5250S+0.450W+H	6.960	5.246
+0.60D+0.60W+0.60H	1.305	1.118
+D+0.70E+H	5.509	5.198
+D+0.750L+0.10S+0.5250E+H	8.460	6.746
+0.60D+0.70E+0.60H	3.305	3.119
D Only	5.509	5.198
Lr Only	0.801	0.801
L Only	3.935	2.065
W Only	-3.335	-3.335
H Only		

Shear Stirrup Requirements

Between 0.00 to 0.78 ft, Max spacing per 9.7.6.2.2, use #3 stirrups spaced at 11 in
Between 0.81 to 15.22 ft, Ties Not Req'd, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+0.50Lr+L-W+1.60H	1	0.00	22.00	14.28	Yes	11.00	26.56	13.20	39.76	0.359	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.17	22.00	14.07	Yes	11.00	26.56	13.20	39.76	0.354	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.33	22.00	13.86	Yes	11.00	26.56	13.20	39.76	0.349	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.50	22.00	13.65	Yes	11.00	26.56	13.20	39.76	0.343	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.67	22.00	13.44	Yes	11.00	26.56	13.20	39.76	0.338	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.83	22.00	13.24	No	N/A	15.25	0.00	15.25	0.868	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.00	22.00	13.03	No	N/A	15.25	0.00	15.25	0.854	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.17	22.00	12.82	No	N/A	15.25	0.00	15.25	0.840	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.33	22.00	12.61	No	N/A	15.25	0.00	15.25	0.827	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.50	22.00	12.40	No	N/A	15.25	0.00	15.25	0.813	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.67	22.00	12.19	No	N/A	15.25	0.00	15.25	0.799	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.83	22.00	11.98	No	N/A	15.25	0.00	15.25	0.786	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.00	22.00	11.77	No	N/A	15.25	0.00	15.25	0.772	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.17	22.00	11.56	No	N/A	15.25	0.00	15.25	0.758	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	2.33	22.00	11.40	No	N/A	15.25	0.00	15.25	0.748	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	2.50	22.00	11.27	No	N/A	15.25	0.00	15.25	0.739	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	2.67	22.00	11.13	No	N/A	15.25	0.00	15.25	0.730	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	2.83	22.00	10.99	No	N/A	15.25	0.00	15.25	0.721	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	3.00	22.00	10.86	No	N/A	15.25	0.00	15.25	0.712	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	3.17	22.00	10.72	No	N/A	15.25	0.00	15.25	0.703	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	3.33	22.00	10.59	No	N/A	15.25	0.00	15.25	0.694	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	3.50	22.00	10.45	No	N/A	15.25	0.00	15.25	0.685	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	3.67	22.00	10.31	No	N/A	15.25	0.00	15.25	0.676	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	3.83	22.00	10.18	No	N/A	15.25	0.00	15.25	0.667	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	4.00	22.00	10.04	No	N/A	15.25	0.00	15.25	0.658	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	4.17	22.00	9.91	No	N/A	15.25	0.00	15.25	0.649	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	4.33	22.00	9.77	No	N/A	15.25	0.00	15.25	0.641	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	4.50	22.00	9.63	No	N/A	15.25	0.00	15.25	0.632	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	4.67	22.00	9.50	No	N/A	15.25	0.00	15.25	0.623	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	4.83	22.00	9.36	No	N/A	15.25	0.00	15.25	0.614	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	5.00	22.00	9.23	No	N/A	15.25	0.00	15.25	0.605	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	5.17	22.00	9.09	No	N/A	15.25	0.00	15.25	0.596	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.33	22.00	2.22	No	N/A	15.25	0.00	15.25	0.146	Eqn (c)	Ties Not Req'd

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B1)

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.30S+1.60H	1	5.50	22.00	-2.09	No	N/A	15.25	0.00	15.25	0.137	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	5.67	22.00	-2.22	No	N/A	15.25	0.00	15.25	0.146	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	5.83	22.00	-2.35	No	N/A	15.25	0.00	15.25	0.154	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	6.00	22.00	-2.48	No	N/A	15.25	0.00	15.25	0.162	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	6.17	22.00	-2.60	No	N/A	15.25	0.00	15.25	0.171	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	6.33	22.00	-2.73	No	N/A	15.25	0.00	15.25	0.179	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	6.50	22.00	-2.86	No	N/A	15.25	0.00	15.25	0.187	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	6.67	22.00	-2.99	No	N/A	15.25	0.00	15.25	0.196	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	6.83	22.00	-3.11	No	N/A	15.25	0.00	15.25	0.204	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	7.00	22.00	-3.24	No	N/A	15.25	0.00	15.25	0.212	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	7.17	22.00	-3.37	No	N/A	15.25	0.00	15.25	0.221	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	7.33	22.00	-3.49	No	N/A	15.25	0.00	15.25	0.229	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	7.50	22.00	-3.62	No	N/A	15.25	0.00	15.25	0.237	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	7.67	22.00	-3.75	No	N/A	15.25	0.00	15.25	0.246	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	7.83	22.00	-3.89	No	N/A	15.25	0.00	15.25	0.255	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.00	22.00	-4.02	No	N/A	15.25	0.00	15.25	0.264	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.17	22.00	-4.16	No	N/A	15.25	0.00	15.25	0.273	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.33	22.00	-4.30	No	N/A	15.25	0.00	15.25	0.282	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.50	22.00	-4.43	No	N/A	15.25	0.00	15.25	0.291	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.67	22.00	-4.57	No	N/A	15.25	0.00	15.25	0.299	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.83	22.00	-4.70	No	N/A	15.25	0.00	15.25	0.308	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	9.00	22.00	-4.84	No	N/A	15.25	0.00	15.25	0.317	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	9.17	22.00	-4.98	No	N/A	15.25	0.00	15.25	0.326	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	9.33	22.00	-5.11	No	N/A	15.25	0.00	15.25	0.335	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	9.50	22.00	-5.25	No	N/A	15.25	0.00	15.25	0.344	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	9.67	22.00	-5.38	No	N/A	15.25	0.00	15.25	0.353	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	9.83	22.00	-5.52	No	N/A	15.25	0.00	15.25	0.362	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	10.00	22.00	-5.66	No	N/A	15.25	0.00	15.25	0.371	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	10.17	22.00	-5.79	No	N/A	15.25	0.00	15.25	0.380	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	10.33	22.00	-5.93	No	N/A	15.25	0.00	15.25	0.389	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.50	22.00	-6.08	No	N/A	15.25	0.00	15.25	0.399	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.67	22.00	-6.29	No	N/A	15.25	0.00	15.25	0.413	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.83	22.00	-6.50	No	N/A	15.25	0.00	15.25	0.426	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.00	22.00	-6.71	No	N/A	15.25	0.00	15.25	0.440	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.17	22.00	-6.92	No	N/A	15.25	0.00	15.25	0.454	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.33	22.00	-7.13	No	N/A	15.25	0.00	15.25	0.467	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.50	22.00	-7.34	No	N/A	15.25	0.00	15.25	0.481	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.67	22.00	-7.55	No	N/A	15.25	0.00	15.25	0.495	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.83	22.00	-7.75	No	N/A	15.25	0.00	15.25	0.508	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.00	22.00	-7.96	No	N/A	15.25	0.00	15.25	0.522	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.17	22.00	-8.17	No	N/A	15.25	0.00	15.25	0.536	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.33	22.00	-8.38	No	N/A	15.25	0.00	15.25	0.549	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.50	22.00	-8.59	No	N/A	15.25	0.00	15.25	0.563	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.67	22.00	-8.80	No	N/A	15.25	0.00	15.25	0.577	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.83	22.00	-9.01	No	N/A	15.25	0.00	15.25	0.591	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.00	22.00	-9.22	No	N/A	15.25	0.00	15.25	0.604	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.17	22.00	-9.43	No	N/A	15.25	0.00	15.25	0.618	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.33	22.00	-9.63	No	N/A	15.25	0.00	15.25	0.632	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.50	22.00	-9.84	No	N/A	15.25	0.00	15.25	0.645	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.67	22.00	-10.05	No	N/A	15.25	0.00	15.25	0.659	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.83	22.00	-10.26	No	N/A	15.25	0.00	15.25	0.673	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.00	22.00	-10.47	No	N/A	15.25	0.00	15.25	0.686	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.17	22.00	-10.68	No	N/A	15.25	0.00	15.25	0.700	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.33	22.00	-10.89	No	N/A	15.25	0.00	15.25	0.714	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.50	22.00	-11.10	No	N/A	15.25	0.00	15.25	0.728	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.67	22.00	-11.31	No	N/A	15.25	0.00	15.25	0.741	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.83	22.00	-11.51	No	N/A	15.25	0.00	15.25	0.755	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.00	22.00	-11.72	No	N/A	15.25	0.00	15.25	0.769	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.17	22.00	-11.93	No	N/A	15.25	0.00	15.25	0.782	Eqn (c)	Ties Not Req'd

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.250	58.60	149.02	0.39

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B1)

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.40D+1.60H					
Span # 1	1	15.250	29.71	149.02	0.20
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	15.250	58.60	149.02	0.39
+1.20D+1.60L+0.30S+1.60H					
Span # 1	1	15.250	57.22	149.02	0.38
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	15.250	49.24	149.02	0.33
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	15.250	24.00	149.02	0.16
+1.20D+1.60Lr-0.50W+1.60H					
Span # 1	1	15.250	36.67	149.02	0.25
+1.20D+L+S+1.60H					
Span # 1	1	15.250	44.83	149.02	0.30
+1.20D+S+0.50W+1.60H					
Span # 1	1	15.250	19.15	149.02	0.13
+1.20D+S-0.50W+1.60H					
Span # 1	1	15.250	31.80	149.02	0.21
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	15.250	34.73	149.02	0.23
+1.20D+0.50Lr+L-W+1.60H					
Span # 1	1	15.250	57.79	149.02	0.39
+1.20D+L+0.30S+W+1.60H					
Span # 1	1	15.250	33.35	149.02	0.22
+1.20D+L+0.30S-W+1.60H					
Span # 1	1	15.250	56.37	149.02	0.38
+0.90D+W+0.90H					
Span # 1	1	15.250	6.66	149.02	0.04
+0.90D-W+0.90H					
Span # 1	1	15.250	31.78	149.02	0.21
+1.20D+L+0.150S+E+1.60H					
Span # 1	1	15.250	44.83	149.02	0.30
+0.90D+E+0.90H					
Span # 1	1	15.250	19.10	149.02	0.13

Overall Maximum Deflections

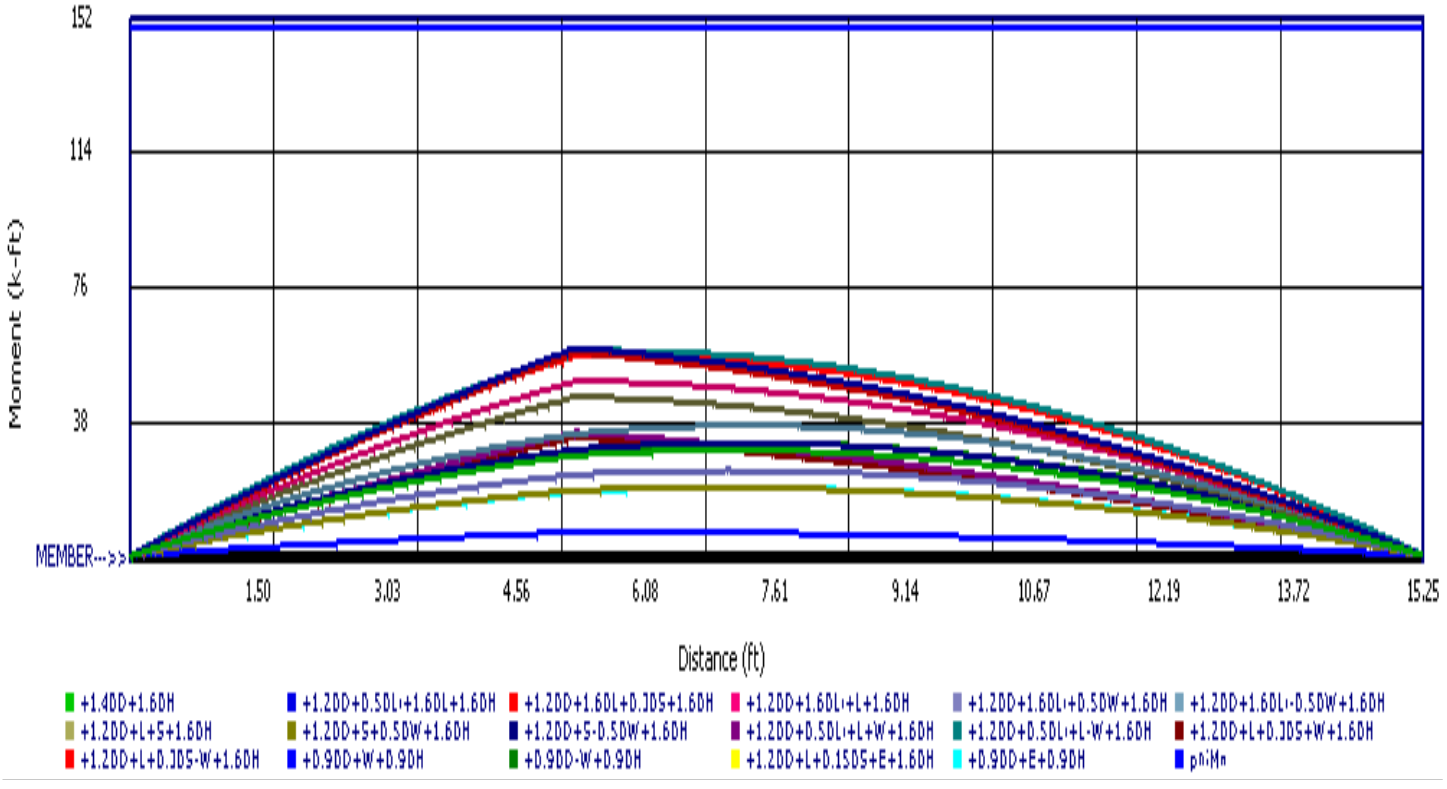
Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+L+H	0.0474	6.875		0.0000	0.000

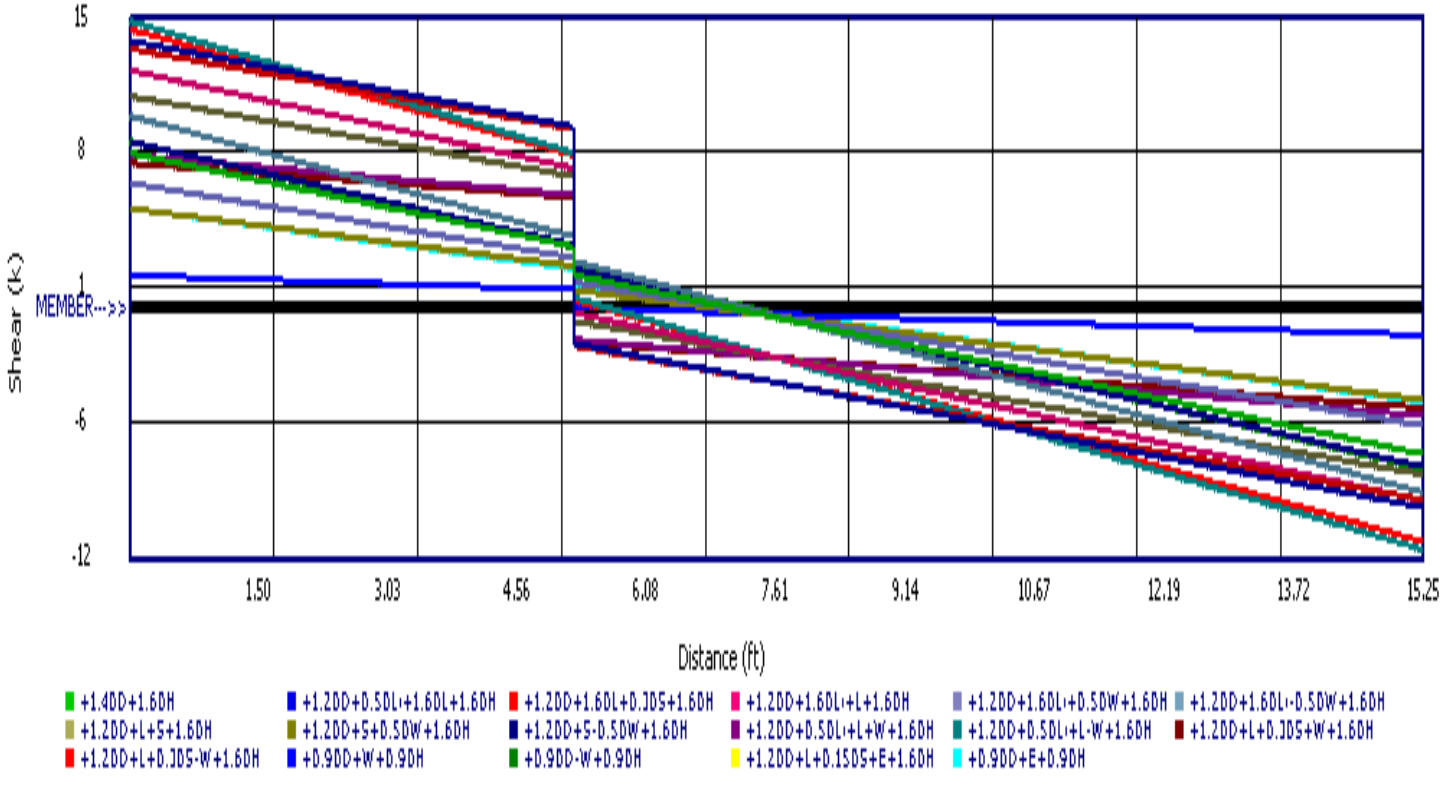
Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-Existing Roof Beam (Ref.B1)





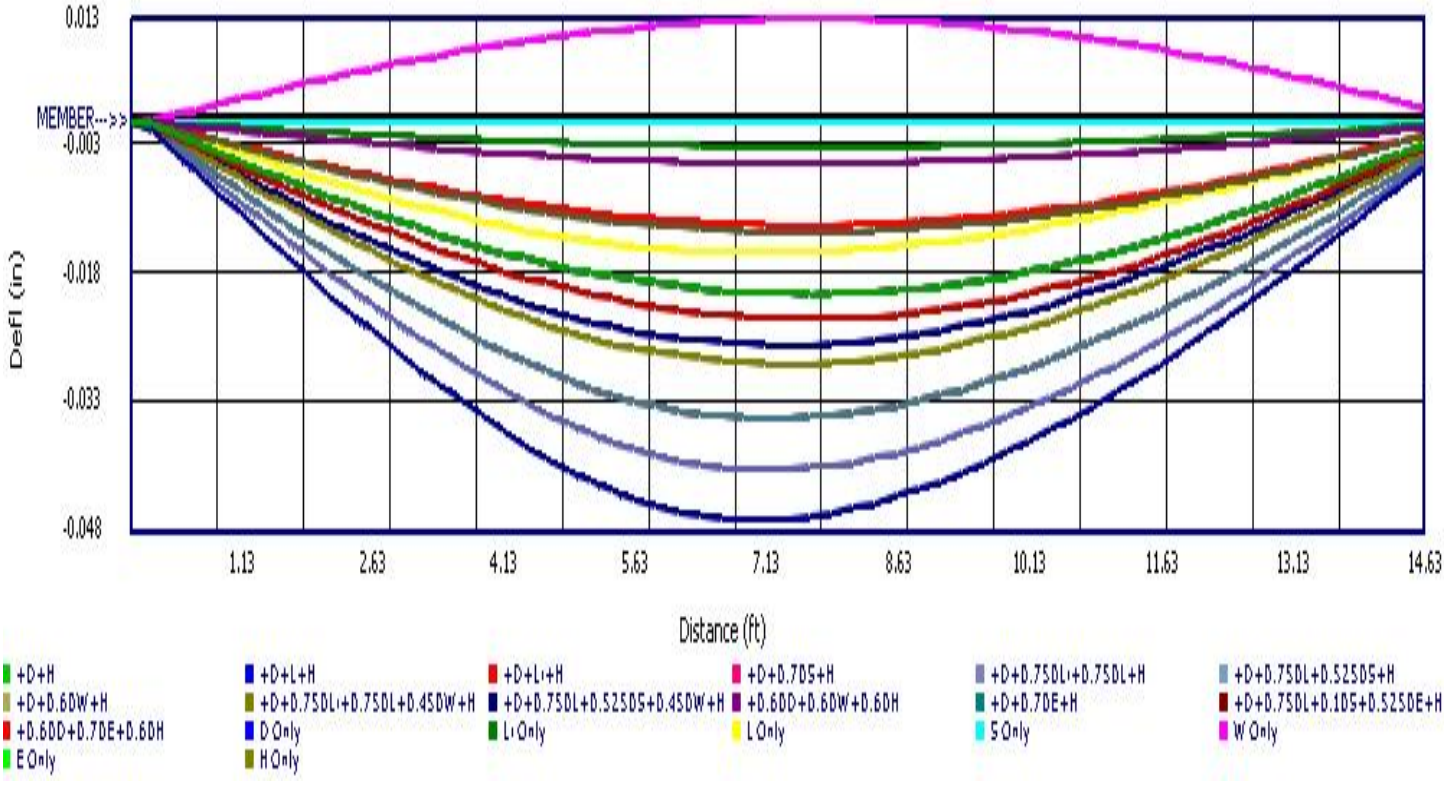
Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B1)



Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B2)

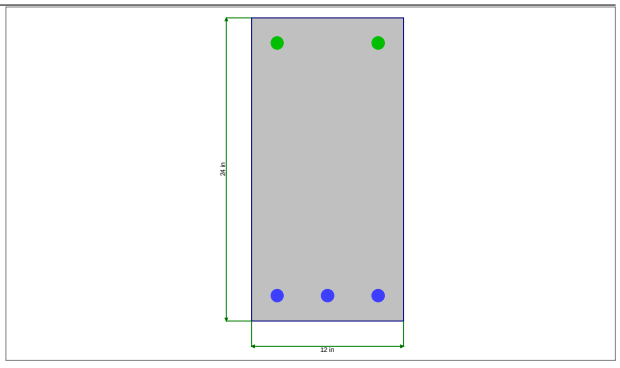
Code References

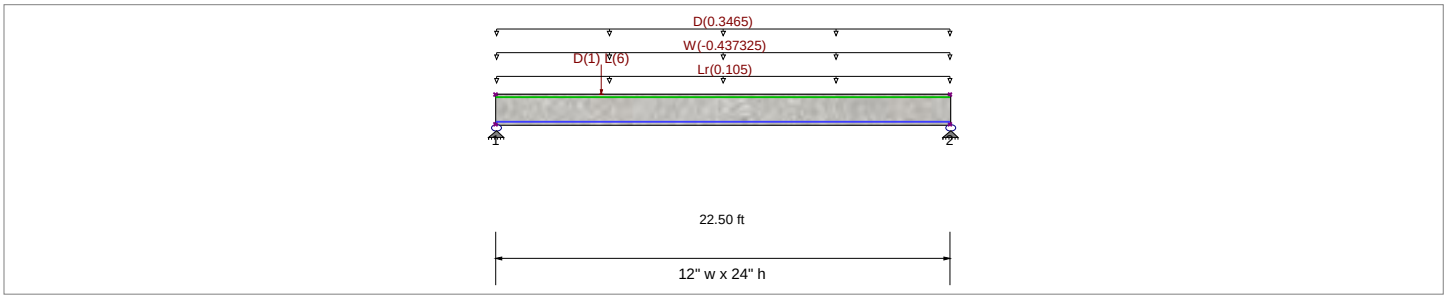
Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combination Set : ASCE 7-22 / IBC 2024 Rho (or Omega) = 1.00

General Information

f'c	=	4.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 *λ * f'c 1/2	=	503.12 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β 1	=	0.8250
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
3-#8 at 2.0 in from Bottom, from 0.0 to 22.50 ft in this span
2-#8 at 2.0 in from Top, from 0.0 to 22.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : Lr = 0.020 ksf, Tributary Width = 5.250 ft, (RLL (20psf))
Uniform Load : W = -0.08330 ksf, Tributary Width = 5.250 ft, (Wind Zone 3 (-83.3psf, Ae>100sf))
Uniform Load : D = 0.0660 ksf, Tributary Width = 5.250 ft, (Precast Roof System (66psf))
Point Load : D = 1.0, L = 6.0 k @ 5.250 ft, (Crane Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.452** : 1
Section used for this span **Typical Section**
Mu : Applied 99.357 k-ft
Mn * Phi : Allowable 220.027 k-ft
Location of maximum on span 9.918 ft
Span # where maximum occurs Span # 1

Design Limits
Tensile Strain >= Min Strain Limit (Section 9.3.3.1)
0.02056 in / in >= 0.00507 in / in OK
As Provided >= As,min (Section 9.6.1.2)
2.370 in^2 >= 1.194 in^2 OK

Maximum Deflection

Max Downward Transient Deflection	0.038 in	Ratio =	7172	>=360.0	W Only
Max Upward Transient Deflection	-0.058 in	Ratio =	4622	>=360.0	L Only
Max Downward Total Deflection	0.215 in	Ratio =	1253	>=180.0	Span: 1 : +D+0.750Lr+0.750L+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+0.750Lr+0.750L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	12.527	9.330

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B2)

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from Load Combinations	12.527	9.330
Max Upward from Load Cases	7.927	7.394
Max Downward from all Load Conditions (Resisting Uplift)	-4.920	-4.920
Max Downward from Load Cases (Resisting Uplift)	-4.920	-4.920
+D+H	7.927	7.394
+D+L+H	12.527	8.794
+D+Lr+H	9.109	8.575
+D+0.70S+H	7.927	7.394
+D+0.750Lr+0.750L+H	12.263	9.330
+D+0.750L+0.5250S+H	11.377	8.444
+D+0.60W+H	4.975	4.442
+D+0.750Lr+0.750L+0.450W+H	10.049	7.116
+D+0.750L+0.5250S+0.450W+H	9.163	6.230
+0.60D+0.60W+0.60H	1.804	1.484
+D+0.70E+H	7.927	7.394
+D+0.750L+0.10S+0.5250E+H	11.377	8.444
+0.60D+0.70E+0.60H	4.756	4.436
D Only	7.927	7.394
Lr Only	1.181	1.181
L Only	4.600	1.400
W Only	-4.920	-4.920
H Only		

Shear Stirrup Requirements

Between 0.00 to 5.08 ft, Max spacing per 9.7.6.2.2, use #3 stirrups spaced at 11 in
Between 5.12 to 20.49 ft, Ties Not Req'd, Stirrups are not required.
Between 20.53 to 22.46 ft, Max spacing per 9.7.6.2.2, use #3 stirrups spaced at 11 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+0.50Lr+L-W+1.60H	1	0.00	22.00	19.62	Yes	11.00	26.56	13.20	39.76	0.493	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.25	22.00	19.32	Yes	11.00	26.56	13.20	39.76	0.486	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.49	22.00	19.01	Yes	11.00	26.56	13.20	39.76	0.478	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.74	22.00	18.70	Yes	11.00	26.56	13.20	39.76	0.470	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.98	22.00	18.39	Yes	11.00	26.56	13.20	39.76	0.462	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	1.23	22.00	18.08	Yes	11.00	26.56	13.20	39.76	0.455	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	1.48	22.00	17.77	Yes	11.00	26.56	13.20	39.76	0.447	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	1.72	22.00	17.47	Yes	11.00	26.56	13.20	39.76	0.439	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	1.97	22.00	17.16	Yes	11.00	26.56	13.20	39.76	0.431	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	2.21	22.00	16.85	Yes	11.00	26.56	13.20	39.76	0.424	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	2.46	22.00	16.54	Yes	11.00	26.56	13.20	39.76	0.416	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	2.70	22.00	16.23	Yes	11.00	26.56	13.20	39.76	0.408	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	2.95	22.00	15.92	Yes	11.00	26.56	13.20	39.76	0.400	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	3.20	22.00	15.62	Yes	11.00	26.56	13.20	39.76	0.393	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	3.44	22.00	15.31	Yes	11.00	26.56	13.20	39.76	0.385	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	3.69	22.00	15.00	Yes	11.00	26.56	13.20	39.76	0.377	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	3.93	22.00	14.69	Yes	11.00	26.56	13.20	39.76	0.369	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	4.18	22.00	14.38	Yes	11.00	26.56	13.20	39.76	0.362	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	4.43	22.00	14.07	Yes	11.00	26.56	13.20	39.76	0.354	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	4.67	22.00	13.77	Yes	11.00	26.56	13.20	39.76	0.346	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	4.92	22.00	13.46	Yes	11.00	26.56	13.20	39.76	0.338	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	5.16	22.00	13.25	No	N/A	17.46	0.00	17.46	0.759	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.41	22.00	6.44	No	N/A	17.46	0.00	17.46	0.369	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.66	22.00	6.16	No	N/A	17.46	0.00	17.46	0.353	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.90	22.00	5.87	No	N/A	17.46	0.00	17.46	0.336	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.15	22.00	5.59	No	N/A	17.46	0.00	17.46	0.320	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.39	22.00	5.31	No	N/A	17.46	0.00	17.46	0.304	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.64	22.00	5.02	No	N/A	17.46	0.00	17.46	0.288	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.89	22.00	4.74	No	N/A	17.46	0.00	17.46	0.272	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	7.13	22.00	4.46	No	N/A	17.46	0.00	17.46	0.255	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	7.38	22.00	4.18	No	N/A	17.46	0.00	17.46	0.239	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	7.62	22.00	3.89	No	N/A	17.46	0.00	17.46	0.223	Eqn (c)	Ties Not Req'd

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B2)

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60Lr-0.50W+1.60H	1	7.87	22.00	3.61	No	N/A	17.46	0.00	17.46	0.207	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	8.11	22.00	3.33	No	N/A	17.46	0.00	17.46	0.191	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	8.36	22.00	3.04	No	N/A	17.46	0.00	17.46	0.174	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	8.61	22.00	2.76	No	N/A	17.46	0.00	17.46	0.158	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	8.85	22.00	2.48	No	N/A	17.46	0.00	17.46	0.142	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	9.10	22.00	2.20	No	N/A	17.46	0.00	17.46	0.126	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	9.34	22.00	1.91	No	N/A	17.46	0.00	17.46	0.110	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	9.59	22.00	1.63	No	N/A	17.46	0.00	17.46	0.093	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	9.84	22.00	-1.44	No	N/A	17.46	0.00	17.46	0.082	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	10.08	22.00	-1.63	No	N/A	17.46	0.00	17.46	0.093	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	10.33	22.00	-1.82	No	N/A	17.46	0.00	17.46	0.104	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	10.57	22.00	-2.00	No	N/A	17.46	0.00	17.46	0.115	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	10.82	22.00	-2.19	No	N/A	17.46	0.00	17.46	0.126	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	11.07	22.00	-2.38	No	N/A	17.46	0.00	17.46	0.136	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	11.31	22.00	-2.57	No	N/A	17.46	0.00	17.46	0.147	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	11.56	22.00	-2.77	No	N/A	17.46	0.00	17.46	0.159	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	11.80	22.00	-2.97	No	N/A	17.46	0.00	17.46	0.170	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	12.05	22.00	-3.17	No	N/A	17.46	0.00	17.46	0.182	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	12.30	22.00	-3.37	No	N/A	17.46	0.00	17.46	0.193	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	12.54	22.00	-3.57	No	N/A	17.46	0.00	17.46	0.205	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	12.79	22.00	-3.77	No	N/A	17.46	0.00	17.46	0.216	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	13.03	22.00	-3.98	No	N/A	17.46	0.00	17.46	0.228	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.28	22.00	-4.22	No	N/A	17.46	0.00	17.46	0.242	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.52	22.00	-4.53	No	N/A	17.46	0.00	17.46	0.260	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.77	22.00	-4.84	No	N/A	17.46	0.00	17.46	0.277	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.02	22.00	-5.15	No	N/A	17.46	0.00	17.46	0.295	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.26	22.00	-5.46	No	N/A	17.46	0.00	17.46	0.313	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.51	22.00	-5.76	No	N/A	17.46	0.00	17.46	0.330	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.75	22.00	-6.07	No	N/A	17.46	0.00	17.46	0.348	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.00	22.00	-6.38	No	N/A	17.46	0.00	17.46	0.365	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.25	22.00	-6.69	No	N/A	17.46	0.00	17.46	0.383	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.49	22.00	-7.00	No	N/A	17.46	0.00	17.46	0.401	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.74	22.00	-7.31	No	N/A	17.46	0.00	17.46	0.418	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.98	22.00	-7.61	No	N/A	17.46	0.00	17.46	0.436	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	16.23	22.00	-7.92	No	N/A	17.46	0.00	17.46	0.454	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	16.48	22.00	-8.23	No	N/A	17.46	0.00	17.46	0.471	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	16.72	22.00	-8.54	No	N/A	17.46	0.00	17.46	0.489	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	16.97	22.00	-8.85	No	N/A	17.46	0.00	17.46	0.507	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	17.21	22.00	-9.16	No	N/A	17.46	0.00	17.46	0.524	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	17.46	22.00	-9.46	No	N/A	17.46	0.00	17.46	0.542	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	17.70	22.00	-9.77	No	N/A	17.46	0.00	17.46	0.560	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	17.95	22.00	-10.08	No	N/A	17.46	0.00	17.46	0.577	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	18.20	22.00	-10.39	No	N/A	17.46	0.00	17.46	0.595	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	18.44	22.00	-10.70	No	N/A	17.46	0.00	17.46	0.613	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	18.69	22.00	-11.01	No	N/A	17.46	0.00	17.46	0.630	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	18.93	22.00	-11.31	No	N/A	17.46	0.00	17.46	0.648	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	19.18	22.00	-11.62	No	N/A	17.46	0.00	17.46	0.666	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	19.43	22.00	-11.93	No	N/A	17.46	0.00	17.46	0.683	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	19.67	22.00	-12.24	No	N/A	17.46	0.00	17.46	0.701	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	19.92	22.00	-12.55	No	N/A	17.46	0.00	17.46	0.719	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	20.16	22.00	-12.85	No	N/A	17.46	0.00	17.46	0.736	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	20.41	22.00	-13.16	No	N/A	17.46	0.00	17.46	0.754	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	20.66	22.00	-13.47	Yes	11.00	26.56	13.20	39.76	0.339	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	20.90	22.00	-13.78	Yes	11.00	26.56	13.20	39.76	0.347	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	21.15	22.00	-14.09	Yes	11.00	26.56	13.20	39.76	0.354	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	21.39	22.00	-14.40	Yes	11.00	26.56	13.20	39.76	0.362	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	21.64	22.00	-14.70	Yes	11.00	26.56	13.20	39.76	0.370	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	21.89	22.00	-15.01	Yes	11.00	26.56	13.20	39.76	0.378	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	22.13	22.00	-15.32	Yes	11.00	26.56	13.20	39.76	0.385	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	22.38	22.00	-15.63	Yes	11.00	26.56	13.20	39.76	0.393	Eqn (a)	Max spacing per 9.7.6.2

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio

MAXimum BENDING Envelope

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B2)

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 1 +1.40D+1.60H	1	22.500	99.36	220.03	0.45
Span # 1 +1.20D+0.50Lr+1.60L+1.60H	1	22.500	60.12	220.03	0.27
Span # 1 +1.20D+1.60L+0.30S+1.60H	1	22.500	83.90	220.03	0.38
Span # 1 +1.20D+1.60Lr+L+1.60H	1	22.500	80.84	220.03	0.37
Span # 1 +1.20D+1.60Lr+0.50W+1.60H	1	22.500	79.38	220.03	0.36
Span # 1 +1.20D+1.60Lr-0.50W+1.60H	1	22.500	48.33	220.03	0.22
Span # 1 +1.20D+L+S+1.60H	1	22.500	75.99	220.03	0.35
Span # 1 +1.20D+S+0.50W+1.60H	1	22.500	69.08	220.03	0.31
Span # 1 +1.20D+S-0.50W+1.60H	1	22.500	37.72	220.03	0.17
Span # 1 +1.20D+0.50Lr+L+W+1.60H	1	22.500	65.36	220.03	0.30
Span # 1 +1.20D+0.50Lr+L-W+1.60H	1	22.500	46.61	220.03	0.21
Span # 1 +1.20D+L+0.30S+W+1.60H	1	22.500	99.36	220.03	0.45
Span # 1 +1.20D+L+0.30S-W+1.60H	1	22.500	43.88	220.03	0.20
Span # 1 +0.90D+W+0.90H	1	22.500	96.08	220.03	0.44
Span # 1 +0.90D-W+0.90H	1	22.500	11.10	220.03	0.05
Span # 1 +1.20D+L+0.150S+E+1.60H	1	22.500	66.31	220.03	0.30
Span # 1 +0.90D+E+0.90H	1	22.500	69.08	220.03	0.31
Span # 1	1	22.500	38.65	220.03	0.18

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+0.750Lr+0.750L+H	0.2154	10.881		0.0000	0.000

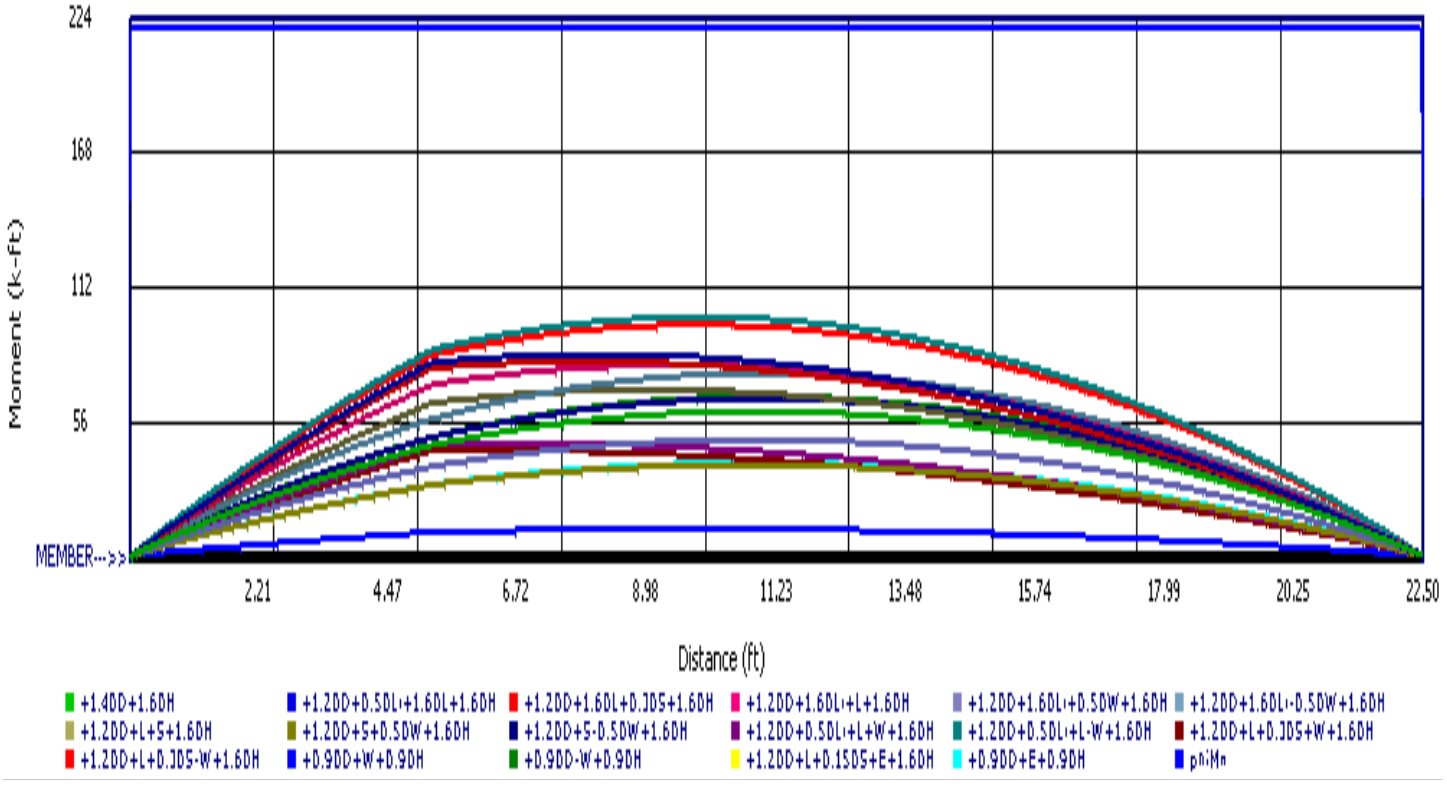
Project Title:
Engineer:
Project ID:
Project Descr:

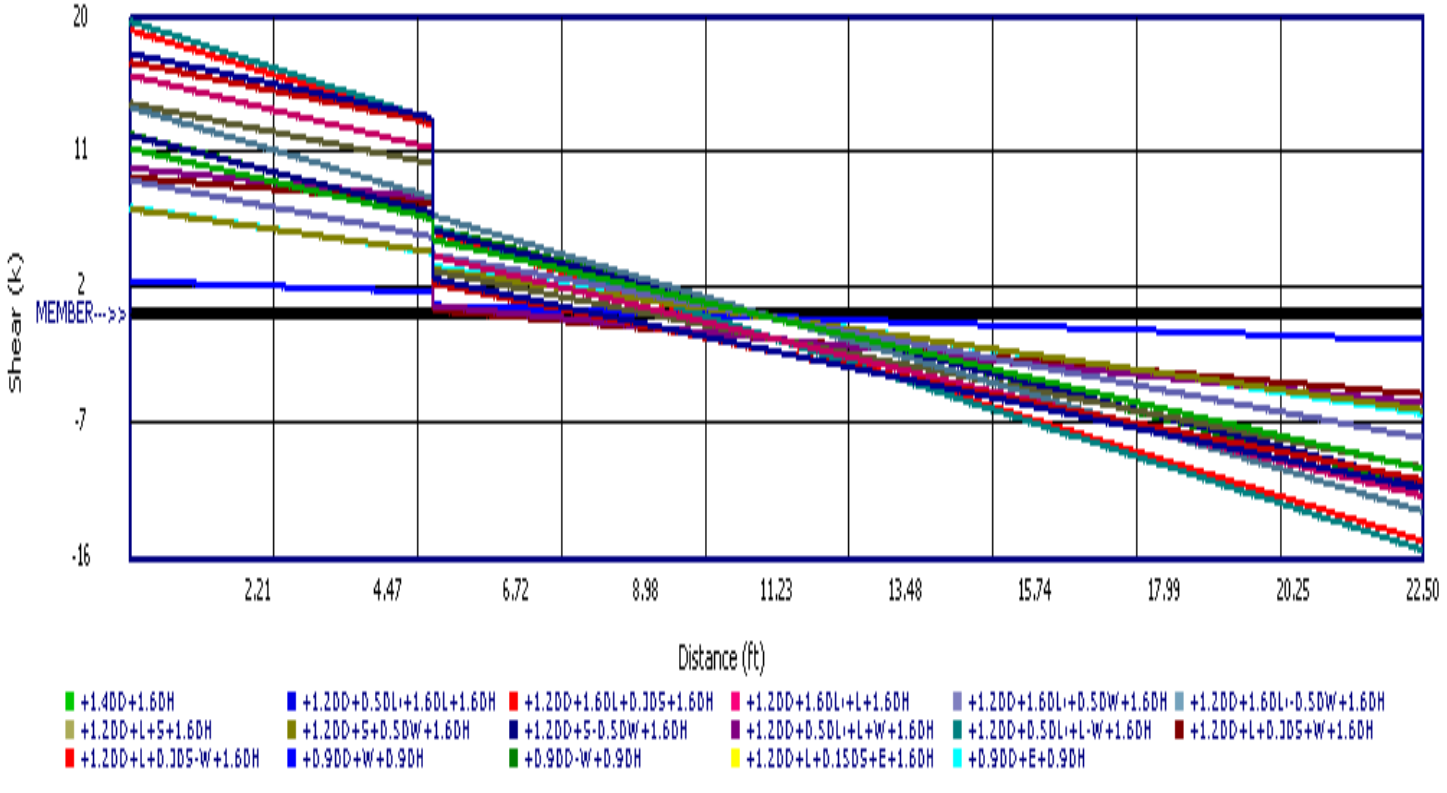
Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B2)





Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

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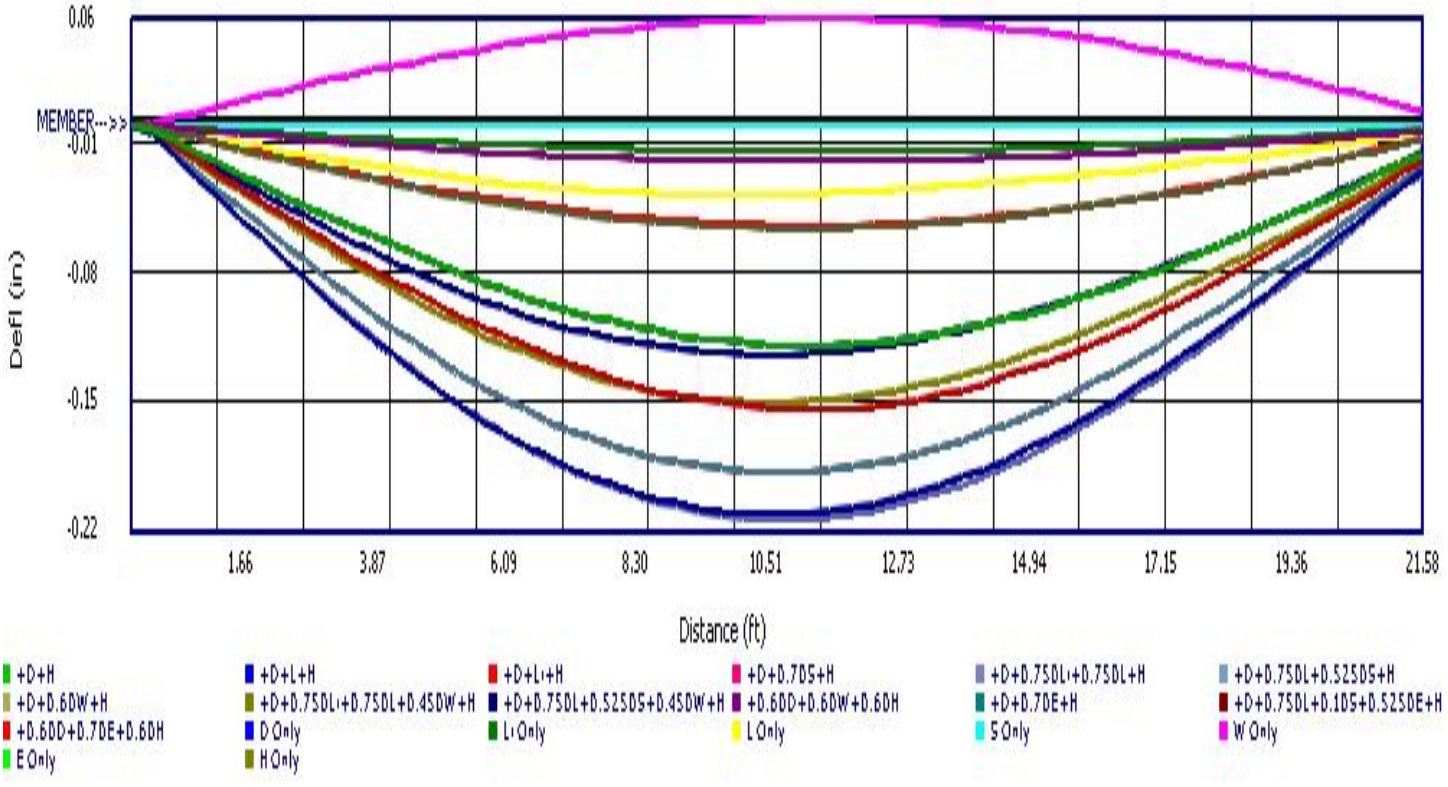
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B2)



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Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B3)

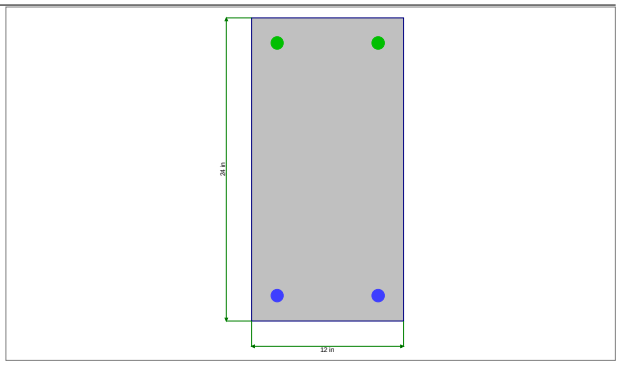
Code References

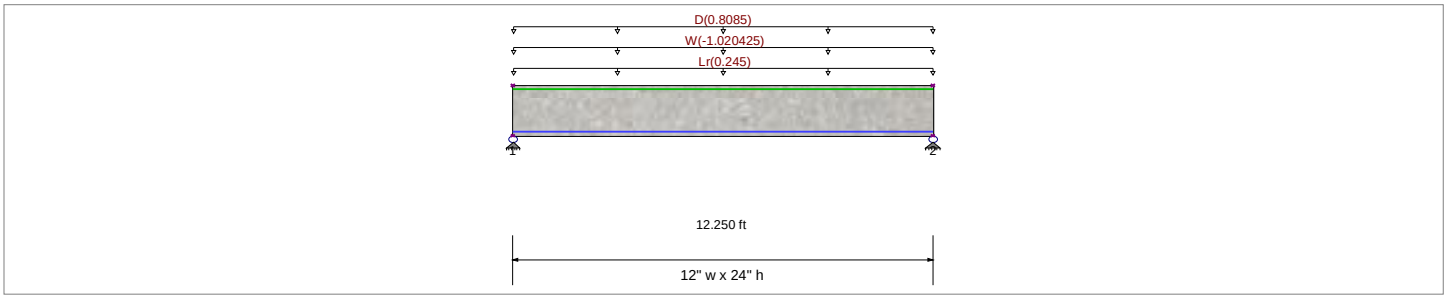
Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combination Set : ASCE 7-22 / IBC 2024 Rho (or Omega) = 1.00

General Information

f'c	=	4.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 *λ * f'c$^{1/2}$	=	503.12 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.8250
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#8 at 2.0 in from Bottom, from 0.0 to 12.250 ft in this span 2-#8 at 2.0 in from Top, from 0.0 to 12.250 ft in this spa

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : Lr = 0.020 ksf, Tributary Width = 12.250 ft, (RLL (20psf))
Uniform Load : W = -0.08330 ksf, Tributary Width = 12.250 ft, (Wind Zone 3 (-83.3psf, Ae>100sf))
Uniform Load : D = 0.0660 ksf, Tributary Width = 12.250 ft, (Precast Roof System (66psf))

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.310** : 1	Design Limits	
Section used for this span	**Typical Section**	Tensile Strain >= Min Strain Limit	(Section 9.3.3.1)
Mu : Applied	46.165 k-ft	0.02705 in / in >=	0.00507 in / in OK
Mn * Phi : Allowable	149.020 k-ft	As Provided >= As,min	(Section 9.6.1.2)
Location of maximum on span	6.136 ft	1.580 in^2 >=	0.740 in^2 OK
Span # where maximum occurs	Span # 1		

Maximum Deflection

Max Downward Transient Deflection	0.003 in	Ratio =	51124 >=360.0	W Only
Max Upward Transient Deflection	-0.012 in	Ratio =	12274 >=360.0	Lr Only
Max Downward Total Deflection	0.016 in	Ratio =	9323 >=180.0	Span: 1 : +D+Lr+H
Max Upward Total Deflection	0.000 in	Ratio =	0 <180.0	Span: 1 : +D+Lr+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	8.229	8.229
Max Upward from Load Combinations	8.229	8.229

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Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B3)

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from Load Cases	6.728	6.728
Max Downward from all Load Conditions (Resisting Uplift)	-6.250	-6.250
Max Downward from Load Cases (Resisting Uplift)	-6.250	-6.250
+D+H	6.728	6.728
+D+L+H	6.728	6.728
+D+Lr+H	8.229	8.229
+D+0.70S+H	6.728	6.728
+D+0.750Lr+0.750L+H	7.854	7.854
+D+0.750L+0.5250S+H	6.728	6.728
+D+0.60W+H	2.978	2.978
+D+0.750Lr+0.750L+0.450W+H	5.041	5.041
+D+0.750L+0.5250S+0.450W+H	3.916	3.916
+0.60D+0.60W+0.60H	0.287	0.287
+D+0.70E+H	6.728	6.728
+D+0.750L+0.10S+0.5250E+H	6.728	6.728
+0.60D+0.70E+0.60H	4.037	4.037
D Only	6.728	6.728
Lr Only	1.501	1.501
W Only	-6.250	-6.250
H Only		

Shear Stirrup Requirements

Between 0.00 to 0.71 ft, Max spacing per 9.7.6.2.2, use #3 stirrups spaced at 11 in
Between 0.74 to 11.51 ft, Ties Not Req'd, Stirrups are not required.
Between 11.54 to 12.23 ft, Max spacing per 9.7.6.2.2, use #3 stirrups spaced at 11 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+0.50Lr+L-W+1.60H	1	0.00	22.00	15.07	Yes	11.00	26.56	13.20	39.76	0.379	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.13	22.00	14.74	Yes	11.00	26.56	13.20	39.76	0.371	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.27	22.00	14.42	Yes	11.00	26.56	13.20	39.76	0.363	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.40	22.00	14.09	Yes	11.00	26.56	13.20	39.76	0.354	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.54	22.00	13.76	Yes	11.00	26.56	13.20	39.76	0.346	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.67	22.00	13.43	Yes	11.00	26.56	13.20	39.76	0.338	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.80	22.00	13.10	No	N/A	15.25	0.00	15.25	0.859	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	0.94	22.00	12.77	No	N/A	15.25	0.00	15.25	0.837	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.07	22.00	12.44	No	N/A	15.25	0.00	15.25	0.816	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.20	22.00	12.11	No	N/A	15.25	0.00	15.25	0.794	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.34	22.00	11.78	No	N/A	15.25	0.00	15.25	0.772	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.47	22.00	11.45	No	N/A	15.25	0.00	15.25	0.751	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.61	22.00	11.12	No	N/A	15.25	0.00	15.25	0.729	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.74	22.00	10.79	No	N/A	15.25	0.00	15.25	0.708	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	1.87	22.00	10.46	No	N/A	15.25	0.00	15.25	0.686	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.01	22.00	10.13	No	N/A	15.25	0.00	15.25	0.664	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.14	22.00	9.80	No	N/A	15.25	0.00	15.25	0.643	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.28	22.00	9.47	No	N/A	15.25	0.00	15.25	0.621	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.41	22.00	9.14	No	N/A	15.25	0.00	15.25	0.600	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.54	22.00	8.81	No	N/A	15.25	0.00	15.25	0.578	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.68	22.00	8.48	No	N/A	15.25	0.00	15.25	0.556	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.81	22.00	8.15	No	N/A	15.25	0.00	15.25	0.535	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.95	22.00	7.83	No	N/A	15.25	0.00	15.25	0.513	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.08	22.00	7.50	No	N/A	15.25	0.00	15.25	0.491	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.21	22.00	7.17	No	N/A	15.25	0.00	15.25	0.470	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.35	22.00	6.84	No	N/A	15.25	0.00	15.25	0.448	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.48	22.00	6.51	No	N/A	15.25	0.00	15.25	0.427	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.61	22.00	6.18	No	N/A	15.25	0.00	15.25	0.405	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.75	22.00	5.85	No	N/A	15.25	0.00	15.25	0.383	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.88	22.00	5.52	No	N/A	15.25	0.00	15.25	0.362	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.02	22.00	5.19	No	N/A	15.25	0.00	15.25	0.340	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.15	22.00	4.86	No	N/A	15.25	0.00	15.25	0.319	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.28	22.00	4.53	No	N/A	15.25	0.00	15.25	0.297	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.42	22.00	4.20	No	N/A	15.25	0.00	15.25	0.275	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.55	22.00	3.87	No	N/A	15.25	0.00	15.25	0.254	Eqn (c)	Ties Not Req'd

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Concrete Beam

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DESCRIPTION: G575-Existing Roof Beam (Ref.B3)

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+0.50Lr+L-W+1.60H1		4.69	22.00	3.54	No	N/A	15.25	0.00	15.25	0.232	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		4.82	22.00	3.21	No	N/A	15.25	0.00	15.25	0.211	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		4.95	22.00	2.88	No	N/A	15.25	0.00	15.25	0.189	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		5.09	22.00	2.55	No	N/A	15.25	0.00	15.25	0.167	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		5.22	22.00	2.22	No	N/A	15.25	0.00	15.25	0.146	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		5.36	22.00	1.89	No	N/A	15.25	0.00	15.25	0.124	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		5.49	22.00	1.57	No	N/A	15.25	0.00	15.25	0.103	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		5.62	22.00	1.24	No	N/A	15.25	0.00	15.25	0.081	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		5.76	22.00	0.91	No	N/A	15.25	0.00	15.25	0.059	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		5.89	22.00	0.58	No	N/A	15.25	0.00	15.25	0.038	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		6.02	22.00	0.25	No	N/A	15.25	0.00	15.25	0.016	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		6.16	22.00	-0.08	No	N/A	15.25	0.00	15.25	0.005	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		6.29	22.00	-0.41	No	N/A	15.25	0.00	15.25	0.027	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		6.43	22.00	-0.74	No	N/A	15.25	0.00	15.25	0.049	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		6.56	22.00	-1.07	No	N/A	15.25	0.00	15.25	0.070	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		6.69	22.00	-1.40	No	N/A	15.25	0.00	15.25	0.092	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		6.83	22.00	-1.73	No	N/A	15.25	0.00	15.25	0.113	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		6.96	22.00	-2.06	No	N/A	15.25	0.00	15.25	0.135	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		7.10	22.00	-2.39	No	N/A	15.25	0.00	15.25	0.157	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		7.23	22.00	-2.72	No	N/A	15.25	0.00	15.25	0.178	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		7.36	22.00	-3.05	No	N/A	15.25	0.00	15.25	0.200	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		7.50	22.00	-3.38	No	N/A	15.25	0.00	15.25	0.221	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		7.63	22.00	-3.71	No	N/A	15.25	0.00	15.25	0.243	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		7.77	22.00	-4.04	No	N/A	15.25	0.00	15.25	0.265	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		7.90	22.00	-4.37	No	N/A	15.25	0.00	15.25	0.286	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.03	22.00	-4.70	No	N/A	15.25	0.00	15.25	0.308	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.17	22.00	-5.02	No	N/A	15.25	0.00	15.25	0.329	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.30	22.00	-5.35	No	N/A	15.25	0.00	15.25	0.351	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.43	22.00	-5.68	No	N/A	15.25	0.00	15.25	0.373	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.57	22.00	-6.01	No	N/A	15.25	0.00	15.25	0.394	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.70	22.00	-6.34	No	N/A	15.25	0.00	15.25	0.416	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.84	22.00	-6.67	No	N/A	15.25	0.00	15.25	0.437	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.97	22.00	-7.00	No	N/A	15.25	0.00	15.25	0.459	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.10	22.00	-7.33	No	N/A	15.25	0.00	15.25	0.481	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.24	22.00	-7.66	No	N/A	15.25	0.00	15.25	0.502	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.37	22.00	-7.99	No	N/A	15.25	0.00	15.25	0.524	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.51	22.00	-8.32	No	N/A	15.25	0.00	15.25	0.545	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.64	22.00	-8.65	No	N/A	15.25	0.00	15.25	0.567	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.77	22.00	-8.98	No	N/A	15.25	0.00	15.25	0.589	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.91	22.00	-9.31	No	N/A	15.25	0.00	15.25	0.610	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.04	22.00	-9.64	No	N/A	15.25	0.00	15.25	0.632	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.17	22.00	-9.97	No	N/A	15.25	0.00	15.25	0.654	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.31	22.00	-10.30	No	N/A	15.25	0.00	15.25	0.675	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.44	22.00	-10.63	No	N/A	15.25	0.00	15.25	0.697	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.58	22.00	-10.96	No	N/A	15.25	0.00	15.25	0.718	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.71	22.00	-11.29	No	N/A	15.25	0.00	15.25	0.740	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.84	22.00	-11.61	No	N/A	15.25	0.00	15.25	0.762	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.98	22.00	-11.94	No	N/A	15.25	0.00	15.25	0.783	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.11	22.00	-12.27	No	N/A	15.25	0.00	15.25	0.805	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.25	22.00	-12.60	No	N/A	15.25	0.00	15.25	0.826	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.38	22.00	-12.93	No	N/A	15.25	0.00	15.25	0.848	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.51	22.00	-13.26	No	N/A	15.25	0.00	15.25	0.870	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.65	22.00	-13.59	Yes	11.00	26.56	13.20	39.76	0.342	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		11.78	22.00	-13.92	Yes	11.00	26.56	13.20	39.76	0.350	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		11.92	22.00	-14.25	Yes	11.00	26.56	13.20	39.76	0.358	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		12.05	22.00	-14.58	Yes	11.00	26.56	13.20	39.76	0.367	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		12.18	22.00	-14.91	Yes	11.00	26.56	13.20	39.76	0.375	Eqn (a)	Max spacing per 9.7.6.2

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	12.250	46.17	149.02	0.31
+1.40D+1.60H					
Span # 1	1	12.250	28.85	149.02	0.19

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B3)

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	12.250	27.02	149.02	0.18
+1.20D+1.60L+0.30S+1.60H					
Span # 1	1	12.250	24.73	149.02	0.17
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	12.250	32.08	149.02	0.22
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	12.250	22.51	149.02	0.15
+1.20D+1.60Lr-0.50W+1.60H					
Span # 1	1	12.250	41.65	149.02	0.28
+1.20D+L+S+1.60H					
Span # 1	1	12.250	24.73	149.02	0.17
+1.20D+S+0.50W+1.60H					
Span # 1	1	12.250	15.16	149.02	0.10
+1.20D+S-0.50W+1.60H					
Span # 1	1	12.250	34.30	149.02	0.23
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	12.250	7.88	149.02	0.05
+1.20D+0.50Lr+L-W+1.60H					
Span # 1	1	12.250	46.17	149.02	0.31
+1.20D+L+0.30S+W+1.60H					
Span # 1	1	12.250	5.59	149.02	0.04
+1.20D+L+0.30S-W+1.60H					
Span # 1	1	12.250	43.87	149.02	0.29
+0.90D+W+0.90H					
Span # 1	1	12.250	-0.60	149.02	0.00
+0.90D-W+0.90H					
Span # 1	1	12.250	37.69	149.02	0.25
+1.20D+L+0.150S+E+1.60H					
Span # 1	1	12.250	24.73	149.02	0.17
+0.90D+E+0.90H					
Span # 1	1	12.250	18.54	149.02	0.12

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+Lr+H	0.0158	6.125		0.0000	0.000

Project Title:
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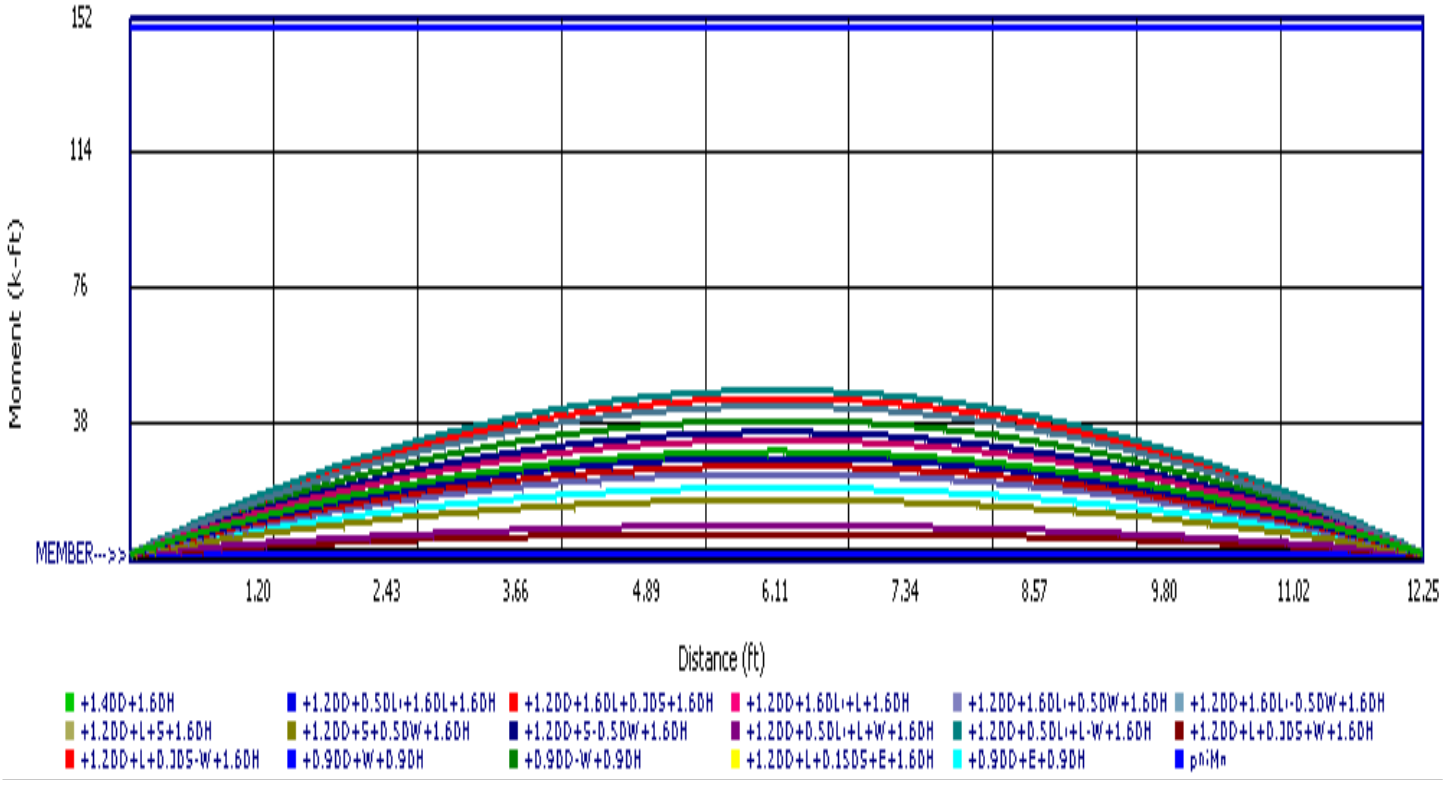
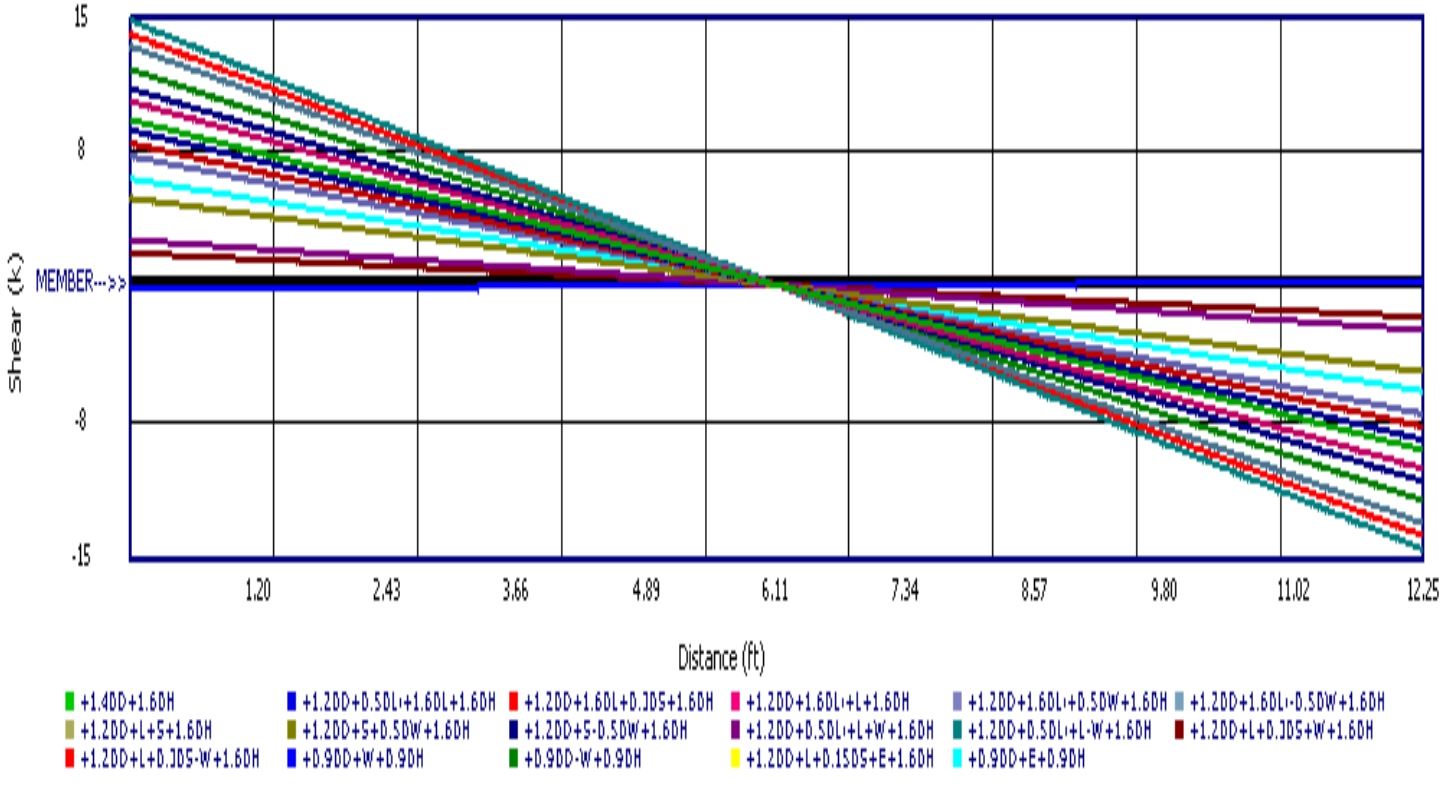
Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam (Ref.B3)





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Project ID:
Project Descr:

Concrete Beam

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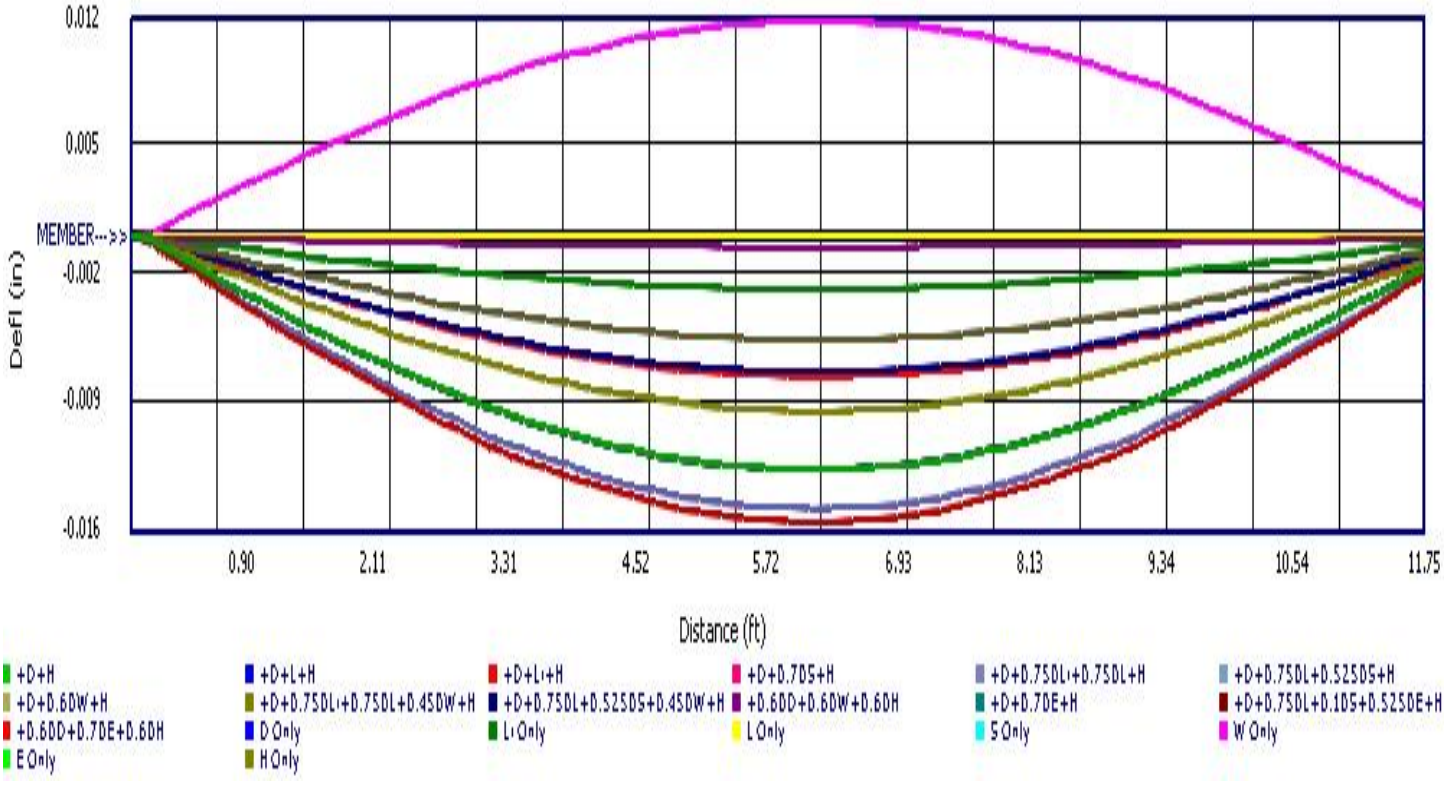
DESCRIPTION: G575-Existing Roof Beam (Ref.B3)



Project Title:
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Concrete Beam

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LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B1) with New Load Path

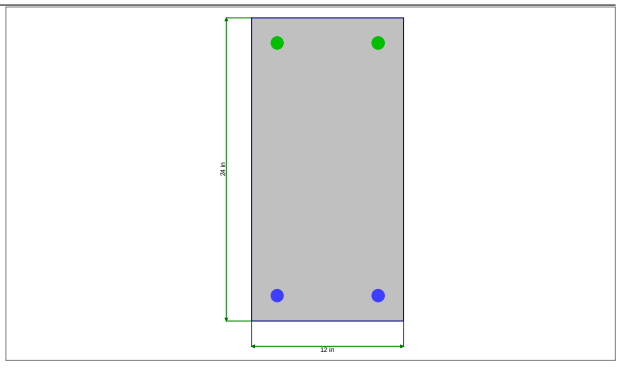
Code References

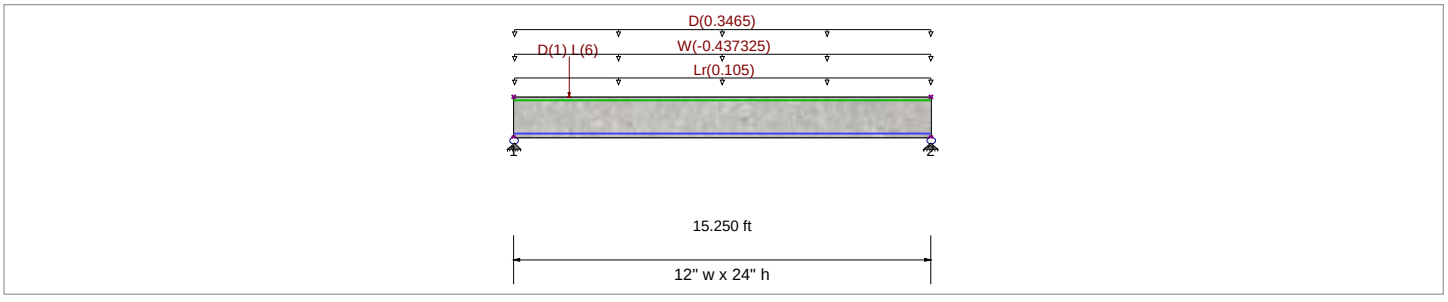
Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combination Set : ASCE 7-22 / IBC 2024 Rho (or Omega) = 1.00

General Information

f'c	=	4.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 *λ * f'c 1/2	=	503.12 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β 1	=	0.8250
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#8 at 2.0 in from Bottom, from 0.0 to 15.250 ft in this span 2-#8 at 2.0 in from Top, from 0.0 to 15.250 ft in this spa

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : Lr = 0.020 ksf, Tributary Width = 5.250 ft, (RLL (20psf))
Uniform Load : W = -0.08330 ksf, Tributary Width = 5.250 ft, (Wind Zone 3 (-83.3psf, Ae>100sf))
Uniform Load : D = 0.0660 ksf, Tributary Width = 5.250 ft, (Precast Roof System (66psf))
Point Load : D = 1.0, L = 6.0 k @ 2.0 ft, (Crane Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.295** : 1	Design Limits	
Section used for this span	**Typical Section**	Tensile Strain >= Min Strain Limit	(Section 9.3.3.1)
Mu : Applied	43.996 k-ft	0.02705 in / in >=	0.00507 in / in OK
Mn * Phi : Allowable	149.020 k-ft	As Provided >= As,min	(Section 9.6.1.2)
Location of maximum on span	6.861 ft	1.580 in^2 >=	0.705 in^2 OK
Span # where maximum occurs	Span # 1		

Maximum Deflection

Max Downward Transient Deflection	0.007 in	Ratio =	26227	>=360.0	W Only
Max Upward Transient Deflection	-0.012 in	Ratio =	14845	>=360.0	L Only
Max Downward Total Deflection	0.026 in	Ratio =	6920	>=180.0	Span: 1 : +D+0.750Lr+0.750L+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+0.750Lr+0.750L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	10.936	6.175

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B1) with New Load Path

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from Load Combinations	10.936	6.175
Max Upward from Load Cases	5.722	4.984
Max Downward from all Load Conditions (Resisting Uplift)	-3.335	-3.335
Max Downward from Load Cases (Resisting Uplift)	-3.335	-3.335
+D+H	5.722	4.984
+D+L+H	10.936	5.771
+D+Lr+H	6.523	5.785
+D+0.70S+H	5.722	4.984
+D+0.750Lr+0.750L+H	10.233	6.175
+D+0.750L+0.5250S+H	9.632	5.574
+D+0.60W+H	3.721	2.984
+D+0.750Lr+0.750L+0.450W+H	8.732	4.674
+D+0.750L+0.5250S+0.450W+H	8.132	4.074
+0.60D+0.60W+0.60H	1.433	0.990
+D+0.70E+H	5.722	4.984
+D+0.750L+0.10S+0.5250E+H	9.632	5.574
+0.60D+0.70E+0.60H	3.433	2.991
D Only	5.722	4.984
Lr Only	0.801	0.801
L Only	5.213	0.787
W Only	-3.335	-3.335
H Only		

Shear Stirrup Requirements

Between 0.00 to 1.97 ft, Max spacing per 9.7.6.2.2, use #3 stirrups spaced at 11 in
Between 2.00 to 15.22 ft, Ties Not Req'd, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+0.50Lr+L-W+1.60H	1	0.00	22.00	15.82	Yes	11.00	26.56	13.20	39.76	0.398	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.17	22.00	15.61	Yes	11.00	26.56	13.20	39.76	0.392	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.33	22.00	15.40	Yes	11.00	26.56	13.20	39.76	0.387	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	0.50	22.00	15.20	Yes	11.00	26.56	13.20	39.76	0.382	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	0.67	22.00	15.06	Yes	11.00	26.56	13.20	39.76	0.379	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	0.83	22.00	14.93	Yes	11.00	26.56	13.20	39.76	0.375	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	1.00	22.00	14.79	Yes	11.00	26.56	13.20	39.76	0.372	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	1.17	22.00	14.66	Yes	11.00	26.56	13.20	39.76	0.369	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	1.33	22.00	14.52	Yes	11.00	26.56	13.20	39.76	0.365	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	1.50	22.00	14.38	Yes	11.00	26.56	13.20	39.76	0.362	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	1.67	22.00	14.25	Yes	11.00	26.56	13.20	39.76	0.358	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+1.60L+1.60H	1	1.83	22.00	14.11	Yes	11.00	26.56	13.20	39.76	0.355	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+1.60Lr-0.50W+1.60H	1	2.00	22.00	6.31	No	N/A	15.25	0.00	15.25	0.414	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	2.17	22.00	6.12	No	N/A	15.25	0.00	15.25	0.401	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	2.33	22.00	5.93	No	N/A	15.25	0.00	15.25	0.389	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	2.50	22.00	5.74	No	N/A	15.25	0.00	15.25	0.376	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	2.67	22.00	5.55	No	N/A	15.25	0.00	15.25	0.364	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	2.83	22.00	5.36	No	N/A	15.25	0.00	15.25	0.351	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	3.00	22.00	5.16	No	N/A	15.25	0.00	15.25	0.339	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	3.17	22.00	4.97	No	N/A	15.25	0.00	15.25	0.326	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	3.33	22.00	4.78	No	N/A	15.25	0.00	15.25	0.313	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	3.50	22.00	4.59	No	N/A	15.25	0.00	15.25	0.301	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	3.67	22.00	4.40	No	N/A	15.25	0.00	15.25	0.288	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	3.83	22.00	4.20	No	N/A	15.25	0.00	15.25	0.276	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	4.00	22.00	4.01	No	N/A	15.25	0.00	15.25	0.263	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	4.17	22.00	3.82	No	N/A	15.25	0.00	15.25	0.251	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	4.33	22.00	3.63	No	N/A	15.25	0.00	15.25	0.238	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	4.50	22.00	3.44	No	N/A	15.25	0.00	15.25	0.225	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	4.67	22.00	3.25	No	N/A	15.25	0.00	15.25	0.213	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	4.83	22.00	3.05	No	N/A	15.25	0.00	15.25	0.200	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.00	22.00	2.86	No	N/A	15.25	0.00	15.25	0.188	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.17	22.00	2.67	No	N/A	15.25	0.00	15.25	0.175	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.33	22.00	2.48	No	N/A	15.25	0.00	15.25	0.163	Eqn (c)	Ties Not Req'd

Project Title:
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Concrete Beam

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LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B1) with New Load Path

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60Lr-0.50W+1.60H	1	5.50	22.00	2.29	No	N/A	15.25	0.00	15.25	0.150	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.67	22.00	2.10	No	N/A	15.25	0.00	15.25	0.137	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	5.83	22.00	1.90	No	N/A	15.25	0.00	15.25	0.125	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.00	22.00	1.71	No	N/A	15.25	0.00	15.25	0.112	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.17	22.00	1.52	No	N/A	15.25	0.00	15.25	0.100	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.33	22.00	1.33	No	N/A	15.25	0.00	15.25	0.087	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.50	22.00	1.14	No	N/A	15.25	0.00	15.25	0.075	Eqn (c)	Ties Not Req'd
+1.20D+1.60Lr-0.50W+1.60H	1	6.67	22.00	0.95	No	N/A	15.25	0.00	15.25	0.062	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	6.83	22.00	-0.81	No	N/A	15.25	0.00	15.25	0.053	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	7.00	22.00	-0.94	No	N/A	15.25	0.00	15.25	0.062	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	7.17	22.00	-1.07	No	N/A	15.25	0.00	15.25	0.070	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	7.33	22.00	-1.19	No	N/A	15.25	0.00	15.25	0.078	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.30S+1.60H	1	7.50	22.00	-1.32	No	N/A	15.25	0.00	15.25	0.087	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	7.67	22.00	-1.45	No	N/A	15.25	0.00	15.25	0.095	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	7.83	22.00	-1.59	No	N/A	15.25	0.00	15.25	0.104	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.00	22.00	-1.72	No	N/A	15.25	0.00	15.25	0.113	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.17	22.00	-1.86	No	N/A	15.25	0.00	15.25	0.122	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.33	22.00	-1.99	No	N/A	15.25	0.00	15.25	0.131	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.50	22.00	-2.13	No	N/A	15.25	0.00	15.25	0.140	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H	1	8.67	22.00	-2.27	No	N/A	15.25	0.00	15.25	0.149	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	8.83	22.00	-2.46	No	N/A	15.25	0.00	15.25	0.161	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	9.00	22.00	-2.67	No	N/A	15.25	0.00	15.25	0.175	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	9.17	22.00	-2.88	No	N/A	15.25	0.00	15.25	0.189	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	9.33	22.00	-3.09	No	N/A	15.25	0.00	15.25	0.202	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	9.50	22.00	-3.29	No	N/A	15.25	0.00	15.25	0.216	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	9.67	22.00	-3.50	No	N/A	15.25	0.00	15.25	0.230	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	9.83	22.00	-3.71	No	N/A	15.25	0.00	15.25	0.243	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.00	22.00	-3.92	No	N/A	15.25	0.00	15.25	0.257	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.17	22.00	-4.13	No	N/A	15.25	0.00	15.25	0.271	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.33	22.00	-4.34	No	N/A	15.25	0.00	15.25	0.284	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.50	22.00	-4.55	No	N/A	15.25	0.00	15.25	0.298	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.67	22.00	-4.76	No	N/A	15.25	0.00	15.25	0.312	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	10.83	22.00	-4.97	No	N/A	15.25	0.00	15.25	0.326	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.00	22.00	-5.17	No	N/A	15.25	0.00	15.25	0.339	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.17	22.00	-5.38	No	N/A	15.25	0.00	15.25	0.353	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.33	22.00	-5.59	No	N/A	15.25	0.00	15.25	0.367	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.50	22.00	-5.80	No	N/A	15.25	0.00	15.25	0.380	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.67	22.00	-6.01	No	N/A	15.25	0.00	15.25	0.394	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	11.83	22.00	-6.22	No	N/A	15.25	0.00	15.25	0.408	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.00	22.00	-6.43	No	N/A	15.25	0.00	15.25	0.421	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.17	22.00	-6.64	No	N/A	15.25	0.00	15.25	0.435	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.33	22.00	-6.85	No	N/A	15.25	0.00	15.25	0.449	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.50	22.00	-7.06	No	N/A	15.25	0.00	15.25	0.463	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.67	22.00	-7.26	No	N/A	15.25	0.00	15.25	0.476	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	12.83	22.00	-7.47	No	N/A	15.25	0.00	15.25	0.490	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.00	22.00	-7.68	No	N/A	15.25	0.00	15.25	0.504	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.17	22.00	-7.89	No	N/A	15.25	0.00	15.25	0.517	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.33	22.00	-8.10	No	N/A	15.25	0.00	15.25	0.531	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.50	22.00	-8.31	No	N/A	15.25	0.00	15.25	0.545	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.67	22.00	-8.52	No	N/A	15.25	0.00	15.25	0.558	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	13.83	22.00	-8.73	No	N/A	15.25	0.00	15.25	0.572	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.00	22.00	-8.94	No	N/A	15.25	0.00	15.25	0.586	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.17	22.00	-9.14	No	N/A	15.25	0.00	15.25	0.600	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.33	22.00	-9.35	No	N/A	15.25	0.00	15.25	0.613	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.50	22.00	-9.56	No	N/A	15.25	0.00	15.25	0.627	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.67	22.00	-9.77	No	N/A	15.25	0.00	15.25	0.641	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	14.83	22.00	-9.98	No	N/A	15.25	0.00	15.25	0.654	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.00	22.00	-10.19	No	N/A	15.25	0.00	15.25	0.668	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	15.17	22.00	-10.40	No	N/A	15.25	0.00	15.25	0.682	Eqn (c)	Ties Not Req'd

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.250	44.00	149.02	0.30

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B1) with New Load Path

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.40D+1.60H					
Span # 1	1	15.250	27.32	149.02	0.18
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	15.250	35.75	149.02	0.24
+1.20D+1.60L+0.30S+1.60H					
Span # 1	1	15.250	34.31	149.02	0.23
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	15.250	34.76	149.02	0.23
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	15.250	21.95	149.02	0.15
+1.20D+1.60Lr-0.50W+1.60H					
Span # 1	1	15.250	34.65	149.02	0.23
+1.20D+L+S+1.60H					
Span # 1	1	15.250	29.98	149.02	0.20
+1.20D+S+0.50W+1.60H					
Span # 1	1	15.250	17.07	149.02	0.11
+1.20D+S-0.50W+1.60H					
Span # 1	1	15.250	29.77	149.02	0.20
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	15.250	19.39	149.02	0.13
+1.20D+0.50Lr+L-W+1.60H					
Span # 1	1	15.250	44.00	149.02	0.30
+1.20D+L+0.30S+W+1.60H					
Span # 1	1	15.250	18.05	149.02	0.12
+1.20D+L+0.30S-W+1.60H					
Span # 1	1	15.250	42.48	149.02	0.29
+0.90D+W+0.90H					
Span # 1	1	15.250	4.89	149.02	0.03
+0.90D-W+0.90H					
Span # 1	1	15.250	30.27	149.02	0.20
+1.20D+L+0.150S+E+1.60H					
Span # 1	1	15.250	29.98	149.02	0.20
+0.90D+E+0.90H					
Span # 1	1	15.250	17.56	149.02	0.12

Overall Maximum Deflections

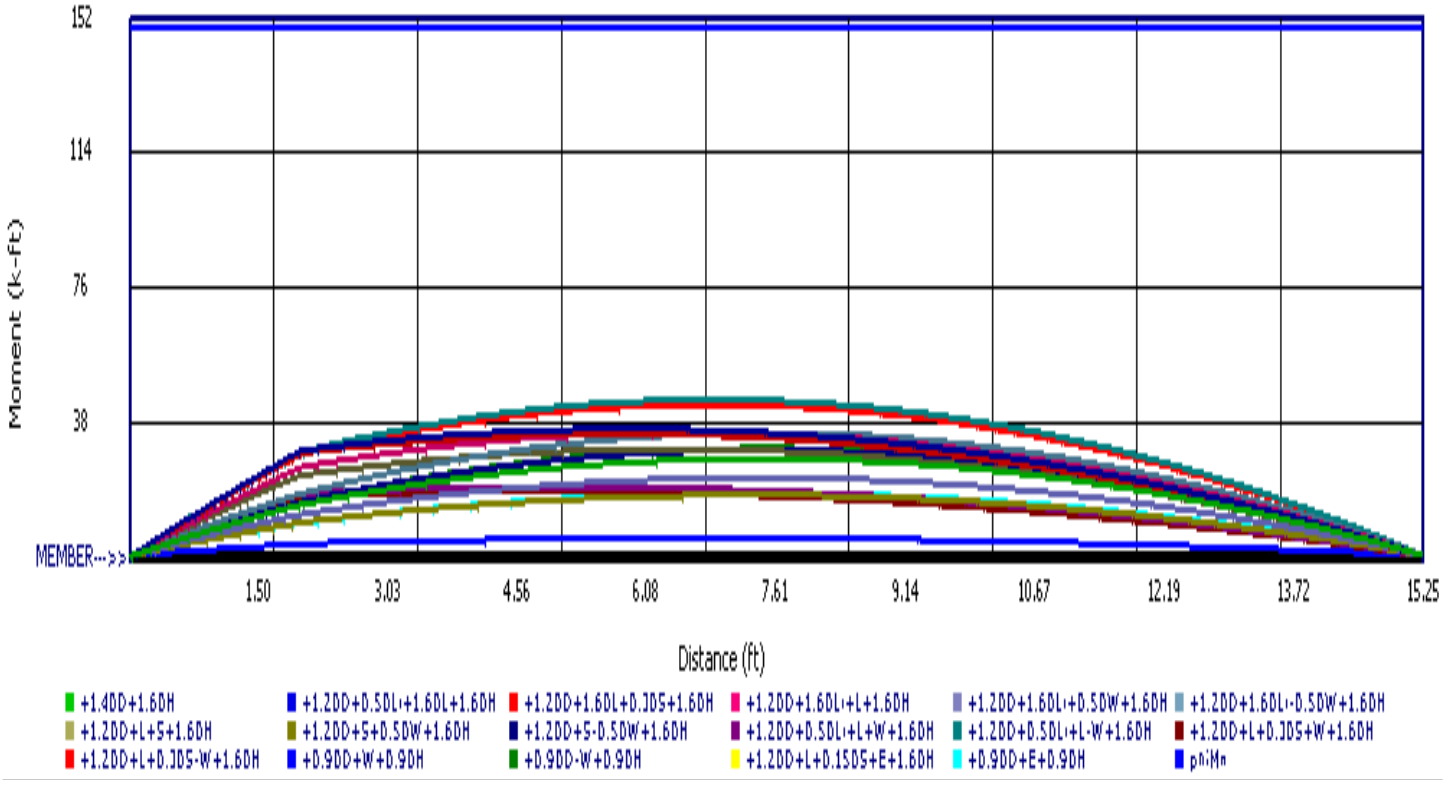
Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+0.750Lr+0.750L+H	0.0264	7.375		0.0000	0.000

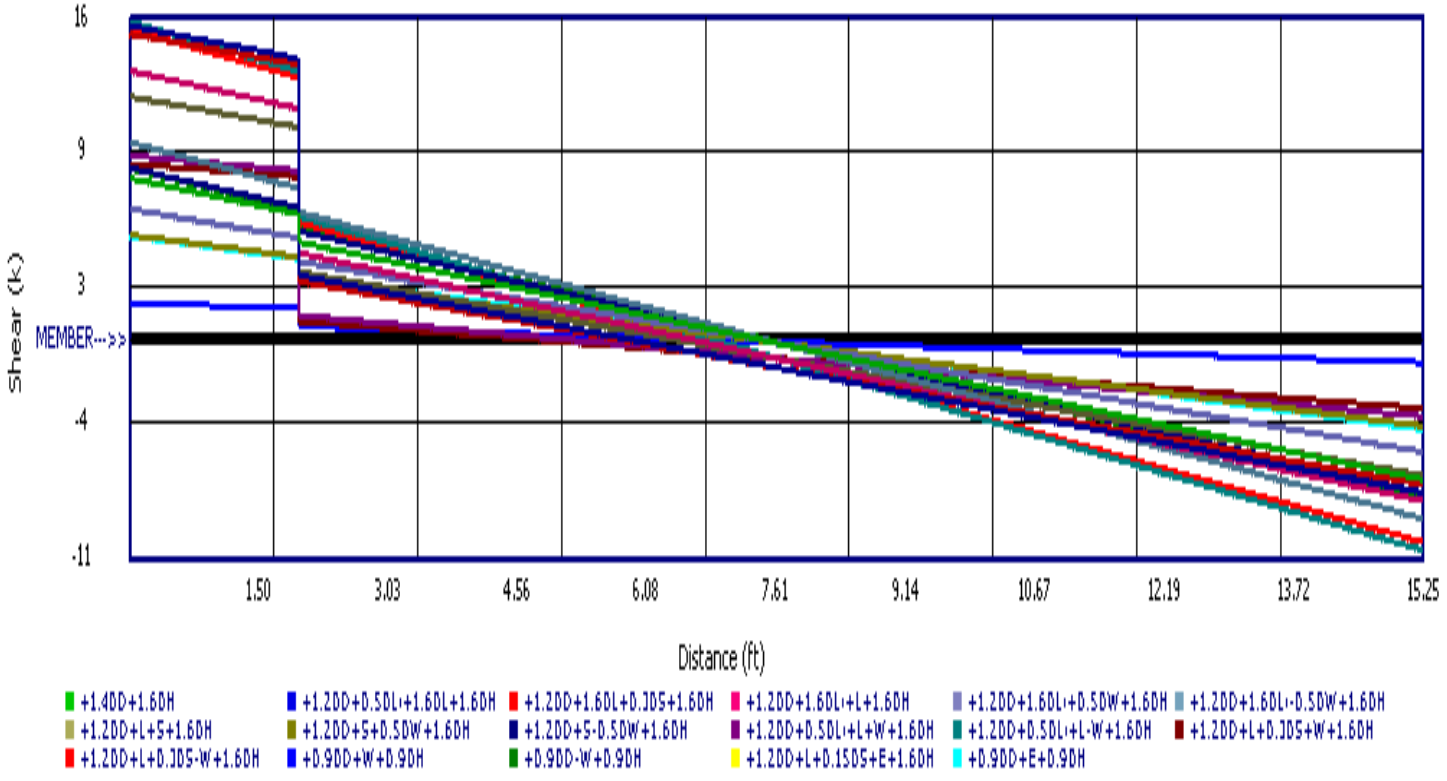
Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B1) with New Load Path





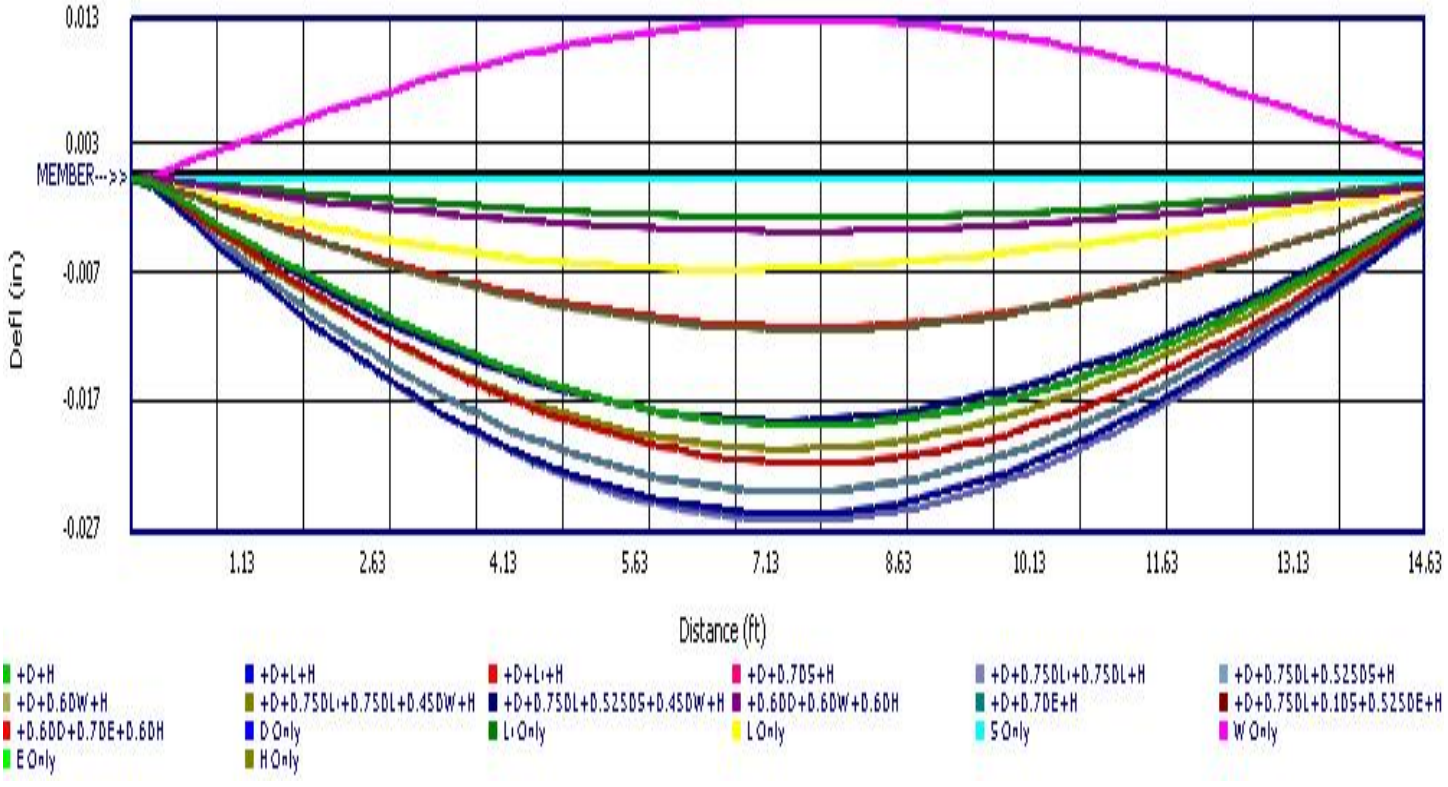
Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B1) with New Load Path



Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B2) with New Load Path

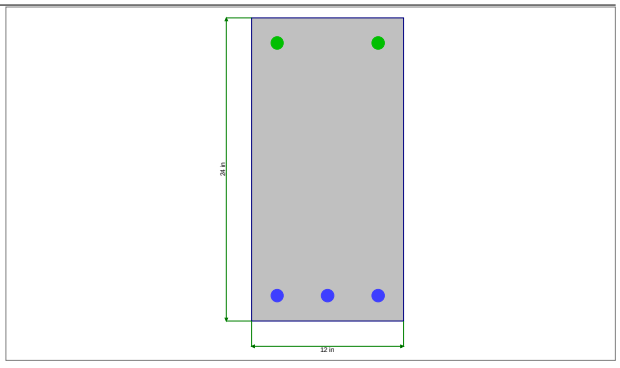
Code References

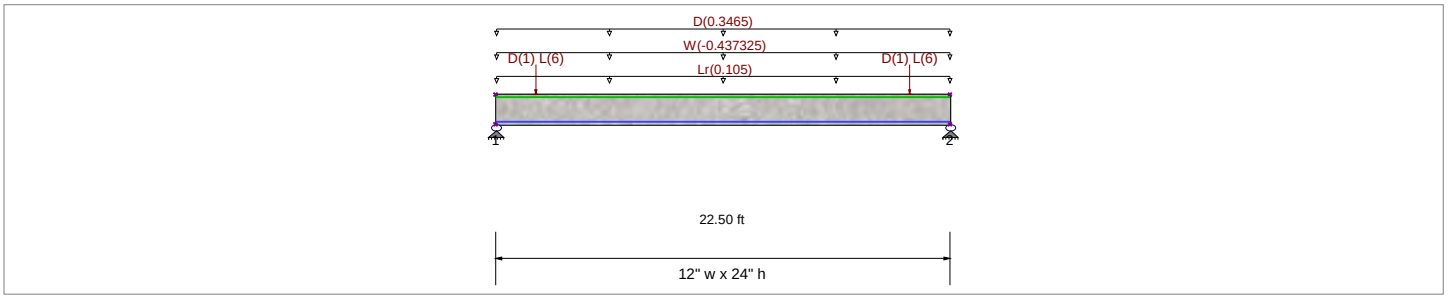
Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combination Set : ASCE 7-22 / IBC 2024 Rho (or Omega) = 1.00

General Information

f'c	=	4.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	=	503.12 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.8250
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
3-#8 at 2.0 in from Bottom, from 0.0 to 22.50 ft in this span
2-#8 at 2.0 in from Top, from 0.0 to 22.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : Lr = 0.020 ksf, Tributary Width = 5.250 ft, (RLL (20psf))
Uniform Load : W = -0.08330 ksf, Tributary Width = 5.250 ft, (Wind Zone 3 (-83.3psf, Ae>100sf))
Uniform Load : D = 0.0660 ksf, Tributary Width = 5.250 ft, (Precast Roof System (66psf))
Point Load : D = 1.0, L = 6.0 k @ 2.0 ft, (Crane Load)
Point Load : D = 1.0, L = 6.0 k @ 20.50 ft, (Crane Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.426** : 1

Section used for this span	**Typical Section**		
Mu : Applied	93.731 k-ft		
Mn * Phi : Allowable	220.027 k-ft		
Location of maximum on span	11.270 ft		
Span # where maximum occurs	Span # 1		

Design Limits

Tensile Strain >= Min Strain Limit (Section 9.3.3.1)
0.02056 in / in >= 0.00507 in / in OK

As Provided >= As,min (Section 9.6.1.2)
2.370 in^2 >= 1.126 in^2 OK

Maximum Deflection

Max Downward Transient Deflection	0.030 in	Ratio =	8977 >=360.0	W Only
Max Upward Transient Deflection	-0.058 in	Ratio =	4622 >=360.0	L Only
Max Downward Total Deflection	0.198 in	Ratio =	1362 >=180.0	Span: 1 : +D+0.750Lr+0.750L+H
Max Upward Total Deflection	0.000 in	Ratio =	0 <180.0	Span: 1 : +D+L+H

Project Title:
Engineer:
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Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B2) with New Load Path

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	14.161	14.161
Max Upward from Load Combinations	14.161	14.161
Max Upward from Load Cases	8.161	8.161
Max Downward from all Load Conditions (Resisting Uplift)	-4.920	-4.920
Max Downward from Load Cases (Resisting Uplift)	-4.920	-4.920
+D+H	8.161	8.161
+D+L+H	14.161	14.161
+D+Lr+H	9.342	9.342
+D+0.70S+H	8.161	8.161
+D+0.750Lr+0.750L+H	13.547	13.547
+D+0.750L+0.5250S+H	12.661	12.661
+D+0.60W+H	5.209	5.209
+D+0.750Lr+0.750L+0.450W+H	11.333	11.333
+D+0.750L+0.5250S+0.450W+H	10.447	10.447
+0.60D+0.60W+0.60H	1.944	1.944
+D+0.70E+H	8.161	8.161
+D+0.750L+0.10S+0.5250E+H	12.661	12.661
+0.60D+0.70E+0.60H	4.896	4.896
D Only	8.161	8.161
Lr Only	1.181	1.181
L Only	6.000	6.000
W Only	-4.920	-4.920
H Only		

Shear Stirrup Requirements

Between 0.00 to 1.97 ft, Max spacing per 9.7.6.2.2, use #3 stirrups spaced at 11 in
Between 2.01 to 20.49 ft, Ties Not Req'd, Stirrups are not required.
Between 20.53 to 22.46 ft, Max spacing per 9.7.6.2.2, use #3 stirrups spaced at 11 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+0.50Lr+L-W+1.60H	1	0.00	22.00	21.30	Yes	11.00	26.56	13.20	39.76	0.536	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.25	22.00	21.00	Yes	11.00	26.56	13.20	39.76	0.528	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.49	22.00	20.69	Yes	11.00	26.56	13.20	39.76	0.520	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.74	22.00	20.38	Yes	11.00	26.56	13.20	39.76	0.512	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	0.98	22.00	20.07	Yes	11.00	26.56	13.20	39.76	0.505	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	1.23	22.00	19.76	Yes	11.00	26.56	13.20	39.76	0.497	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	1.48	22.00	19.45	Yes	11.00	26.56	13.20	39.76	0.489	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	1.72	22.00	19.15	Yes	11.00	26.56	13.20	39.76	0.481	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	1.97	22.00	18.84	Yes	11.00	26.56	13.20	39.76	0.474	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H	1	2.21	22.00	11.33	No	N/A	17.46	0.00	17.46	0.649	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.46	22.00	11.02	No	N/A	17.46	0.00	17.46	0.631	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.70	22.00	10.71	No	N/A	17.46	0.00	17.46	0.614	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	2.95	22.00	10.40	No	N/A	17.46	0.00	17.46	0.596	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.20	22.00	10.10	No	N/A	17.46	0.00	17.46	0.578	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.44	22.00	9.79	No	N/A	17.46	0.00	17.46	0.561	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.69	22.00	9.48	No	N/A	17.46	0.00	17.46	0.543	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	3.93	22.00	9.17	No	N/A	17.46	0.00	17.46	0.525	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.18	22.00	8.86	No	N/A	17.46	0.00	17.46	0.508	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.43	22.00	8.55	No	N/A	17.46	0.00	17.46	0.490	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.67	22.00	8.25	No	N/A	17.46	0.00	17.46	0.472	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	4.92	22.00	7.94	No	N/A	17.46	0.00	17.46	0.455	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	5.16	22.00	7.63	No	N/A	17.46	0.00	17.46	0.437	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	5.41	22.00	7.32	No	N/A	17.46	0.00	17.46	0.419	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	5.66	22.00	7.01	No	N/A	17.46	0.00	17.46	0.402	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	5.90	22.00	6.70	No	N/A	17.46	0.00	17.46	0.384	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	6.15	22.00	6.40	No	N/A	17.46	0.00	17.46	0.366	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	6.39	22.00	6.09	No	N/A	17.46	0.00	17.46	0.349	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	6.64	22.00	5.78	No	N/A	17.46	0.00	17.46	0.331	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	6.89	22.00	5.47	No	N/A	17.46	0.00	17.46	0.313	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	7.13	22.00	5.16	No	N/A	17.46	0.00	17.46	0.296	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H	1	7.38	22.00	4.86	No	N/A	17.46	0.00	17.46	0.278	Eqn (c)	Ties Not Req'd

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B2) with New Load Path

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+0.50Lr+L-W+1.60H1		7.62	22.00	4.55	No	N/A	17.46	0.00	17.46	0.260	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		7.87	22.00	4.24	No	N/A	17.46	0.00	17.46	0.243	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.11	22.00	3.93	No	N/A	17.46	0.00	17.46	0.225	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.36	22.00	3.62	No	N/A	17.46	0.00	17.46	0.207	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.61	22.00	3.31	No	N/A	17.46	0.00	17.46	0.190	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		8.85	22.00	3.01	No	N/A	17.46	0.00	17.46	0.172	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.10	22.00	2.70	No	N/A	17.46	0.00	17.46	0.154	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.34	22.00	2.39	No	N/A	17.46	0.00	17.46	0.137	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.59	22.00	2.08	No	N/A	17.46	0.00	17.46	0.119	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		9.84	22.00	1.77	No	N/A	17.46	0.00	17.46	0.102	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.08	22.00	1.46	No	N/A	17.46	0.00	17.46	0.084	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.33	22.00	1.16	No	N/A	17.46	0.00	17.46	0.066	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.57	22.00	0.85	No	N/A	17.46	0.00	17.46	0.049	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		10.82	22.00	0.54	No	N/A	17.46	0.00	17.46	0.031	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.07	22.00	0.23	No	N/A	17.46	0.00	17.46	0.013	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.31	22.00	-0.08	No	N/A	17.46	0.00	17.46	0.004	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.56	22.00	-0.39	No	N/A	17.46	0.00	17.46	0.022	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		11.80	22.00	-0.69	No	N/A	17.46	0.00	17.46	0.040	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		12.05	22.00	-1.00	No	N/A	17.46	0.00	17.46	0.057	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		12.30	22.00	-1.31	No	N/A	17.46	0.00	17.46	0.075	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		12.54	22.00	-1.62	No	N/A	17.46	0.00	17.46	0.093	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		12.79	22.00	-1.93	No	N/A	17.46	0.00	17.46	0.110	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		13.03	22.00	-2.23	No	N/A	17.46	0.00	17.46	0.128	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		13.28	22.00	-2.54	No	N/A	17.46	0.00	17.46	0.146	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		13.52	22.00	-2.85	No	N/A	17.46	0.00	17.46	0.163	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		13.77	22.00	-3.16	No	N/A	17.46	0.00	17.46	0.181	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		14.02	22.00	-3.47	No	N/A	17.46	0.00	17.46	0.199	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		14.26	22.00	-3.78	No	N/A	17.46	0.00	17.46	0.216	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		14.51	22.00	-4.08	No	N/A	17.46	0.00	17.46	0.234	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		14.75	22.00	-4.39	No	N/A	17.46	0.00	17.46	0.252	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		15.00	22.00	-4.70	No	N/A	17.46	0.00	17.46	0.269	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		15.25	22.00	-5.01	No	N/A	17.46	0.00	17.46	0.287	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		15.49	22.00	-5.32	No	N/A	17.46	0.00	17.46	0.305	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		15.74	22.00	-5.63	No	N/A	17.46	0.00	17.46	0.322	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		15.98	22.00	-5.93	No	N/A	17.46	0.00	17.46	0.340	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		16.23	22.00	-6.24	No	N/A	17.46	0.00	17.46	0.358	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		16.48	22.00	-6.55	No	N/A	17.46	0.00	17.46	0.375	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		16.72	22.00	-6.86	No	N/A	17.46	0.00	17.46	0.393	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		16.97	22.00	-7.17	No	N/A	17.46	0.00	17.46	0.411	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		17.21	22.00	-7.48	No	N/A	17.46	0.00	17.46	0.428	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		17.46	22.00	-7.78	No	N/A	17.46	0.00	17.46	0.446	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		17.70	22.00	-8.09	No	N/A	17.46	0.00	17.46	0.463	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		17.95	22.00	-8.40	No	N/A	17.46	0.00	17.46	0.481	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		18.20	22.00	-8.71	No	N/A	17.46	0.00	17.46	0.499	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		18.44	22.00	-9.02	No	N/A	17.46	0.00	17.46	0.516	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		18.69	22.00	-9.33	No	N/A	17.46	0.00	17.46	0.534	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		18.93	22.00	-9.63	No	N/A	17.46	0.00	17.46	0.552	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		19.18	22.00	-9.94	No	N/A	17.46	0.00	17.46	0.569	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		19.43	22.00	-10.25	No	N/A	17.46	0.00	17.46	0.587	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		19.67	22.00	-10.56	No	N/A	17.46	0.00	17.46	0.605	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		19.92	22.00	-10.87	No	N/A	17.46	0.00	17.46	0.622	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		20.16	22.00	-11.17	No	N/A	17.46	0.00	17.46	0.640	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		20.41	22.00	-11.48	No	N/A	17.46	0.00	17.46	0.658	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+L-W+1.60H1		20.66	22.00	-18.99	Yes	11.00	26.56	13.20	39.76	0.478	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		20.90	22.00	-19.30	Yes	11.00	26.56	13.20	39.76	0.485	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		21.15	22.00	-19.61	Yes	11.00	26.56	13.20	39.76	0.493	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		21.39	22.00	-19.92	Yes	11.00	26.56	13.20	39.76	0.501	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		21.64	22.00	-20.22	Yes	11.00	26.56	13.20	39.76	0.509	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		21.89	22.00	-20.53	Yes	11.00	26.56	13.20	39.76	0.516	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		22.13	22.00	-20.84	Yes	11.00	26.56	13.20	39.76	0.524	Eqn (a)	Max spacing per 9.7.6.2
+1.20D+0.50Lr+L-W+1.60H1		22.38	22.00	-21.15	Yes	11.00	26.56	13.20	39.76	0.532	Eqn (a)	Max spacing per 9.7.6.2

Maximum Forces & Stresses for Load Combinations

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B2) with New Load Path

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	22.500	93.73	220.03	0.43
+1.40D+1.60H					
Span # 1	1	22.500	59.19	220.03	0.27
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	22.500	73.26	220.03	0.33
+1.20D+1.60L+0.30S+1.60H					
Span # 1	1	22.500	69.93	220.03	0.32
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	22.500	73.37	220.03	0.33
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	22.500	47.53	220.03	0.22
+1.20D+1.60Lr-0.50W+1.60H					
Span # 1	1	22.500	75.20	220.03	0.34
+1.20D+L+S+1.60H					
Span # 1	1	22.500	62.73	220.03	0.29
+1.20D+S+0.50W+1.60H					
Span # 1	1	22.500	36.90	220.03	0.17
+1.20D+S-0.50W+1.60H					
Span # 1	1	22.500	64.57	220.03	0.29
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	22.500	38.38	220.03	0.17
+1.20D+0.50Lr+L-W+1.60H					
Span # 1	1	22.500	93.73	220.03	0.43
+1.20D+L+0.30S+W+1.60H					
Span # 1	1	22.500	35.06	220.03	0.16
+1.20D+L+0.30S-W+1.60H					
Span # 1	1	22.500	90.41	220.03	0.41
+0.90D+W+0.90H					
Span # 1	1	22.500	10.38	220.03	0.05
+0.90D-W+0.90H					
Span # 1	1	22.500	65.72	220.03	0.30
+1.20D+L+0.150S+E+1.60H					
Span # 1	1	22.500	62.73	220.03	0.29
+0.90D+E+0.90H					
Span # 1	1	22.500	38.05	220.03	0.17

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+0.750Lr+0.750L+H	0.1982	11.250		0.0000	0.000

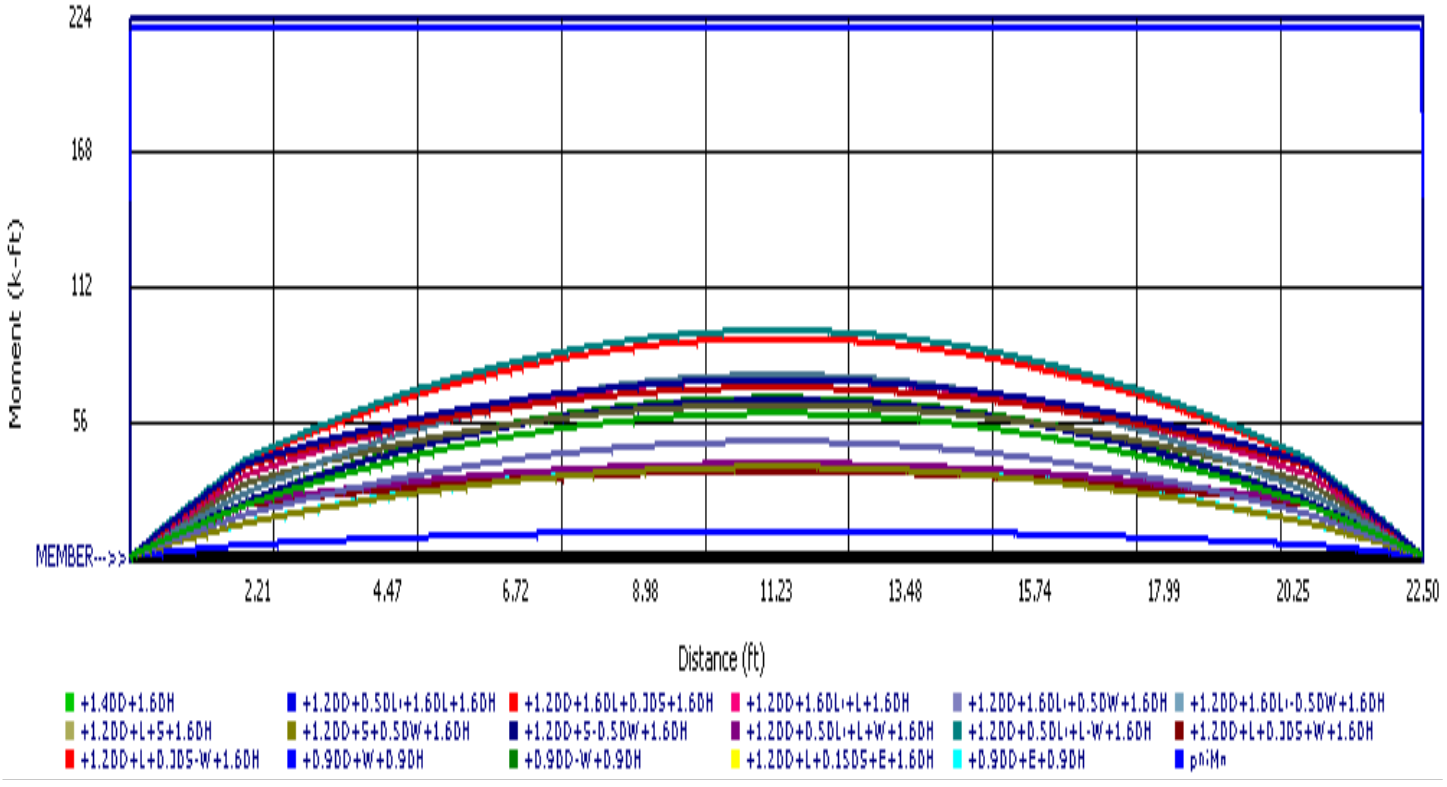
Project Title:
Engineer:
Project ID:
Project Descr:

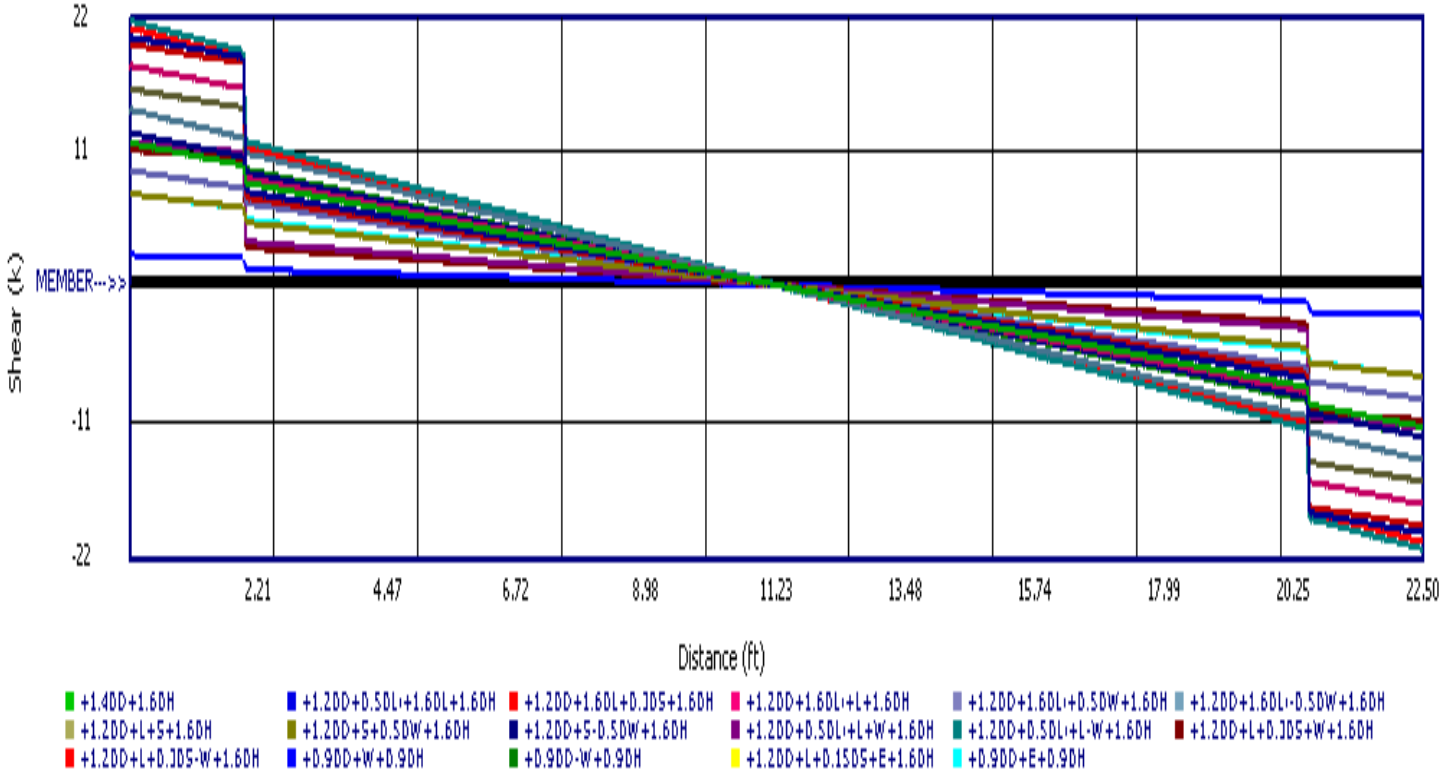
Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B2) with New Load Path





Project Title:
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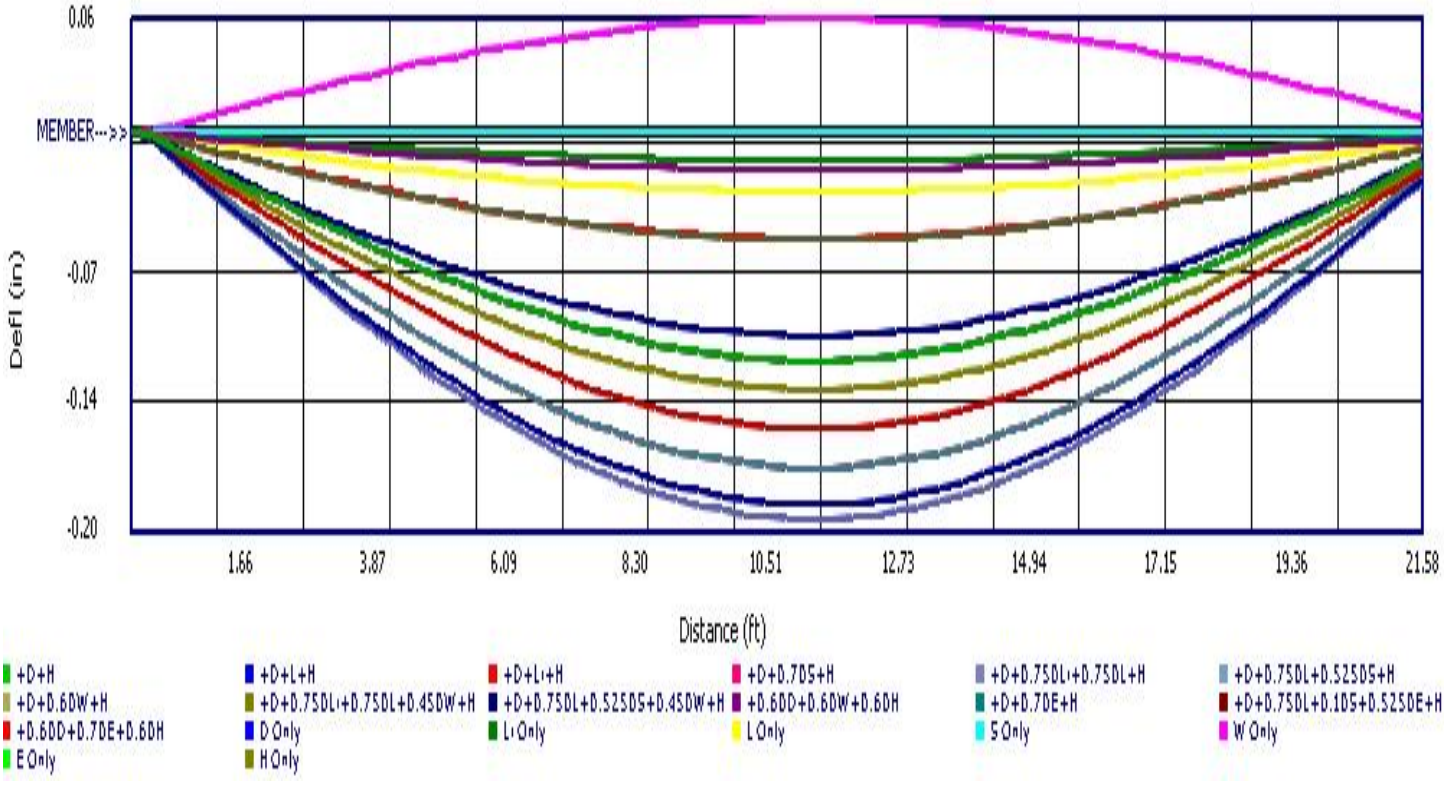
Project Descr:

Concrete Beam

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Beam Check (Ref.B2) with New Load Path



Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Column

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

f'c : Concrete 28 day streng	=	4.50 ksi
E =	=	3,122.0 ksi
Density	=	150.0 pcf
β	=	0.0
fy - Main Rebar	=	60.0 ksi
E - Main Rebar	=	29,000.0 ksi
Allow. Reinforcing Limits		*ASTM A615 Bars Used*
Min. Reinf.	=	1.0 %
Max. Reinf.	=	8.0 %
Seismic Design Category	=	C

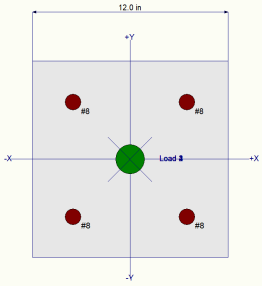
Overall Column Height = 14.0 ft
End Fixity Top Free, Bottom Fixed

Brace condition for deflection (buckling) along colur
X-X (width) axis :
Unbraced Length for buckling ABOUT X-X Axis = 14.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 14.0 ft, K = 1.0

Column Cross Section

Column Dimensions : 12.0in Square Column, Column Edge to Rebar Edge Cover = 2.0in

Column Reinforcing : 4 - #8 bars @ corners,



Applied Loads

Entered loads are factored per load combinations specified by user.

Column self weight included : 2,100.0 lbs * Dead Load Factor
AXIAL LOADS . . .
Precast Roof System (66psf, Trib Area = 118sf): Axial Load at 14.0 ft above base, D = 7.788 k
RLL (20psf, Trib Area = 118sf): Axial Load at 14.0 ft above base, LR = 2.360 k
Wind Zone 3 (-83.3psf, Trib Area = 118sf): Axial Load at 14.0 ft above base, W = 9.829 k
Crane Load: Axial Load at 14.0 ft above base, L = 6.0 k
BENDING LOADS . . .
Wind Zone 5 (60.3psf, Trib Width = 1.25ft): Lat. Uniform Load creating Mx-x, W = 0.0750 k/ft
Crane Load: Lat. Point Load at 14.0 ft creating Mx-x, L = 1.20 k

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-Existing Roof Column

DESIGN SUMMARY

Load Combination	0.0
Location of max.above base	0.0 ft
Maximum Stress Ratio	**0.0 : 1**
Ratio = (Pu^2+Mu^2)^.5 / (PhiPn^2+PhiMn^2)^.5	

Pu =	0.0 k	φ * Pn =	0.0 k
Mu-x =	0.0 k-ft	φ * Mn-x =	0.0 k-ft
Mu-y =	0.0 k-ft	φ* Mn-y =	0.0 k-ft
Mu Angle =	deg	φ =	
Mu at Angle =	k-ft	φMn at Angle =	k-ft

Pn & Mn values located at Pu-Mu vector intersection with capacity curve

Column Capacities . .

Pnmax : Nominal Max. Compressive Axial Capac	0.0 k
Pnmin : Nominal Min. Tension Axial Capacity	k
φ Pn, max : Usable Compressive Axial Capacity	0.0 k
φ Pn, min : Usable Tension Axial Capacity	k

Maximum SERVICE Load Reactions .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Deflections . .

Along Y-Y	0.0 in	at	0.0 ft	above base
for load combination :	0.0			
Along X-X	0.0 in	at	0.0 ft	above base
for load combination :	0.0			

General Section Informatio

β = 0.0 θ = 0.0

ρ : % Reinforcing	0.0 %	Rebar < Min of 1.0 %
Reinforcing Area	0.0 in^2	
Concrete Area	0.0 in^2	

Governing Load Combination Results

Governing Factored Load Combination	Moment X-X	Moment Y-Y	Dist. from base ft	Axial Load k Pu	φ * Pn	Bending Analysis k-ft δx	δx * Mux	δy	δy * Muy	Alpha (deg)	δ Mu	φ Mn	Utilization Ratio

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top

Maximum Moment Reactions

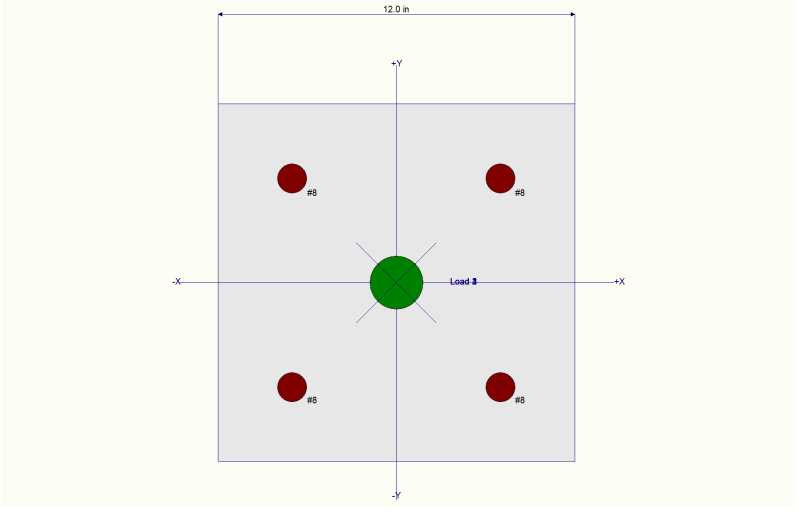
Note: Only non-zero reactions are listed.

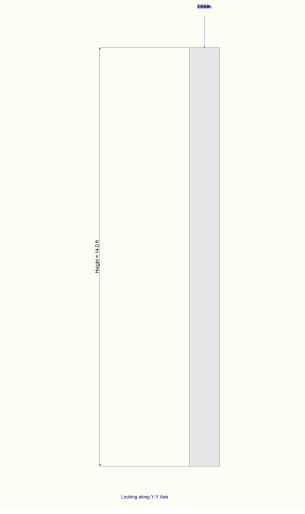
Load Combination	Moment About X-X Axis @ Base	@ Top	Moment About Y-Y Axis @ Base	@ Top

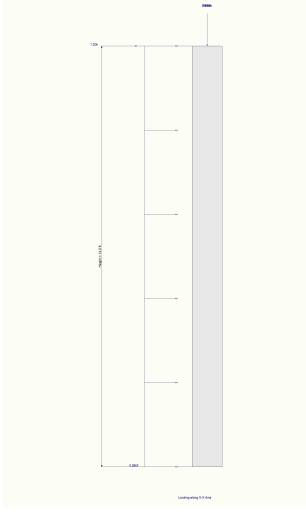
Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

Sketches







REVISIONS			
SYM.	DESCRIPTION	DATE	APP.

STEEL FRAMING NOTES:

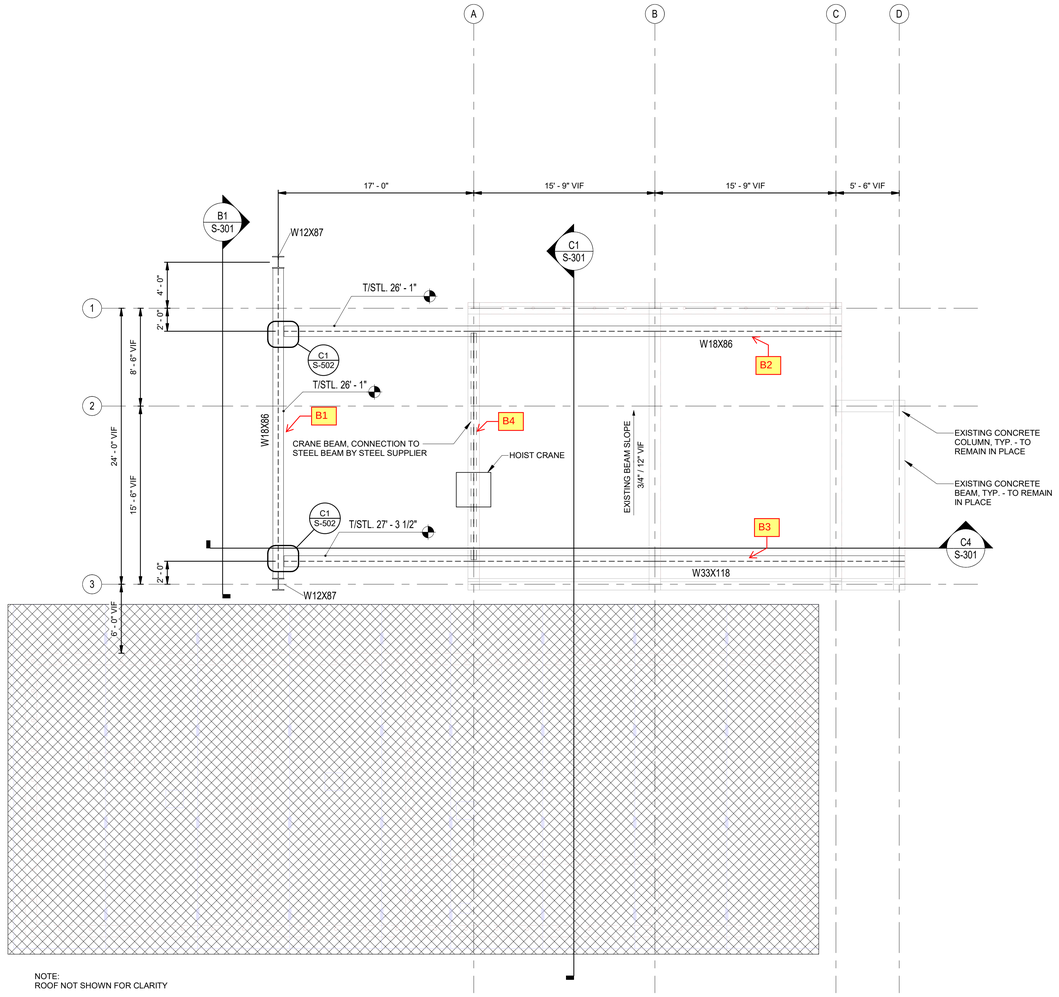
1. FABRICATOR SHALL SELECT TYPICAL BEAM CONNECTIONS FROM THESE DETAILS USING LOAD REACTIONS GIVEN ON THE PLAN (AS _K) OR SCHEDULE. WHERE NOT GIVEN ON PLAN, BEAM REACTION AT EACH END SHALL BE ASSUMED TO BE 55 PERCENT OF THE MAXIMUM TOTAL ALLOWABLE (ASD) UNIFORM LOAD FOR THE BEAM SIZE AND SPAN GIVEN IN THE 50 KSI TABLES IN PART 2 OF THE AISC STEEL CONSTRUCTION MANUAL.
2. ALL BEAM REACTIONS ARE IN KIPS, AT SERVICE LOADS (UNFACTORED).
3. SLOTTED HOLES ARE NOT PERMISSIBLE EXCEPT WHERE SHOWN.
4. COMPLY WITH AISC MIN. EDGE DISTANCES.
5. VERIFY ALL T/STL. ELEVATION BASED ON EXISTING STRUCTURAL ELEVATION.

CRANE NOTES:

1. CRANE STOPS AND ALL ASSOCIATED HARDWARE AND CONNECTION BY CRANE SUPPLIER.
2. THE MAXIMUM PUMP WEIGHT CARRIED BY CRANE SHALL NOT EXCEED 2800 LBS.
3. CRANE IS ASSUMED TO BE 2TONS CAPACITY. CRANE SUPPORT BEAMS ARE DESIGNED FOR 2 TONS CAPACITY WITH 25% VERTICAL IMPACT LOADING AND ADDITIONAL LATERAL LOAD OF 20% RATED CAPACITY OF THE CRANE.
4. CONTRACTOR SHALL PROVIDE CRANE CUT SHEET INDICATING FINAL LOADS IMPOSED BY CRANE ON CRANE SUPPORTING STRUCTURES.
5. PROVIDE CONNECTION OF HOIST CRANE TO CRANE BEAM SUCH THAT CRANE MOVES ALONG THE LENGTH OF THE CRANE BEAM. PROVIDE ROLLER CONNECTION TO THE CRANE BEAM TO STEEL BEAM SUCH THAT THE CRANE BEAM CAN MOVE ALONG THE LENGTH OF THE STEEL BEAM. ALL THESE CONNECTIONS ARE DELEGATED DESIGN AND SHALL BE PROVIDED BE CRANE SUPPLIER.
6. CRANE SUPPLIER SHALL VERIFY CLEARANCE AND MAXIMUM CRANE HOOK HEIGHT AS CALLED OUT ON STRUCTURAL DRAWINGS.

LEGEND:

= NOT IN CONTRACT



NOTE:
ROOF NOT SHOWN FOR CLARITY

B2 CRANE FRAMING PLAN
3/16" = 1'-0"

PLAN NORTH

GRAPHIC SCALE:
3/16" =1'-0"
0' 4' 8' 12'

LS
LIFT ST

PRELIMINARY
DO NOT USE FOR CONSTRUCTION
16 MAR 2026

S-112

MBFA NO.

Stantec

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND

MARINE CORPS BASE

MCAS NEW RIVER, NORTH CAROLINA

DES.	Designer
DR.	Author
CHK.	Checker
SUBMITTED BY:	
DESIGN DIR.	
APPROVED: PWO OR OICC	DATE
Approver	
SATISFACTORY TO:	DATE

REPAIR BEQ G -575

CRANE FRAMING PLAN - G575

SIZE	CODE IDENT. NO.	NAVFAC DRAWING NO.
E1	80091	
SCALE AS NOTED	SPEC. 05-25-0010	CONSTR. CONTR. NO. N40085-25-B-0010

SHEET

PREFINAL SUBMITTAL

File Path: Autodesk Docs://175578902_CampLeJeune_LSG575/175578902_CAMP_LEJEUNE_G575_STRU.rvt
Print Date: 4/20/2026 3:49:04 PM

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B1

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **W18x86**
Analysis Method : Load Resistance Factor
Steel Stress Grade
Fy : Steel Yield 50.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 28.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition :
Unbraced Length for buckling ABOUT X-X Axis = 28.0 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 28.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 2,408.0 lbs * Dead Load Factor
BENDING LOADS . . .
Crane Load: Lat. Point Load at 2.0 ft creating Mx-x, L = 6.0 k
Crane Load: Lat. Point Load at 22.0 ft creating Mx-x, L = 6.0 k
Crane Load: Lat. Point Load at 22.0 ft creating My-y, L = 1.20 k
Crane Load: Lat. Point Load at 2.0 ft creating My-y, L = 1.20 k
Beam Load: Lat. Point Load at 2.0 ft creating Mx-x, D = 0.660 k
Beam Load: Lat. Point Load at 22.0 ft creating Mx-x, D = 0.660 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = 0.1351 : 1
Load Combination +1.20D+1.60L
Location of max.above base 21.987 ft
At maximum location values are . . .
Pu 2.890 k
0.9 * Pn 350.182 k
Mu-x 53.425 k-ft
0.9 * Mn-x : 697.50 k-ft
Mu-y 9.871 k-ft
0.9 * Mn-y : 181.50 k-ft

PASS Maximum Shear Stress Ratio 0.04482 : 1
Load Combination +1.20D+1.60L
Location of max.above base 0.0 ft
At maximum location values are . . .
Vu : Applied 11.877 k
Vn * Phi : Allowable 264.960 k

Maximum Load Reactions . .
Top along X-X k
Bottom along X-X k
Top along Y-Y k
Bottom along Y-Y k

Maximum Load Deflections . . .
Along Y-Y in at ft above base
for load combination :
Along X-X in at ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W18x86

Steel Section Properties : W18x86

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

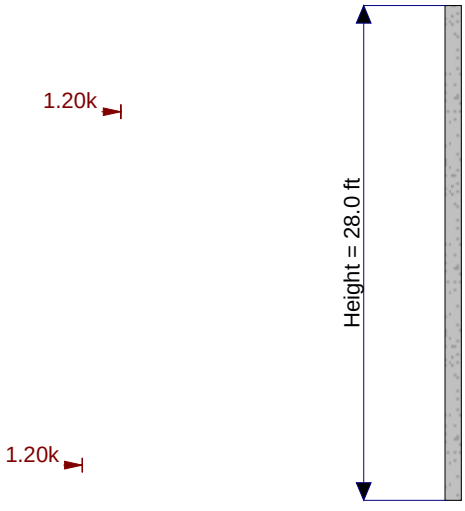
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B1

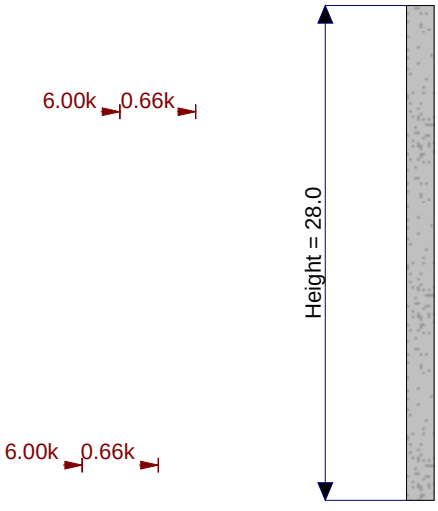
Depth	=	18.400	in	I xx	=	1,530.00	in^4	J	=	4.100	in^4
Web Thick	=	0.480	in	S xx	=	166.00	in^3	Cw	=	13600.00	in^6
Flange Width	=	11.100	in	R xx	=	7.770	in				
Flange Thick	=	0.770	in	Zx	=	186.000	in^3				
Area	=	25.300	in^2	I yy	=	175.000	in^4				
Weight	=	86.000	plf	S yy	=	31.600	in^3	Wno	=	48.900	in^2
Kdesign	=	1.170	in	R yy	=	2.630	in	Sw	=	105.000	in^4
K1	=	1.063	in	Zy	=	48.400	in^3	Qf	=	36.000	in^3
rts	=	3.050	in					Qw	=	92.400	in^3
Ycg	=	0.000	in								

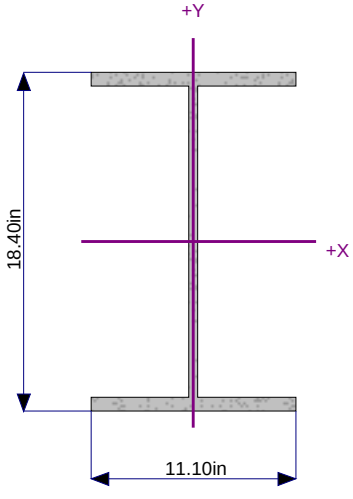
Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis





Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B2 (Bending Check - 17' Span)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **W18x86**
Analysis Method : Load Resistance Factor
Steel Stress Grade
Fy : Steel Yield 50.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 17.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition :
Unbraced Length for buckling ABOUT X-X Axis = 17.0 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 17.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 1,462.0 lbs * Dead Load Factor
BENDING LOADS . . .
Crane Load: Lat. Point Load at 8.50 ft creating Mx-x, L = 6.0 k
Crane Load: Lat. Point Load at 8.50 ft creating My-y, L = 1.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.1040** : 1
Load Combination +1.20D+1.60L
Location of max.above base 8.557 ft
At maximum location values are . . .
Pu 1.754 k
0.9 * Pn 733.30 k
Mu-x 40.526 k-ft
0.9 * Mn-x : 697.50 k-ft
Mu-y 8.105 k-ft
0.9 * Mn-y : 181.50 k-ft

PASS Maximum Shear Stress Ratio **0.01812** : 1
Load Combination +1.20D+1.60L
Location of max.above base 0.0 ft
At maximum location values are . . .
Vu : Applied 4.80 k
Vn * Phi : Allowable 264.960 k

Maximum Load Reactions . .
Top along X-X k
Bottom along X-X k
Top along Y-Y k
Bottom along Y-Y k

Maximum Load Deflections . . .
Along Y-Y in at ft above base
for load combination :
Along X-X in at ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W18x86

Steel Section Properties : W18x86

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

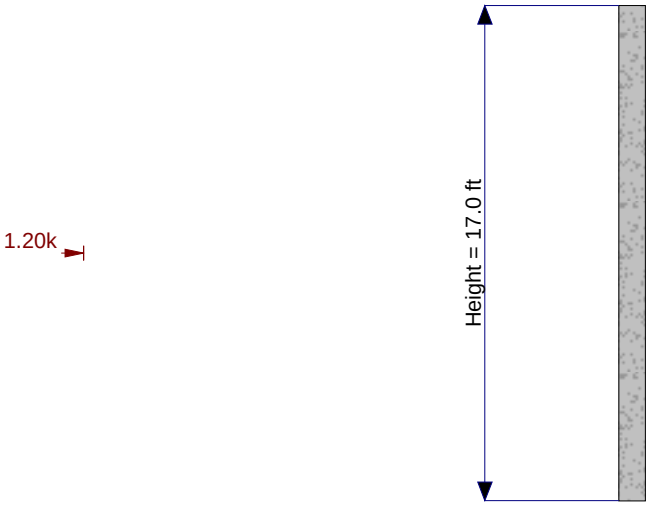
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B2 (Bending Check - 17' Span)

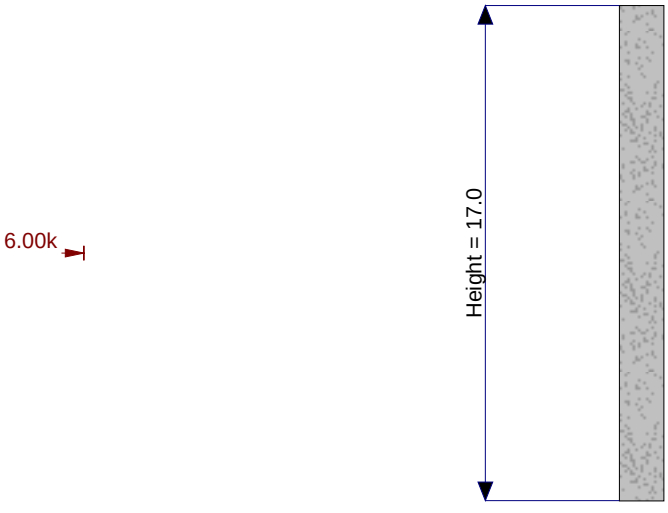
Depth	=	18.400	in	I xx	=	1,530.00	in^4	J	=	4.100	in^4
Web Thick	=	0.480	in	S xx	=	166.00	in^3	Cw	=	13600.00	in^6
Flange Width	=	11.100	in	R xx	=	7.770	in				
Flange Thick	=	0.770	in	Zx	=	186.000	in^3				
Area	=	25.300	in^2	I yy	=	175.000	in^4				
Weight	=	86.000	plf	S yy	=	31.600	in^3	Wno	=	48.900	in^2
Kdesign	=	1.170	in	R yy	=	2.630	in	Sw	=	105.000	in^4
K1	=	1.063	in	Zy	=	48.400	in^3	Qf	=	36.000	in^3
rts	=	3.050	in					Qw	=	92.400	in^3
Ycg	=	0.000	in								

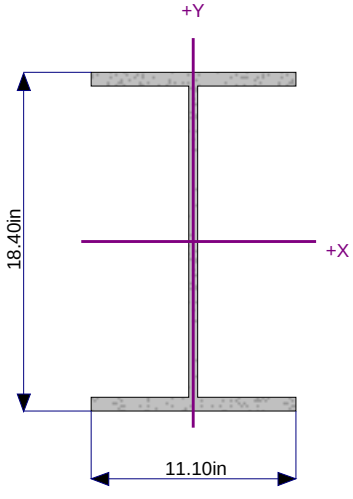
Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis





Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B2 (Shear Check - 17' Span)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **W18x86**

Analysis Method :	Load Resistance Factor	Overall Column Height	17.0 ft
Steel Stress Grade		Top & Bottom Fixity	Top & Bottom Pinned
Fy : Steel Yield	50.0 ksi	Brace condition :	
E : Elastic Bending Modulus	29,000.0 ksi		

Unbraced Length for buckling ABOUT X-X Axis = 17.0 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 17.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 1,462.0 lbs * Dead Load Factor
BENDING LOADS . . .
Crane Load: Lat. Point Load at 0.50 ft creating Mx-x, L = 6.0 k
Crane Load: Lat. Point Load at 0.50 ft creating My-y, L = 1.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.01296** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.5705	ft
At maximum location values are . . .		
Pu	1.754	k
0.9 * Pn	733.30	k
Mu-x	4.639	k-ft
0.9 * Mn-x :	697.50	k-ft
Mu-y	0.9278	k-ft
0.9 * Mn-y :	181.50	k-ft

PASS Maximum Shear Stress Ratio **0.03517** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Vu : Applied	9.318	k
Vn * Phi : Allowable	264.960	k

Maximum Load Reactions . .

Top along X-X		k
Bottom along X-X		k
Top along Y-Y		k
Bottom along Y-Y		k

Maximum Load Deflections . . .

Along Y-Y in at ft above base
for load combination :

Along X-X in at ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W18x86

Steel Section Properties : W18x86

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

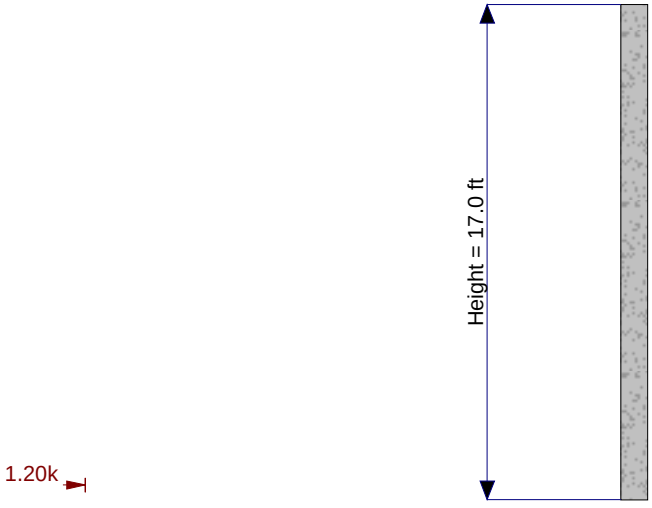
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B2 (Shear Check - 17' Span)

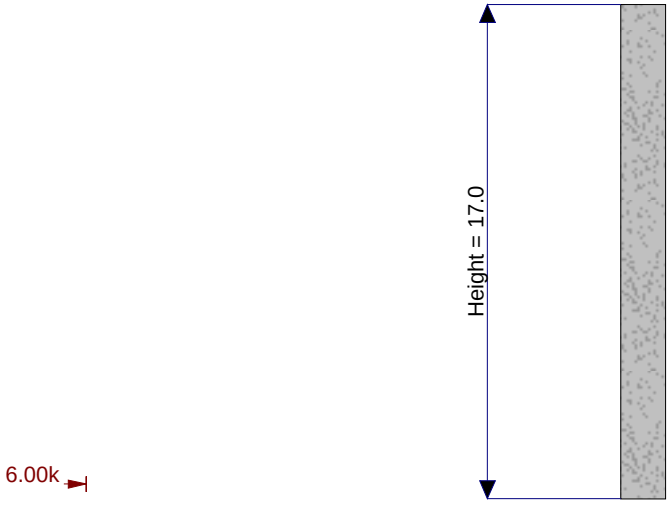
Depth	=	18.400	in	I xx	=	1,530.00	in^4	J	=	4.100	in^4
Web Thick	=	0.480	in	S xx	=	166.00	in^3	Cw	=	13600.00	in^6
Flange Width	=	11.100	in	R xx	=	7.770	in				
Flange Thick	=	0.770	in	Zx	=	186.000	in^3				
Area	=	25.300	in^2	I yy	=	175.000	in^4				
Weight	=	86.000	plf	S yy	=	31.600	in^3	Wno	=	48.900	in^2
Kdesign	=	1.170	in	R yy	=	2.630	in	Sw	=	105.000	in^4
K1	=	1.063	in	Zy	=	48.400	in^3	Qf	=	36.000	in^3
rts	=	3.050	in					Qw	=	92.400	in^3
Ycg	=	0.000	in								

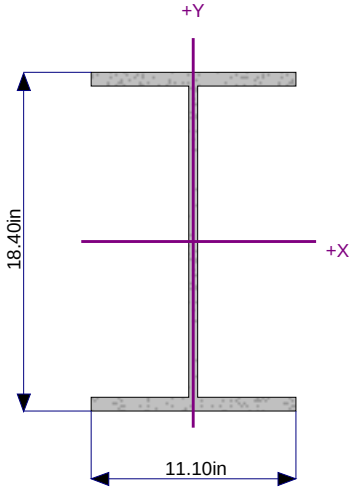
Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis





Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam with Torsional Loads

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B2 (Torsion Check - 17' Span)

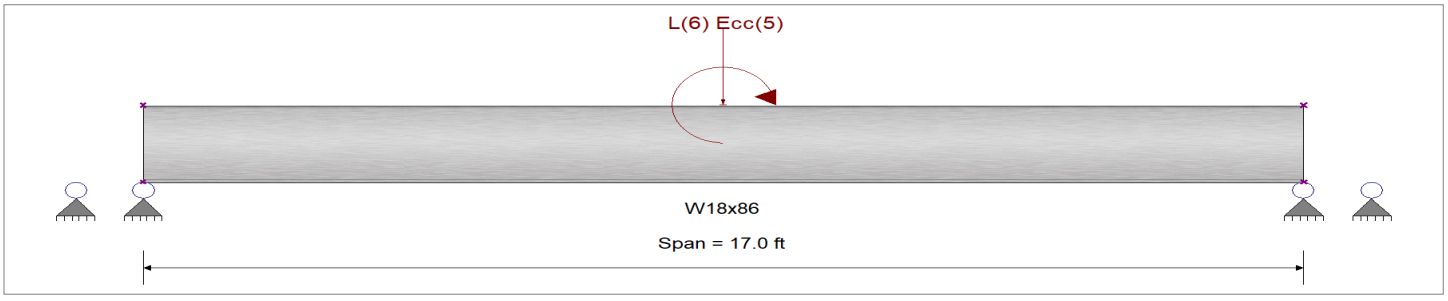
Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combination Set : IBC 2021

Rho (or Omega) = 1.00

Analysis Settings

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		
Load Combination	IBC 2021		



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load(s) for Span Number 0
Moment : L = 3.0 k-ft, Loc = 8.50 ft in span, Torsional Load
Point Load : L = 6.0 k @ 8.50 ft, Tors Ecc. = 5.0 in, (Crane Load)

DESIGN SUMMARY

Design N.G.

Max. Flange Normal Stress Ratio =	**0.324** : 1	Maximum Shear Stress Ratio =	**0.140** : 1
Flange Normal Stress	10.87 ksi	Flange Shear Stress	2.80 ksi
Fb / Ω : Flange Normal Stress *[Mn/(Ω Sxx)]*	33.55 ksi	Web Shear Stress	2.02 ksi
		Vn/Ω : Allowable	20.00 ksi
Max Mu : Applied	28.61 k-ft		
Section used for this span	**W18x86**	Section used for this span	**W18x86**
Load Combination		Load Combination	+D+L

Maximum Rotation = 1.1444 deg at 8.50 ft

Maximum Deflection

Max Download Transient Load Deflection	0.024 in	Max Downward Total Deflection	0.028 in
Ratio =	8478	Ratio =	7357
Max Upward Transient Load Deflection	0.000 in	Max Upward Total Deflection	0.000 in
Ratio =	0 <360	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination	Max Stress Ratio	Bending Max Mu (kft)	Bending Max Vu (k)	Flange Normal (ksi) Total	Flange Normal (ksi) Allow	Flange Normal (ksi) Ratio	Flange Shear (ksi) Total	Flange Shear (ksi) Allow	Flange Shear (ksi) Ratio	Web Shear (ksi) Total	Web Shear (ksi) Allow	Web Shear (ksi) Ratio
D Only	0.007	3.11	0.73	0.225	32.470	0.007	0.022	20.000	0.001	0.092	20.000	0.005
+D+L	0.324	28.61	3.73	10.873	33.547	0.324	2.797	20.000	0.140	2.018	20.000	0.101
+D+0.750L	0.245	22.23	2.98	8.211	33.547	0.245	2.103	20.000	0.105	1.537	20.000	0.077
+0.60D	0.004	1.86	0.44	0.135	32.470	0.004	0.013	20.000	0.001	0.055	20.000	0.003

Maximum Upward Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
span_1	1	0.0277	8.568		0.0000	0.000

Vertical Reactions - Unfactored

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Condit	3.731	3.731
Max Upward from Load Combinat	3.731	3.731
Max Upward from Load Cases	3.000	3.000
D Only	0.731	0.731

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam with Torsional Loads

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B2 (Torsion Check - 17' Span)

Vertical Reactions - Unfactored

Values in KIPS

Load Combination	Support 1	Support 2
+D+L	3.731	3.731
+D+0.750L	2.981	2.981
+0.60D	0.439	0.439
L Only	3.000	3.000

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B3 (Bending Check - 17' Span)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **W33x118**
Analysis Method : Load Resistance Factor
Steel Stress Grade
Fy : Steel Yield 50.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 17.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition :
Unbraced Length for buckling ABOUT X-X Axis = 17.0 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 17.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 2,006.0 lbs * Dead Load Factor
BENDING LOADS . . .
Crane Load: Lat. Point Load at 8.50 ft creating Mx-x, L = 6.0 k
Crane Load: Lat. Point Load at 8.50 ft creating My-y, L = 1.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.06975** : 1
Load Combination +1.20D+1.60L
Location of max.above base 8.557 ft
At maximum location values are . . .
Pu 2.407 k
0.9 * Pn 763.71 k
Mu-x 40.526 k-ft
0.9 * Mn-x : 1,556.25 k-ft
Mu-y 8.105 k-ft
0.9 * Mn-y : 192.375 k-ft

PASS Maximum Shear Stress Ratio **0.009825** : 1
Load Combination +1.20D+1.60L
Location of max.above base 8.557 ft
At maximum location values are . . .
Vu : Applied 4.80 k
Vn * Phi : Allowable 488.565 k

Maximum Load Reactions . .
Top along X-X k
Bottom along X-X k
Top along Y-Y k
Bottom along Y-Y k

Maximum Load Deflections . . .
Along Y-Y in at ft above base
for load combination :
Along X-X in at ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W33x118

Steel Section Properties : W33x118

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

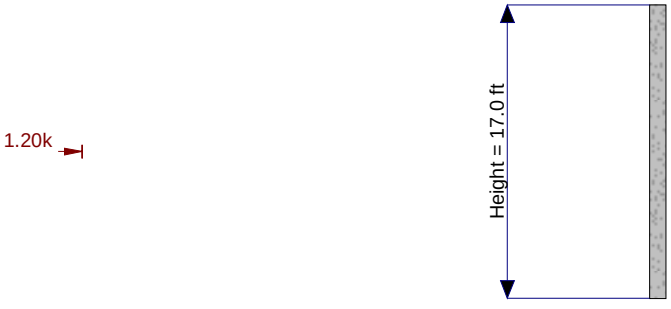
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B3 (Bending Check - 17' Span)

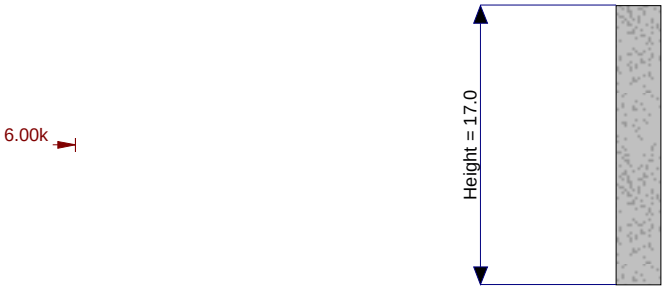
Depth	=	32.900 in	I xx	=	5,900.00 in^4	J	=	5.300 in^4
Web Thick	=	0.550 in	S xx	=	359.00 in^3	Cw	=	48300.00 in^6
Flange Width	=	11.500 in	R xx	=	13.000 in			
Flange Thick	=	0.740 in	Zx	=	415.000 in^3			
Area	=	34.700 in^2	I yy	=	187.000 in^4			
Weight	=	118.000 plf	S yy	=	32.600 in^3	Wno	=	92.500 in^2
Kdesign	=	1.440 in	R yy	=	2.320 in	Sw	=	197.000 in^4
K1	=	1.500 in	Zy	=	51.300 in^3	Qf	=	65.100 in^3
rts	=	2.890 in				Qw	=	205.000 in^3
Ycg	=	0.000 in						

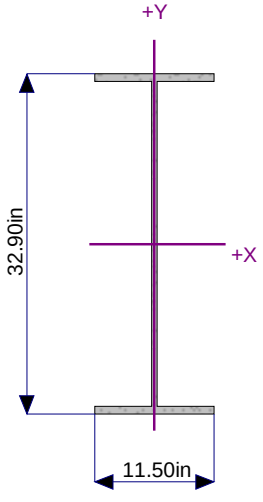
Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis





Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B3 (Shear Check - 17' Span)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **W33x118**

Analysis Method :	Load Resistance Factor
Steel Stress Grade	
Fy : Steel Yield	50.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	17.0 ft
Top & Bottom Fixity	Top & Bottom Pinned
Brace condition :	

Fully braced against buckling ABOUT X-X Axis
Fully braced against buckling ABOUT Y-Y Axis

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 2,006.0 lbs * Dead Load Factor
BENDING LOADS . . .
Crane Load: Lat. Point Load at 0.50 ft creating Mx-x, L = 6.0 k
Crane Load: Lat. Point Load at 0.50 ft creating My-y, L = 1.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.008720** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.5705	ft
At maximum location values are . . .		
Pu	2.407	k
0.9 * Pn	1,561.50	k
Mu-x	4.639	k-ft
0.9 * Mn-x :	1,483.71	k-ft
Mu-y	0.9278	k-ft
0.9 * Mn-y :	192.375	k-ft

PASS Maximum Shear Stress Ratio = **0.01907** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Vu : Applied	9.318	k
Vn * Phi : Allowable	488.565	k

Maximum Load Reactions . .

Top along X-X	k
Bottom along X-X	k
Top along Y-Y	k
Bottom along Y-Y	k

Maximum Load Deflections . . .

Along Y-Y in at ft above base
for load combination :

Along X-X in at ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W33x118

Steel Section Properties : W33x118

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

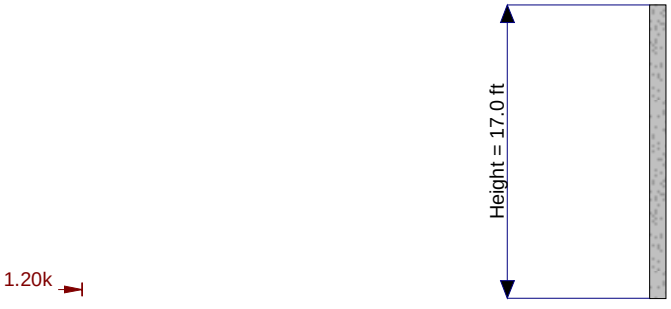
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B3 (Shear Check - 17' Span)

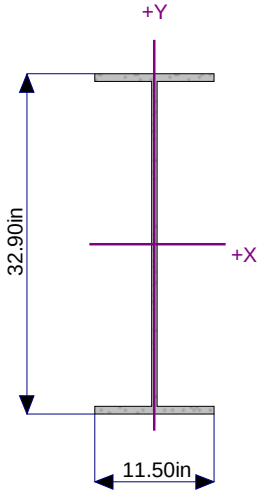
Depth	=	32.900	in	I xx	=	5,900.00	in^4	J	=	5.300	in^4
Web Thick	=	0.550	in	S xx	=	359.00	in^3	Cw	=	48300.00	in^6
Flange Width	=	11.500	in	R xx	=	13.000	in				
Flange Thick	=	0.740	in	Zx	=	415.000	in^3				
Area	=	34.700	in^2	I yy	=	187.000	in^4				
Weight	=	118.000	plf	S yy	=	32.600	in^3	Wno	=	92.500	in^2
Kdesign	=	1.440	in	R yy	=	2.320	in	Sw	=	197.000	in^4
K1	=	1.500	in	Zy	=	51.300	in^3	Qf	=	65.100	in^3
rts	=	2.890	in					Qw	=	205.000	in^3
Ycg	=	0.000	in								

Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis



Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam with Torsional Loads

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B3 (Torsion Check - 17' Span)

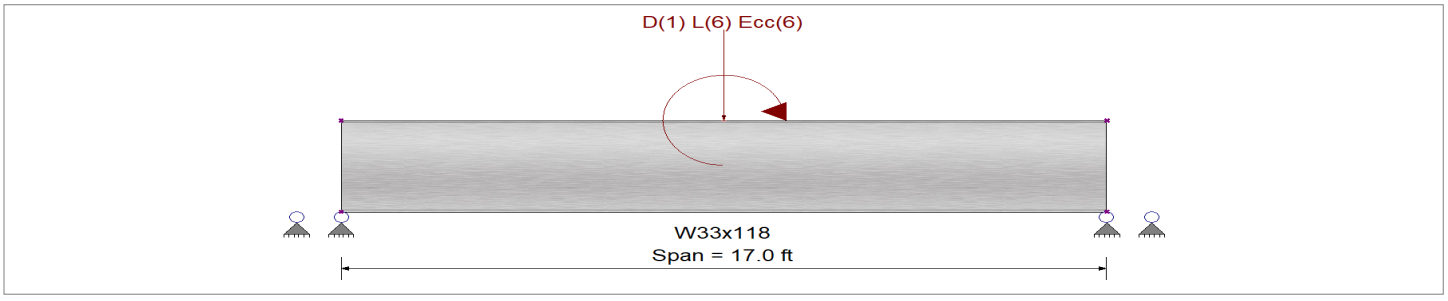
Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combination Set : IBC 2021

Rho (or Omega) = 1.00

Analysis Settings

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		
Load Combination	IBC 2021		



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load(s) for Span Number 0
Moment : L = 3.0 k-ft, Loc = 8.50 ft in span, Torsional Load
Point Load : D = 1.0, L = 6.0 k @ 8.50 ft, Tors Ecc. = 6.0 in, (Crane Load)

DESIGN SUMMARY

Design N.G.

Max. Flange Normal Stress Ratio =	0.225 : 1	Maximum Shear Stress Ratio =	0.070 : 1
Flange Normal Stress	7.80 ksi	Flange Shear Stress	1.26 ksi
Fb / Ω : Flange Normal Stress *[Mn/(Ω Sxx)]*	34.61 ksi	Web Shear Stress	1.04 ksi
		Vn/Ω : Allowable	17.96 ksi
Max Mu : Applied	34.01 k-ft		
Section used for this span	**W33x118**	Section used for this span	**W33x118**
Load Combination		Load Combination	+D+L

Maximum Rotation = 0.4799 deg at 8.50 ft

Maximum Deflection

Max Download Transient Load Deflection	0.006 in	Max Downward Total Deflection	0.009 in
Ratio =	32695	Ratio =	23766
Max Upward Transient Load Deflection	0.000 in	Max Upward Total Deflection	0.000 in
Ratio =	0 <360	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination	Max Stress Ratio	Bending Max Mu (kft)	Bending Max Vu (k)	Flange Normal (ksi) Total	Flange Normal (ksi) Allow	Flange Normal (ksi) Ratio	Flange Shear (ksi) Total	Flange Shear (ksi) Allow	Flange Shear (ksi) Ratio	Web Shear (ksi) Total	Web Shear (ksi) Allow	Web Shear (ksi) Ratio
D Only	0.024	8.51	1.50	0.797	32.732	0.024	0.114	17.964	0.006	0.153	17.964	0.009
+D+L	0.225	34.01	4.50	7.803	34.610	0.225	1.256	17.964	0.070	1.038	17.964	0.058
+D+0.750L	0.175	27.64	3.75	6.052	34.524	0.175	0.970	17.964	0.054	0.817	17.964	0.045
+0.60D	0.015	5.11	0.90	0.478	32.732	0.015	0.068	17.964	0.004	0.092	17.964	0.005

Maximum Upward Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
span_1	1	0.0086	8.568		0.0000	0.000

Vertical Reactions - Unfactored

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Condit	4.503	4.503
Max Upward from Load Combinat	4.503	4.503
Max Upward from Load Cases	3.000	3.000
D Only	1.503	1.503

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam with Torsional Loads

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Beam B3 (Torsion Check - 17' Span)

Vertical Reactions - Unfactored

Values in KIPS

Load Combination	Support 1	Support 2
+D+L	4.503	4.503
+D+0.750L	3.753	3.753
+0.60D	0.902	0.902
L Only	3.000	3.000

Project Title:
Engineer:
Project ID:
Project Descr:

General Section Property Calculator

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

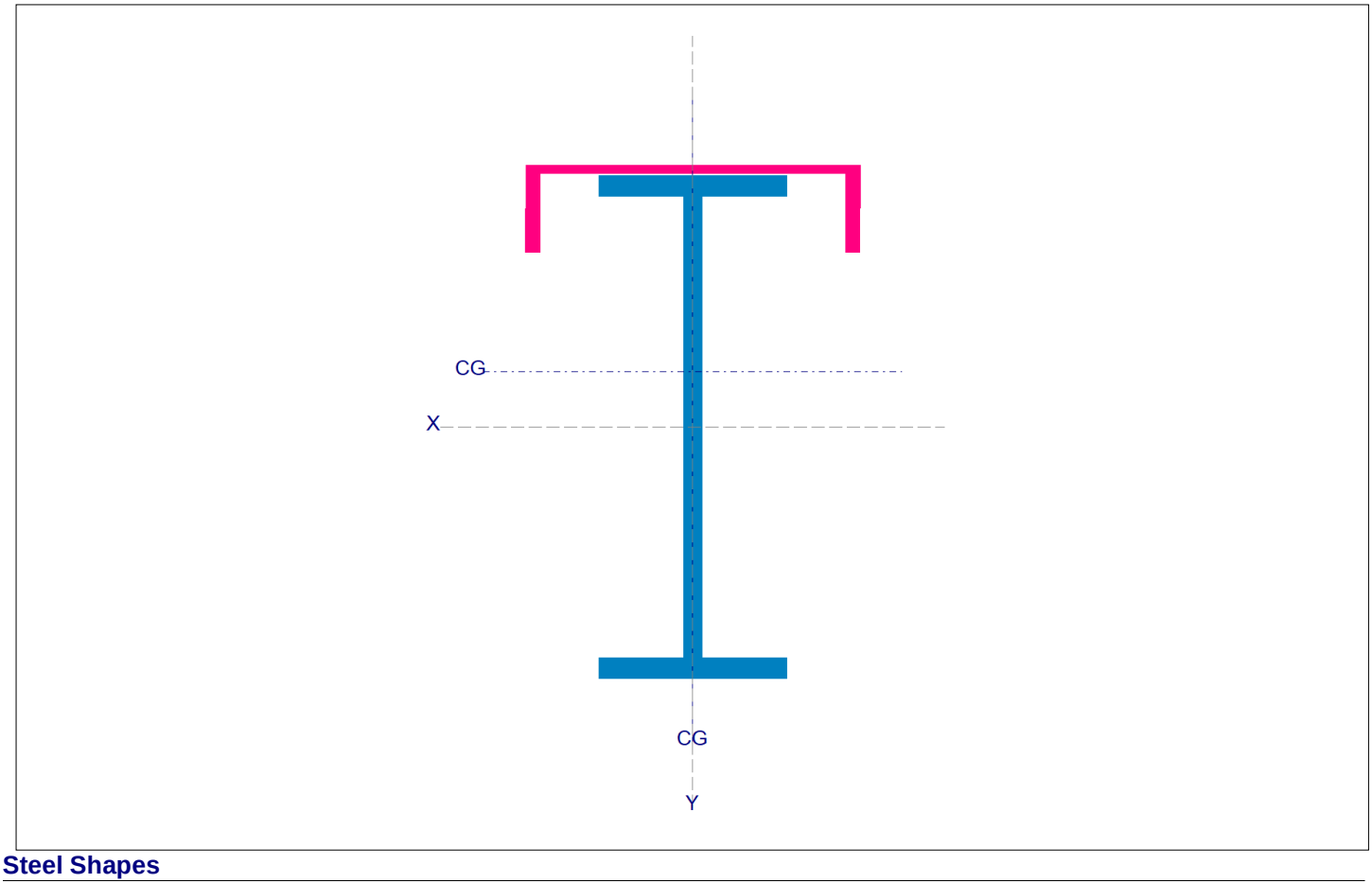
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575 - New Crane Beam Section S15x50 w/ C10x15.3 Cap Channel

Final Section Properties

Total Area	:	19.040 in^2	Ixx	:	656.93 in^4	Sxx : - Y	: 71.704 in^3
			Iyy	:	85.880 in^4	Sxx : +Y	: 106.234 in^3
Calculated final C.G. distance from Datum :						Syy : - X	: 17.146 in^3
X cg Dist.	:	0.0 in	Zxx	:	99.061 in^3	Syy : +X	: 17.146 in^3
Y cg Dist.	:	1.662 in	Zyy	:	26.774 in^3		
Edge Distances from CG. :						r xx	: 5.874 in
+X	:	5.009 in	+Y	:	6.184 in	r yy	: 2.124 in
-X	:	-5.009 in	-Y	:	-9.162 in		

Rotation of All Components @ / 0.00 deg CCW



Steel Shapes

S15x50 : 1	Area =	14.582 in^2	Rotation =	0 deg CCW	
			Xcg =	0.000 in	
			Ycg =	0.000 in	
C10x15.3 : 2	Area =	4.458 in^2	Rotation =	270 deg CCW	
			Xcg =	0.000 in	
			Ycg =	7.183 in	

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Crane Beam B4 (Moment Check)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **S15x50 w/ C10x15.3 Cap Channel**
Analysis Method : Load Resistance Factor
Steel Stress Grade
Fy : Steel Yield 50.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 20.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition :
Unbraced Length for buckling ABOUT X-X Axis = 20.0 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 20.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 1,306.0 lbs * Dead Load Factor
BENDING LOADS . . .
Crane Load: Lat. Point Load at 10.0 ft creating Mx-x, L = 6.0 k
Crane Load: Lat. Point Load at 10.0 ft creating My-y, L = 1.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2256** : 1
Load Combination +1.20D+1.60L
Location of max.above base 10.067 ft
At maximum location values are . . .
Pu 1.567 k
0.9 * Pn 336.859 k
Mu-x 47.678 k-ft
0.9 * Mn-x : 371.479 k-ft
Mu-y 9.536 k-ft
0.9 * Mn-y : 100.403 k-ft

PASS Maximum Shear Stress Ratio **0.01855** : 1
Load Combination +1.20D+1.60L
Location of max.above base 0.0 ft
At maximum location values are . . .
Vu : Applied 4.80 k
Vn * Phi : Allowable 258.770 k

Maximum Load Reactions . .
Top along X-X 0.030 k
Bottom along X-X 1.170 k
Top along Y-Y 0.150 k
Bottom along Y-Y 5.850 k

Maximum Load Deflections . . .
Along Y-Y 0.007101 in at 8.591 ft above base
for load combination :+D+L
Along X-X 0.01086 in at 8.591 ft above base
for load combination :+D+L

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : S15x50 w/ C10x15.3 Cap

Steel Section Properties : S15x50 w/ C10x15.3 Cap

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

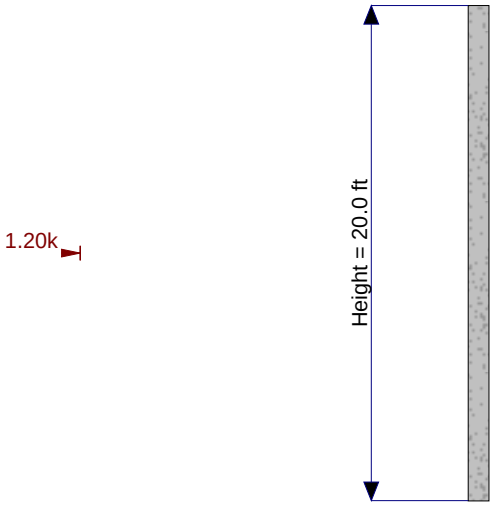
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Crane Beam B4 (Moment Check)

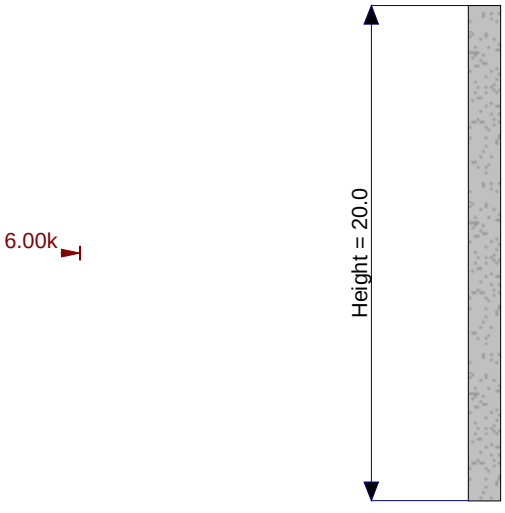
Depth	=	15.683	in	I xx	=	656.93	in^4	J	=	2.120	in^4
Web Thick	=	0.550	in	S xx	=	71.70	in^3	Cw	=	805.00	in^6
Flange Width	=	10.000	in	R xx	=	5.874	in				
Flange Thick	=	0.622	in	Zx	=	99.061	in^3				
Area	=	19.040	in^2	I yy	=	85.880	in^4				
Weight	=	65.300	plf	S yy	=	17.146	in^3	Wno	=	20.300	in^2
Kdesign	=	1.380	in	R yy	=	2.124	in	Sw	=	17.800	in^4
K1	=	0.000	in	Zy	=	26.774	in^3	Qf	=	11.400	in^3
rts	=	1.320	in					Qw	=	38.200	in^3
Ycg	=	0.000	in								

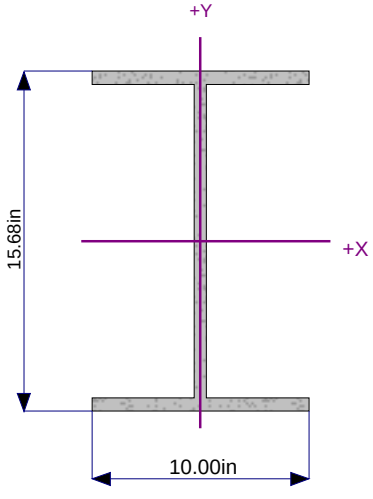
Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis





Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Crane Beam B4 (Shear Check)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **S15x50 w/ C10x15.3 Cap Channel**
Analysis Method : Load Resistance Factor
Steel Stress Grade
Fy : Steel Yield 50.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 20.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition :
Fully braced against buckling ABOUT X-X Axis
Fully braced against buckling ABOUT Y-Y Axis

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 1,306.0 lbs * Dead Load Factor
BENDING LOADS . . .
Crane Load: Lat. Point Load at 0.50 ft creating Mx-x, L = 6.0 k
Crane Load: Lat. Point Load at 0.50 ft creating My-y, L = 1.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.02425** : 1
Load Combination +1.20D+1.60L
Location of max.above base 0.5369 ft
At maximum location values are . . .
Pu 1.567 k
0.9 * Pn 856.80 k
Mu-x 4.671 k-ft
0.9 * Mn-x : 333.025 k-ft
Mu-y 0.9342 k-ft
0.9 * Mn-y : 100.403 k-ft

PASS Maximum Shear Stress Ratio **0.03617** : 1
Load Combination +1.20D+1.60L
Location of max.above base 0.0 ft
At maximum location values are . . .
Vu : Applied 9.360 k
Vn * Phi : Allowable 258.770 k

Maximum Load Reactions . .
Top along X-X 0.030 k
Bottom along X-X 1.170 k
Top along Y-Y 0.150 k
Bottom along Y-Y 5.850 k

Maximum Load Deflections . . .
Along Y-Y 0.007101 in at 8.591 ft above base
for load combination :+D+L
Along X-X 0.01086 in at 8.591 ft above base
for load combination :+D+L

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : S15x50 w/ C10x15.3 Cap

Steel Section Properties : S15x50 w/ C10x15.3 Cap

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

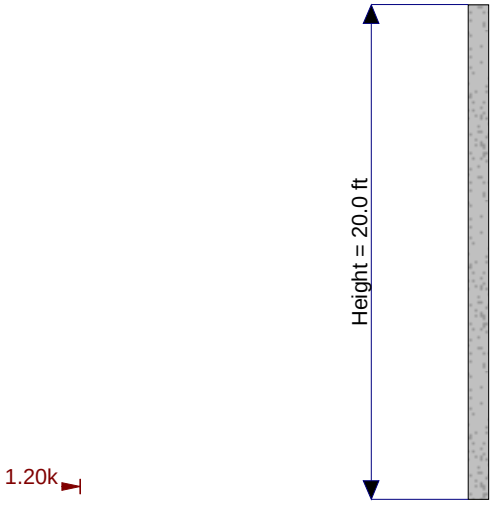
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Crane Beam B4 (Shear Check)

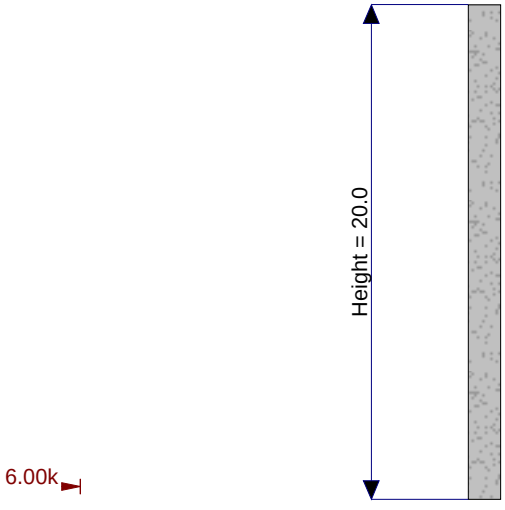
Depth	=	15.683	in	I xx	=	656.93	in^4	J	=	2.120	in^4
Web Thick	=	0.550	in	S xx	=	71.70	in^3	Cw	=	805.00	in^6
Flange Width	=	10.000	in	R xx	=	5.874	in				
Flange Thick	=	0.622	in	Zx	=	99.061	in^3				
Area	=	19.040	in^2	I yy	=	85.880	in^4				
Weight	=	65.300	plf	S yy	=	17.146	in^3	Wno	=	20.300	in^2
Kdesign	=	1.380	in	R yy	=	2.124	in	Sw	=	17.800	in^4
K1	=	0.000	in	Zy	=	26.774	in^3	Qf	=	11.400	in^3
rts	=	1.320	in					Qw	=	38.200	in^3
Ycg	=	0.000	in								

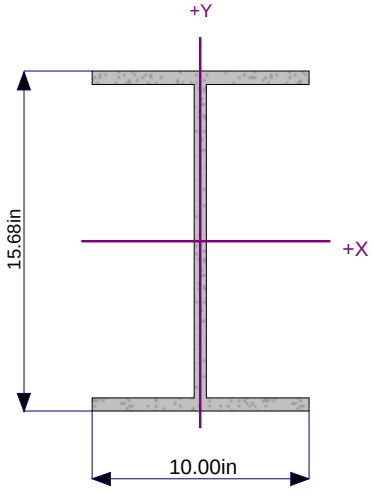
Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis





Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Column (In Plane Loading)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : IBC 2021

General Information

Steel Section Name : **W12x87**

Analysis Method :	Load Resistance Factor	Overall Column Height	9.083 ft
Steel Stress Grade	A-992, High Strength, Low Alloy, Fy = 50 ksi	Top & Bottom Fixity	Top Free, Bottom Fixed
Fy : Steel Yield	50.0 ksi	Brace condition :	
E : Elastic Bending Modulus	29,000.0 ksi		

Unbraced Length for buckling ABOUT X-X Axis = 9.083 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 9.083 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 790.22 lbs * Dead Load Factor
AXIAL LOADS . . .
Crane Framing: Axial Load at 9.083 ft, D = 1.0 k
Crane Load: Axial Load at 9.083 ft, L = 6.0 k
BENDING LOADS . . .
Moment acting about X-X axis at 9.083 ft, L = 36.0 k-ft
Wind: Lat. Uniform Load creating Mx-x, W = 0.050 k/ft
Seismic: Lat. Point Load at 9.083 ft creating Mx-x, E = 0.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.1220** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Pu	11.748	k
0.9 * Pn	1,050.57	k
Mu-x	57.60	k-ft
0.9 * Mn-x :	495.0	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	226.50	k-ft

PASS Maximum Shear Stress Ratio **0.002352** : 1

Load Combination	+0.90D+W	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Vu : Applied	0.4542	k
Vn * Phi : Allowable	193.125	k

Maximum Load Reactions . .

Top along X-X	k
Bottom along X-X	k
Top along Y-Y	k
Bottom along Y-Y	k

Maximum Load Deflections . . .

Along Y-Y in at ft above base
for load combination :

Along X-X in at ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W12x87

Steel Section Properties : W12x87

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

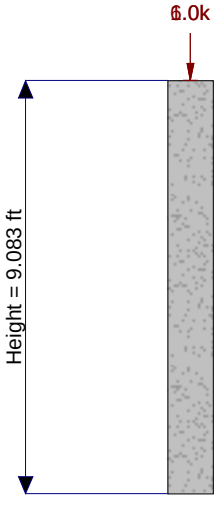
Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-New Biaxial Rail Support Column (In Plane Loading)

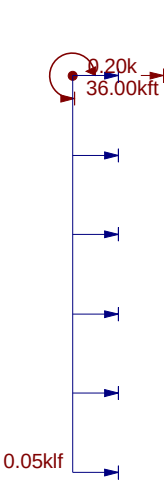
Depth	=	12.500	in	I xx	=	740.00	in^4	J	=	5.100	in^4
Web Thick	=	0.515	in	S xx	=	118.00	in^3	Cw	=	8,270.00	in^6
Flange Width	=	12.100	in	R xx	=	5.380	in				
Flange Thick	=	0.810	in	Zx	=	132.000	in^3				
Area	=	25.600	in^2	I yy	=	241.000	in^4				
Weight	=	87.000	plf	S yy	=	39.700	in^3	Wno	=	35.400	in^2
Kdesign	=	1.410	in	R yy	=	3.070	in	Sw	=	86.600	in^4
K1	=	1.063	in	Zy	=	60.400	in^3	Qf	=	27.400	in^3
rts	=	3.460	in					Qw	=	64.900	in^3
Ycg	=	0.000	in								

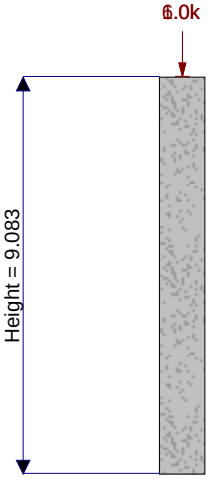
Sketches

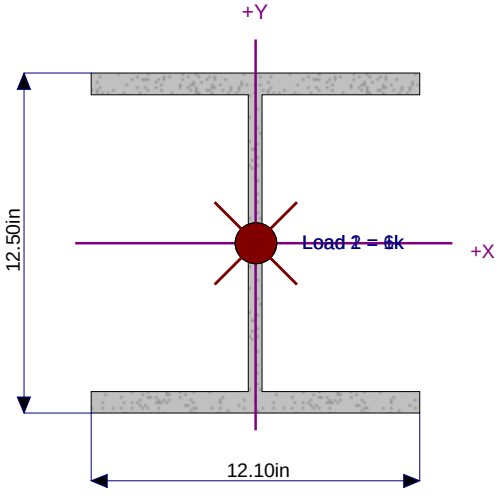
My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis







Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-New Biaxial Rail Support Column (Out of Plane Loading)

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : AISC 360-22
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

Steel Section Name : **W12x87**

Analysis Method :	Load Resistance Factor	Overall Column Height	9.083 ft
Steel Stress Grade	A-992, High Strength, Low Alloy, Fy = 50 ksi	Top & Bottom Fixity	Top Free, Bottom Fixed
Fy : Steel Yield	50.0 ksi	Brace condition :	
E : Elastic Bending Modulus	29,000.0 ksi		

Unbraced Length for buckling ABOUT X-X Axis = 9.083 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 9.083 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 790.22 lbs * Dead Load Factor
AXIAL LOADS . . .
Crane Framing: Axial Load at 9.083 ft, D = 1.0 k
Crane Load: Axial Load at 9.083 ft, L = 6.0 k
BENDING LOADS . . .
Lat. Point Load at 9.083 ft creating My-y, L = 1.20 k
Moment acting about X-X axis at 9.083 ft, L = 36.0 k-ft
Wind: Lat. Uniform Load creating Mx-x, W = 0.050 k/ft
Seismic: Lat. Point Load at 9.083 ft creating Mx-x, E = 0.20 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.1990** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Pu	11.748	k
0.9 * Pn	1,050.57	k
Mu-x	57.60	k-ft
0.9 * Mn-x :	495.0	k-ft
Mu-y	-17.439	k-ft
0.9 * Mn-y :	226.50	k-ft

PASS Maximum Shear Stress Ratio = **0.003265** : 1

Load Combination	+1.20D+1.60L	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Vu : Applied	1.920	k
Vn * Phi : Allowable	588.06	k

Maximum Load Reactions . .

Top along X-X	k
Bottom along X-X	k
Top along Y-Y	k
Bottom along Y-Y	k

Maximum Load Deflections . . .

Along Y-Y in at ft above base
for load combination :

Along X-X in at ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Extreme Reactions

Item	Extreme Value	Axial (k) @ Base	Rx (k) @ Base	Rx (k) @ Top	Ry (k) @ Base	Ry (k) @ Top	Mx (k-ft) @ Base	Mx (k-ft) @ Top	My (k-ft) @ Base	My (k-ft) @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : W12x87

Steel Section Properties : W12x87

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

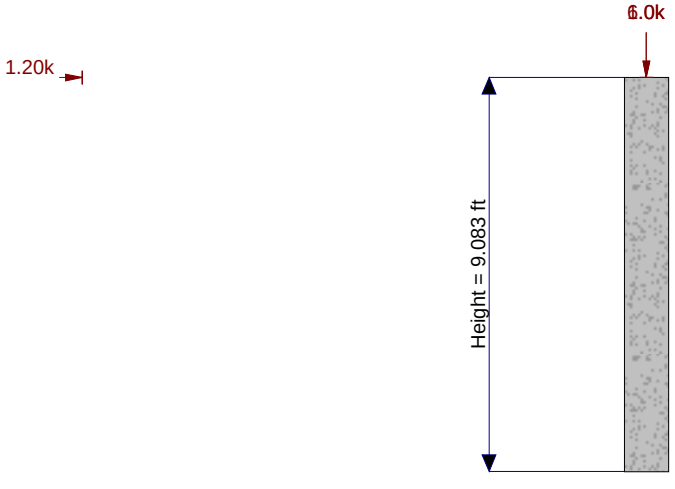
LIC# : KW-06018230, Build:20.26.03.03 STANTEC CONSULTING INC (c) ENERCALC, LLC 1982-2026

DESCRIPTION: G575-New Biaxial Rail Support Column (Out of Plane Loading)

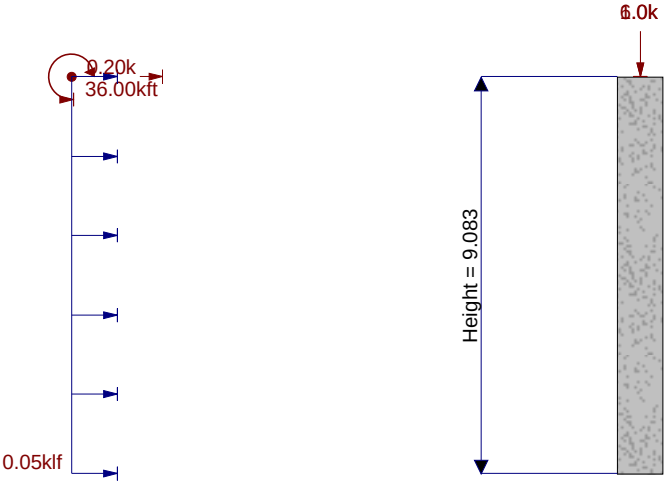
Depth	=	12.500	in	I xx	=	740.00	in^4	J	=	5.100	in^4
Web Thick	=	0.515	in	S xx	=	118.00	in^3	Cw	=	8,270.00	in^6
Flange Width	=	12.100	in	R xx	=	5.380	in				
Flange Thick	=	0.810	in	Zx	=	132.000	in^3				
Area	=	25.600	in^2	I yy	=	241.000	in^4				
Weight	=	87.000	plf	S yy	=	39.700	in^3	Wno	=	35.400	in^2
Kdesign	=	1.410	in	R yy	=	3.070	in	Sw	=	86.600	in^4
K1	=	1.063	in	Zy	=	60.400	in^3	Qf	=	27.400	in^3
rts	=	3.460	in					Qw	=	64.900	in^3
Ycg	=	0.000	in								

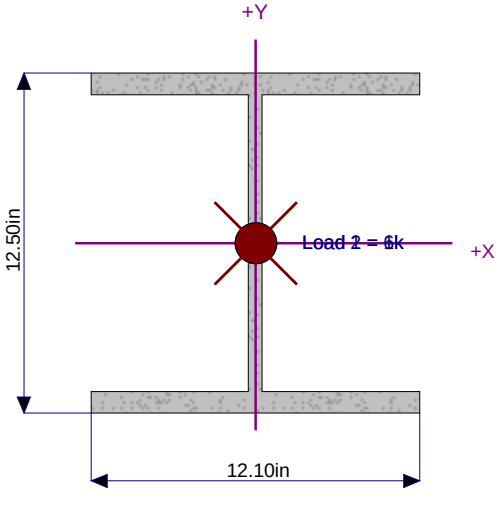
Sketches

My Loads - Looking along Y-Y Axis



Mx Loads - Looking along X-X Axis





Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-New Biaxial Rail Support Pier Foundation

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combinations Used : ASCE 7-22 / IBC 2024

Rho (or Omega) = 1.00

General Information

Material Properties

f'c : Concrete 28 day strength	=	5.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	Yes
Use Pedestal wt for stability, mom & shear	:	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	Yes	
Soil Passive Resistance (for Sliding)	=		pcf
Soil/Concrete Friction Coeff.	=		

Increases based on footing Depth

Footing base depth below soil surface	=	3.50	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

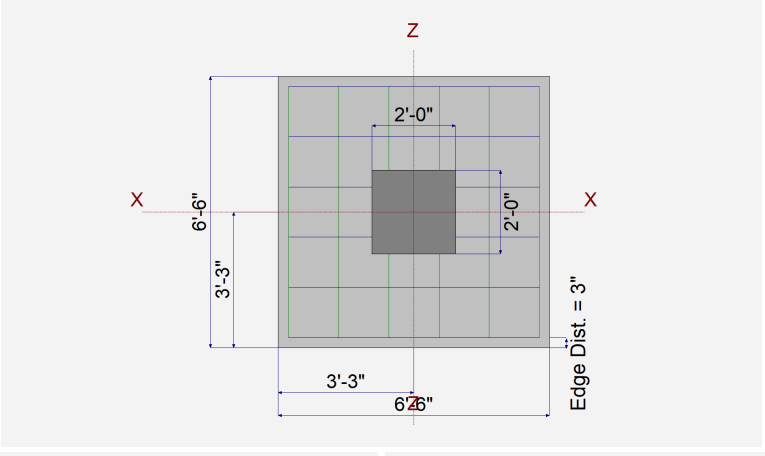
Width parallel to X-X Axis	=	6.50 ft
Length parallel to Z-Z Axis	=	6.50 ft
Footing Thickness	=	18.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	24.0 in
pz : parallel to Z-Z Axis	=	24.0 in
Height	=	48.0 in

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



Bottom Reinforcing

Bars parallel to X-X Axis (resisting Z Flexure)

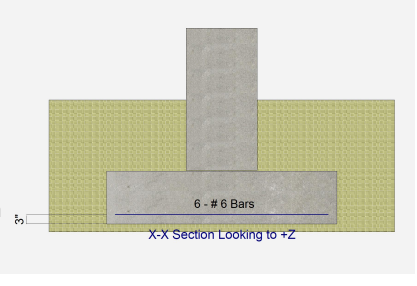
Number of Bars	=		6.0
Reinforcing Bar Size	=	#	6

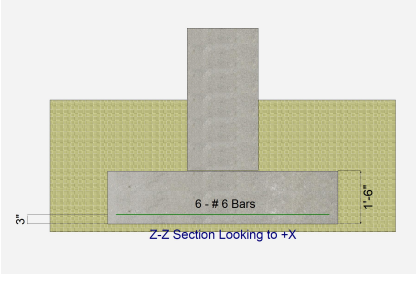
Bars parallel to Z-Z Axis (resisting X Flexure)

Number of Bars	=		6.0
Reinforcing Bar Size	=	#	6

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in





Top Reinforcing

Bars parallel to X-X Axis (resisting Z Flexure)

Number of Bars	=	6.0
Reinforcing Bar Size	=	6

Bars parallel to Z-Z Axis (resisting X Flexure)

Number of Bars	=	6.0
Reinforcing Bar Size	=	6

Rebar Centerline to Edge of Concrete...

at Top of footing	=	3.0 in

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-New Biaxial Rail Support Pier Foundation

Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	1.000	0.000	6.000	0.000	0.000	0.000	0.000	k
OB : Overburden	=	0.000	0.000	0.000	0.000	0.000	0.000	0.000	ksf
M-xx	=	0.000	0.000	0.000	0.000	0.000	0.000	0.000	k-ft
M-zz	=	0.000	0.000	36.000	0.000	2.063	1.817	0.000	k-ft
V-x	=	0.000	0.000	1.200	0.000	0.000	0.000	0.000	k
V-z	=	0.000	0.000	0.000	0.000	0.000	0.000	0.000	k

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9578	Soil Bearing	1.645 ksf	1.718 ksf	+D+L about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	2.054	Overturning - Z-Z	42.60 k-ft	87.504 k-ft	+D+L
PASS	999.0	Sliding - X-X	0.0 k	0.0 k	D Only
PASS	999.0	Sliding - Z-Z	0.0 k	0.0 k	D Only
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1599	Z Flexure (+X) Bot Tens	4.314 k-ft/ft	26.979 k-ft/ft	+1.20D+1.60L
PASS	0.007585	Z Flexure (-X) Bot Tens	0.2046 k-ft/ft	26.979 k-ft/ft	+1.40D
PASS	0.957	Min Steel X Flexure Bottom	0.389 in2/ft	0.406 in2/ft	n/a
PASS	0.02782	X Flexure (+Z) Bot Tens	0.7505 k-ft/ft	26.979 k-ft/ft	+1.20D+1.60L
PASS	0.02782	X Flexure (-Z) Bot Tens	0.7505 k-ft/ft	26.979 k-ft/ft	+1.20D+1.60L
PASS	0.957	Min Steel Z Flexure Bottom	0.389 in2/ft	0.406 in2/ft	n/a
PASS		Z Flexure (+X) Top Tens	k-ft/ft	k-ft/ft	
PASS	Undefined	Z Flexure (-X) Top Tens	k-ft/ft	k-ft/ft	+1.20D+1.60L
PASS	0.957	Min Steel X Flexure Top	0.389 in2/ft	0.406 in2/ft	n/a
PASS		X Flexure (+Z) Top Tens	k-ft/ft	k-ft/ft	
PASS		X Flexure (-Z) Top Tens	k-ft/ft	k-ft/ft	
PASS	0.000	Min Steel Z Flexure Top	0.000 in2/ft	0.000 in2/ft	n/a
PASS	0.1843	1-way Shear (+X)	10.254 psi	55.647 psi	+1.20D+1.60L
PASS	0.05110	1-way Shear (-X)	2.844 psi	55.647 psi	+1.20D+1.60L
PASS	0.02886	1-way Shear (+Z)	1.606 psi	55.647 psi	+1.20D+1.60L
PASS	0.02886	1-way Shear (-Z)	1.606 psi	55.647 psi	+1.20D+1.60L
PASS	0.02469	2-way Punching	5.238 psi	212.132 psi	+1.20D+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	1.718	n/a	0.0	0.4953	0.4953	n/a	n/a	0.288
X-X, +D+L	1.718	n/a	0.0	0.6373	0.6373	n/a	n/a	0.371
X-X, +D+0.750L	1.718	n/a	0.0	0.6018	0.6018	n/a	n/a	0.350
X-X, +D+0.60W	1.718	n/a	0.0	0.4953	0.4953	n/a	n/a	0.288
X-X, +D+0.750L+0.450W	1.718	n/a	0.0	0.6018	0.6018	n/a	n/a	0.350
X-X, +0.60D+0.60W	1.718	n/a	0.0	0.2972	0.2972	n/a	n/a	0.173
X-X, +D+0.70E	1.718	n/a	0.0	0.4953	0.4953	n/a	n/a	0.288
X-X, +D+0.750L+0.5250E	1.718	n/a	0.0	0.6018	0.6018	n/a	n/a	0.350
X-X, +0.60D+0.70E	1.718	n/a	0.0	0.2972	0.2972	n/a	n/a	0.173
Z-Z, D Only	1.718	0.0	n/a	n/a	n/a	0.4953	0.4953	0.288
Z-Z, +D+L	1.718	18.987	n/a	n/a	n/a	0.0	1.645	0.958
Z-Z, +D+0.750L	1.718	15.080	n/a	n/a	n/a	0.0	1.301	0.758
Z-Z, +D+0.60W	1.718	0.7099	n/a	n/a	n/a	0.4685	0.5220	0.304
Z-Z, +D+0.750L+0.450W	1.718	15.518	n/a	n/a	n/a	0.0	1.325	0.772
Z-Z, +0.60D+0.60W	1.718	1.183	n/a	n/a	n/a	0.2704	0.3239	0.189
Z-Z, +D+0.70E	1.718	0.7294	n/a	n/a	n/a	0.4677	0.5228	0.304
Z-Z, +D+0.750L+0.5250E	1.718	15.530	n/a	n/a	n/a	0.0	1.326	0.772
Z-Z, +0.60D+0.70E	1.718	1.216	n/a	n/a	n/a	0.2696	0.3247	0.189

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	0.0 k-ft	Infinity	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-New Biaxial Rail Support Pier Foundation

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, +D+L	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750L	None	0.0 k-ft	Infinity	OK
X-X, +D+0.60W	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750L+0.450W	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.60W	None	0.0 k-ft	Infinity	OK
X-X, +D+0.70E	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750L+0.5250E	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.70E	None	0.0 k-ft	Infinity	OK
Z-Z, D Only	None	0.0 k-ft	Infinity	OK
Z-Z, +D+L	42.60 k-ft	87.504 k-ft	2.054	OK
Z-Z, +D+0.750L	31.950 k-ft	82.629 k-ft	2.586	OK
Z-Z, +D+0.60W	1.238 k-ft	68.004 k-ft	54.940	OK
Z-Z, +D+0.750L+0.450W	32.878 k-ft	82.629 k-ft	2.513	OK
Z-Z, +0.60D+0.60W	1.238 k-ft	40.803 k-ft	32.964	OK
Z-Z, +D+0.70E	1.272 k-ft	68.004 k-ft	53.467	OK
Z-Z, +D+0.750L+0.5250E	32.904 k-ft	82.629 k-ft	2.511	OK
Z-Z, +0.60D+0.70E	1.272 k-ft	40.803 k-ft	32.080	OK

All units k

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, D Only	0.0 k	0.0 k	999.0	OK
X-X, +D+L	1.20 k	0.0 k	No Sliding	OK
X-X, +D+0.750L	0.90 k	0.0 k	No Sliding	OK
X-X, +D+0.60W	0.0 k	0.0 k	999.0	OK
X-X, +D+0.750L+0.450W	0.90 k	0.0 k	No Sliding	OK
X-X, +0.60D+0.60W	0.0 k	0.0 k	999.0	OK
X-X, +D+0.70E	0.0 k	0.0 k	999.0	OK
X-X, +D+0.750L+0.5250E	0.90 k	0.0 k	No Sliding	OK
X-X, +0.60D+0.70E	0.0 k	0.0 k	999.0	OK
Z-Z, D Only	0.0 k	0.0 k	999.0	OK
Z-Z, +D+L	0.0 k	0.0 k	999.0	OK
Z-Z, +D+0.750L	0.0 k	0.0 k	999.0	OK
Z-Z, +D+0.60W	0.0 k	0.0 k	999.0	OK
Z-Z, +D+0.70E	0.0 k	0.0 k	999.0	OK
Z-Z, +D+0.750L+0.5250E	0.0 k	0.0 k	999.0	OK
Z-Z, +0.60D+0.70E	0.0 k	0.0 k	999.0	OK
Z-Z, +D+0.750L+0.450W	0.0 k	0.0 k	999.0	OK
Z-Z, +0.60D+0.60W	0.0 k	0.0 k	999.0	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.2046	+Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.40D	0.2046	-Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+1.60L	0.7505	+Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+1.60L	0.7505	-Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+L	0.5348	+Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+L	0.5348	-Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+0.50W	0.1754	+Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+0.50W	0.1754	-Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+L+W	0.5348	+Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+L+W	0.5348	-Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +0.90D+W	0.1315	+Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +0.90D+W	0.1315	-Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+L+E	0.5348	+Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +1.20D+L+E	0.5348	-Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +0.90D+E	0.1315	+Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
X-X, +0.90D+E	0.1315	-Z	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.40D	0.2046	-X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.40D	0.2046	+X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+1.60L	4.314	+X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+L	2.394	+X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+0.50W	0.1315	-X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+0.50W	0.2193	+X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+L+W	2.509	+X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +0.90D+W	0.04380	-X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-New Biaxial Rail Support Pier Foundation

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +0.90D+W	0.2193	+X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+L+E	2.495	+X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +0.90D+E	0.05427	-X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +0.90D+E	0.2088	+X	Bottom	0.3888	ACI 7.6.1.1	0.4062	26.979	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60L	1.329	-X	Top	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+L	1.194	-X	Top	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+L+W	1.237	-X	Top	0.3888	ACI 7.6.1.1	0.4062	26.979	OK
Z-Z, +1.20D+L+E	1.233	-X	Top	0.3888	ACI 7.6.1.1	0.4062	26.979	OK

One Way Shear X

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.44 psi	0.44 psi	0.44 psi	55.65 psi	0.01	OK
+1.20D+1.60L	2.84 psi	10.25 psi	10.25 psi	55.65 psi	0.18	OK
+1.20D+L	2.83 psi	5.55 psi	5.55 psi	55.65 psi	0.10	OK
+1.20D+0.50W	0.27 psi	0.48 psi	0.48 psi	55.65 psi	0.01	OK
+1.20D+L+W	2.84 psi	5.83 psi	5.83 psi	55.65 psi	0.10	OK
+0.90D+W	0.07 psi	0.49 psi	0.49 psi	55.65 psi	0.01	OK
+1.20D+L+E	2.84 psi	5.80 psi	5.80 psi	55.65 psi	0.10	OK
+0.90D+E	0.10 psi	0.46 psi	0.46 psi	55.65 psi	0.01	OK

One Way Shear Z

Load Combination...	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.44 psi	0.44 psi	0.44 psi	55.65 psi	0.01	OK
+1.20D+1.60L	1.61 psi	1.61 psi	1.61 psi	55.65 psi	0.03	OK
+1.20D+L	1.15 psi	1.15 psi	1.15 psi	55.65 psi	0.02	OK
+1.20D+0.50W	0.38 psi	0.38 psi	0.38 psi	55.65 psi	0.01	OK
+1.20D+L+W	1.15 psi	1.15 psi	1.15 psi	55.65 psi	0.02	OK
+0.90D+W	0.28 psi	0.28 psi	0.28 psi	55.65 psi	0.01	OK
+1.20D+L+E	1.15 psi	1.15 psi	1.15 psi	55.65 psi	0.02	OK
+0.90D+E	0.28 psi	0.28 psi	0.28 psi	55.65 psi	0.01	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	1.10 psi	212.13 psi	0.01	OK
+1.20D+1.60L	5.24 psi	212.13 psi	0.02	OK
+1.20D+L	2.94 psi	212.13 psi	0.01	OK
+1.20D+0.50W	0.94 psi	212.13 psi	0.00	OK
+1.20D+L+W	2.99 psi	212.13 psi	0.01	OK
+0.90D+W	0.70 psi	212.13 psi	0.00	OK
+1.20D+L+E	2.98 psi	212.13 psi	0.01	OK
+0.90D+E	0.70 psi	212.13 psi	0.00	OK

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-New Biaxial Rail Support Pier

Code References

Governing Code : IBC 2024
Referenced Design Standard(s) : ACI 318-19
Load Combinations Used : ASCE 7-22 / IBC 2024

General Information

f'c : Concrete 28 day streng	=	5.0 ksi
E =	=	3,122.0 ksi
Density	=	150.0 pcf
β	=	0.0
fy - Main Rebar	=	60.0 ksi
E - Main Rebar	=	29,000.0 ksi
Allow. Reinforcing Limits		*ASTM A615 Bars Used*
Min. Reinf.	=	1.0 %
Max. Reinf.	=	8.0 %
Seismic Design Category	=	C

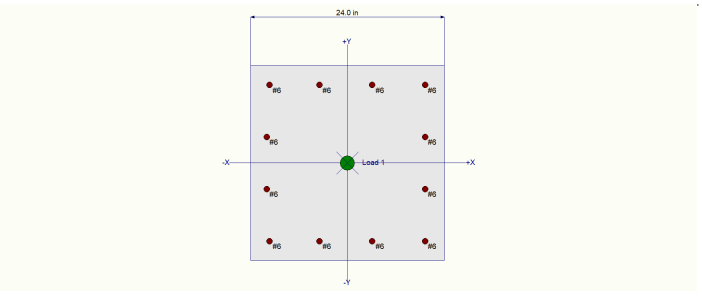
Overall Column Height = 4.0 ft
End Fixity Top Free, Bottom Fixed

Brace condition for deflection (buckling) along colur
X-X (width) axis :
Unbraced Length for buckling ABOUT X-X Axis = 4.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 4.0 ft, K = 1.0

Column Cross Section

Column Dimensions : 24.0in Square Column, Column Edge to Rebar Edge Cover = 2.0in

Column Reinforcing : 4 - #7 bars @ corners,, 2 - #7 bars top & bottom between corner bars, 2 - #7 bars left & right between corner



Applied Loads

Entered loads are factored per load combinations specified by user.

Column self weight included : 2,400.0 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 4.0 ft above base, D = 1.0, L = 6.0 k
BENDING LOADS . . .
Lat. Point Load at 4.0 ft creating Mx-x, L = 1.20 k
Wind: Moment acting about X-X axisat 4.0 ft, W = 2.063 k-ft
Seismic: Moment acting about X-X axisat 4.0 ft, E = 1.817 k-ft
Moment acting about X-X axisat 4.0 ft, L = 36.0 k-ft

DESIGN SUMMARY

Load Combination 0.0
Location of max.above base 0.0 ft

Maximum Stress Ratio **0.0 : 1**
Ratio = (Pu^2+Mu^2)^.5 / (PhiPn^2+PhiMn^2)^.5

Pu =	0.0 k	φ * Pn =	0.0 k
Mu-x =	0.0 k-ft	φ * Mn-x =	0.0 k-ft
Mu-y =	0.0 k-ft	φ* Mn-y =	0.0 k-ft
Mu Angle =	deg	φ =	
Mu at Angle =	k-ft	φMn at Angle =	k-ft

Pn & Mn values located at Pu-Mu vector intersection with capacity curve

Column Capacities . .

Pnmax : Nominal Max. Compressive Axial Capac	0.0 k
Pnmin : Nominal Min. Tension Axial Capacity	k
φ Pn, max : Usable Compressive Axial Capacity	0.0 k
φ Pn, min : Usable Tension Axial Capacity	k

Maximum SERVICE Load Reactions .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Deflections . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination : 0.0
Along X-X 0.0 in at 0.0 ft above base
for load combination : 0.0

General Section Informatio β = 0.0 θ = 0.0
ρ : % Reinforcing 0.0 % Rebar < Min of 1.0 %
Reinforcing Area 0.0 in^2
Concrete Area 0.0 in^2

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Column

Project File: 175578902_03.03.2026_G575 Crane Calcs_TJF.ec6

DESCRIPTION: G575-New Biaxial Rail Support Pier

Governing Load Combination Results

Governing Factored Load Combination	Moment X-X	Moment Y-Y	Dist. from base	Dist. from ft	Axial Load k Pu	Axial Load k φ * Pn	Bending Analysis k-ft δx	δx * Mux	δy	δy * Muy	Alpha (deg)	δ Mu	φ Mn	Utilization Ratio

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top

Maximum Moment Reactions

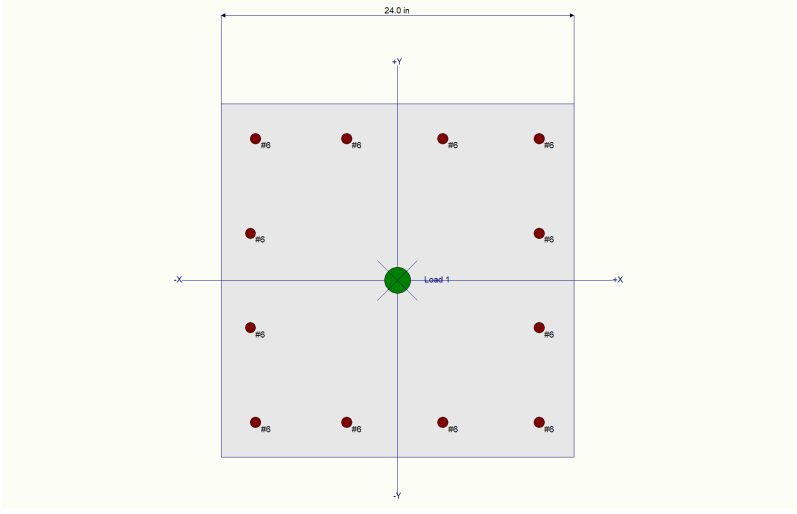
Note: Only non-zero reactions are listed.

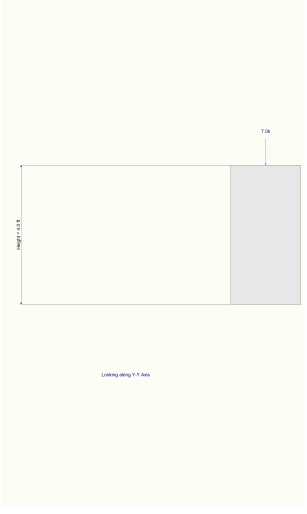
Load Combination	Moment About X-X Axis @ Base	@ Top	Moment About Y-Y Axis @ Base	@ Top

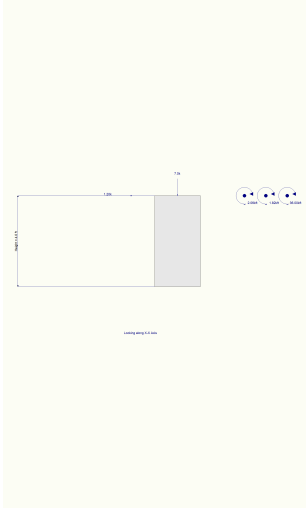
Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

Sketches







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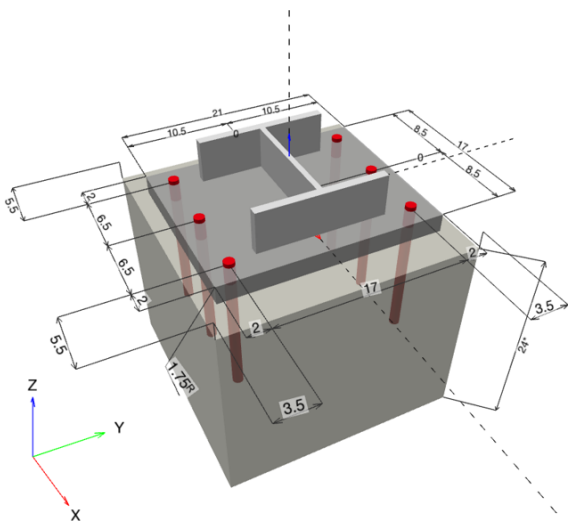
Specifier's comments:

1 Input data

Anchor type and diameter:	**Heavy Hex Head ASTM F 1554 GR. 36 1**
Item number:	not available
Specification text:	∅ 1 IN HEAVY HEX HEAD ASTM F 1554 GR. 36 WITH 12 IN NOMINAL EMBEDMENT DEPTH PER TECHNICAL DATA , CAST IN PLACE INSTALLATION PER MPII
Effective embedment depth:	h_{ef} = 12.000 in.
Material:	ASTM F 1554
Evaluation Service Report:	Hilti Technical Data
Issued I Valid:	- | -
Proof:	Design Method ACI 318-19 / CIP
Shear edge breakout verification:	Row closest to edge (Case 3 only from ACI 318-19 Fig. R.17.7.2.1b)
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 1.750 in.
Anchor plate[R] :	l_x x l_y x t = 17.000 in. x 21.000 in. x 1.750 in.;
Profile:	W shape (AISC), W12X87; (L x W x T x FT) = 12.500 in. x 12.100 in. x 0.515 in. x 0.810 in.
Base material:	cracked concrete, 5000, f_c' = 5,000 psi; h = 24.000 in.
Reinforcement:	tension: present, shear: not present; anchor reinforcement: tension
	edge reinforcement: none or < No. 4 bar

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [kip, ft.kip]



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1.1 Unfactored loads

	Sustained load factor	Load factor f_1 or f_2	V_x [kip]	V_y [kip]	N [kip]	M_x [ft.kip]	M_y [ft.kip]	M_z [ft.kip]
D (Dead)	1.000	-	0.200	-	1.000	-	-	-
F (Fluid)	1.000	-	-	-	-	-	-	-
T (Temperature)	1.000	-	-	-	-	-	-	-
L (Live)	1.000	1.000	1.200	-	6.000	-	36.00000	-
H (Lateral)	1.000	-	-	-	-	-	-	-
L_r (Roof live)	1.000	-	-	-	-	-	-	-
S (Snow)	1.000	0.200	-	-	-	-	-	-
R (Rain)	-	-	-	-	-	-	-	-
W (Wind)	-	-	-	-	-	-	2.06300	-
E (Earthquake)	-	-	-	-	-	-	1.81700	-

1.2 Load combination and design results

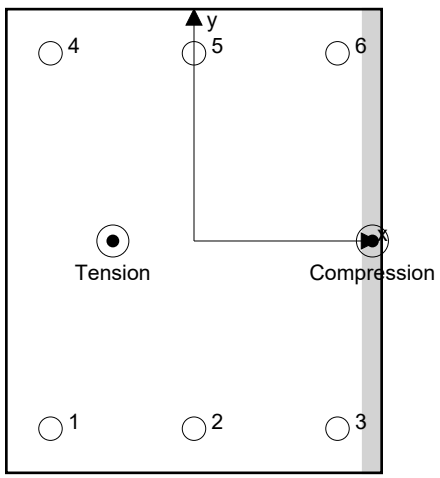
1.2.1 Load combination

Load case	Load combination
Equation (16-2a)	1.2 (D + F) + 1.6 (L + H) + 0.5 (L_r)

1.2.2 Design results

Case	Description	Forces [kip] / Moments [ft.kip]	Seismic	Max. Util. Anchor [%]
Equation (16-2a)	1.2 (D + F) + 1.6 (L + H) + 0.5 (L_r)	N = 10.800; V_x = 2.160; V_y = 0.000; M_x = 0.00000; M_y = 57.60000; M_z = 0.00000;	no	81

2 Load case/Resulting anchor forces



Anchor reactions [kip]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	20.395	0.360	0.360	0.000
2	11.036	0.360	0.360	0.000
3	1.676	0.360	0.360	0.000
4	20.395	0.360	0.360	0.000
5	11.036	0.360	0.360	0.000
6	1.676	0.360	0.360	0.000

Max. concrete compressive strain:	0.07 [‰]
Max. concrete compressive stress:	3,157 [psi]
Resulting tension force in (x/y)=(-3.675/0.000):	66.214 [kip]
Resulting compression force in (x/y)=(8.082/0.000):	55.414 [kip]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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3 Tension load

	Load N_{ua} [kip]	Capacity ϕ N_n [kip]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	20.395	26.361	78	OK
Pullout Strength*	20.395	42.028	49	OK
Concrete Breakout Failure**[1]	N/A	N/A	N/A	N/A
Concrete Side-Face Blowout, direction y-**	33.107	58.909	57	OK

* highest loaded anchor **anchor group (anchors in tension)

[1] Tension Anchor Reinforcement has been selected!

3.1 Steel Strength

$N_{sa} = A_{se,N} f_{uta}$ ACI 318-19 Eq. (17.6.1.2)

$\phi N_{sa} \geq N_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.61	58,000

Calculations

N_{sa} [kip]
35.148

Results

N_{sa} [kip]	ϕ_{steel}	ϕN_{sa} [kip]	N_{ua} [kip]
35.148	0.750	26.361	20.395

3.2 Pullout Strength

$N_{pN} = \psi_{c,p} N_p$ ACI 318-19 Eq. (17.6.3.1)

$N_p = 8 A_{brg} f'_c$ ACI 318-19 Eq. (17.6.3.2.2a)

$\phi N_{pN} \geq N_{ua}$ ACI 318-19 Table 17.5.2

Variables

$\psi_{c,p}$	A_{brg} [in.^{2}]	λ_a	f'_c [psi]
1.000	1.50	1.000	5,000

Calculations

N_p [kip]
60.040

Results

N_{pn} [kip]	$\phi_{concrete}$	ϕN_{pn} [kip]	N_{ua} [kip]
60.040	0.700	42.028	20.395

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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3.3 Concrete Side-Face Blowout, direction y-

$N_{sb} = 160\, c_{a1} \sqrt{A_{brg}}\, \lambda_a \sqrt{f'_c}$ ACI 318-19 Eq. (17.6.4.1)

$N_{sbg} = \alpha_{group}\, N_{sb}$ ACI 318-19 Eq. (17.6.4.2)

$\phi\, N_{sbg} \geq N_{ua}$ ACI 318-19 Table 17.5.2

$\alpha_{group} = \left(1 + \frac{s}{6\, c_{a1}}\right)$ see ACI 318-19, Section 17.6.4.2, Eq. (17.6.4.2)

Variables

c_{a1} [in.]	c_{a2} [in.]	A_{brg} [in.^{2}]	λ_a	f'_c [psi]	s [in.]
3.500	5.500	1.50	1.000	5,000	13.000

Calculations

α_{group}	N_{sb} [kip]
1.619	48.514

Results

N_{sbg} [kip]	$\phi_{concrete}$	$\phi\, N_{sbg}$ [kip]	$N_{ua,edge}$ [kip]
78.546	0.750	58.909	33.107

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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4 Shear load

	Load V_{ua} [kip]	Capacity ϕ V_n [kip]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	0.360	13.708	3	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	2.160	52.604	5	OK
Concrete edge failure in direction x+**	2.160	6.770	32	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

$V_{sa} = 0.6\ A_{se,V}\ f_{uta}$ ACI 318-19 Eq. (17.7.1.2b)

$\phi\ V_{steel} \geq V_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.61	58,000

Calculations

V_{sa} [kip]
21.089

Results

V_{sa} [kip]	ϕ_{steel}	$\phi\ V_{sa}$ [kip]	V_{ua} [kip]
21.089	0.650	13.708	0.360

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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4.2 Pryout Strength

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \right]$ ACI 318-19 Eq. (17.7.3.1b)

$\phi V_{cpg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-19 Eq. (17.6.2.2.1)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	5.667	0.000	0.000	3.500

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	-	24	1.000	5,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [kip]
576.00	289.00	1.000	1.000	0.824	1.000	22.892

Results

V_{cpg} [kip]	$\phi_{concrete}$	ϕV_{cpg} [kip]	V_{ua} [kip]
75.149	0.700	52.604	2.160

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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4.3 Concrete edge failure in direction x+

$V_{cbg} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} \psi_{parallel,V} V_b$ ACI 318-19 Eq. (17.7.2.1b)

$\phi V_{cbg} \geq V_{ua}$ ACI 318-19 Table 17.5.2

A_{Vc} see ACI 318-19, Section 17.7.2.1, Fig. R 17.7.2.1(b)*

$A_{Vc0} = 4.5 c_{a1}^2$ ACI 318-19 Eq. (17.7.2.1.3)

$\psi_{ec,V} = \left(\frac{1}{1 + \frac{e'_v}{1.5c_{a1}}}\right) \leq 1.0$ ACI 318-19 Eq. (17.7.2.3.1)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ ACI 318-19 Eq. (17.7.2.4.1b)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ ACI 318-19 Eq. (17.7.2.6.1)

$V_b = 9 \lambda_a \sqrt{f'_c} c_{a1}^{1.5}$ ACI 318-19 Eq. (17.7.2.2.1b)

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\psi_{c,V}$	h_a [in.]
5.500	3.500	0.000	1.000	24.000

l_e [in.]	λ_a	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
8.000	1.000	1.000	5,000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [kip]
193.87	136.12	1.000	0.827	1.000	8.209

Results

V_{cbg} [kip]	$\phi_{concrete}$	ϕV_{cbg} [kip]	V_{ua} [kip]
9.672	0.700	6.770	2.160

*Anchor row defined by: Anchor 3, 6; Case 3 controls

5 Combined tension and shear loads, per ACI 318-19 section 17.8

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.774	0.319	5/3	81	OK

$\beta_{NV} = \beta_N^{\zeta} + \beta_V^{\zeta} <= 1$

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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6 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (EN1992-4, AS5216, etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- User is responsible for evaluating the hole bearing capacity in case of shear forces.
- The equations presented in this report are based on imperial units. When inputs are displayed in metric units, the user should be aware that the equations remain in their imperial format.
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- For additional information about ACI 318 strength design provisions, please go to https://viewer.joomag.com/profis-design-guide-us-en-summer-2021/0841849001625154758?short&/
- The design of Anchor Reinforcement is beyond the scope of PROFIS Engineering. Refer to ACI 318-19, Section 17.5.2.1 (a) for information about Anchor Reinforcement.
- Anchor Reinforcement has been selected as a design option, calculations should be compared with PROFIS Engineering calculations.

Fastening meets the design criteria!

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7 Anchor plate and concrete bearing stress check

	Load	Capacity	Utilization [%]	Status
Concentric Compression	N/A	N/A	N/A	N/A
Concrete bearing	3,157 [psi]	3,157 [psi]	100	OK
Tension Interface	14,218.15 [in.lb/in.]	24,806.22 [in.lb/in.]	58	OK
Uniaxial Moment (Strong Axis)	4,174.76 [in.lb/in.]	24,806.22 [in.lb/in.]	17	OK
Uniaxial Moment (Weak Axis)	13,908.38 [in.lb/in.]	24,806.22 [in.lb/in.]	57	OK

7.1 Concrete bearing check (per AISC DG1, section 4.3.1)

$A_1 = B \cdot N$

$A_2 = L \cdot W$

$f_{pu(max)} = \phi \left(0.85 f'_c \sqrt{\frac{A_2}{A_1}} \right) , \sqrt{\frac{A_2}{A_1}} \leq 2$

Variables

B [in.]	N [in.]	L [in.]	W [in.]	f_c' [psi]	ϕ	P_u [kip]
17.000	21.000	24.000	19.429	5,000	0.650	10.800

Calculations

A_1 [in.^{2}]	A_2 [in.^{2}]
357.00	466.29

Results

f_{pu} [psi]	$f_{pu(max)}$ [psi]
3,157	3,157

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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7.2 Plate bending (Strong Axis), Compression (per AISC DG1, sections 4.3.7, 4.3.8)

$A_1 = B \cdot N$

$A_2 = L \cdot W$

$f_{pu(max)} = \phi \left(0.85 f'_c \sqrt{\frac{A_2}{A_1}} \right) , \sqrt{\frac{A_2}{A_1}} \leq 2$

$m = \frac{B\text{-}0.95d}{2}$

$n = \frac{N\text{-}0.80b_f}{2}$

$M_{pl1} = C_r \cdot \frac{x}{b_{eff}}$

$\phi M_n = \phi \cdot F_y \cdot \frac{t_p^2}{4}$

$M_{pl1} \leq \phi M_n$

Variables

B [in.]	N [in.]	L [in.]	W [in.]	d [in.]	b_f [in.]
17.000	21.000	24.000	19.429	12.500	12.100

F_y [psi]	ϕ	t_p [in.]	P_u [kip]	M_u [ft.kip]
36,000	0.900	1.750	10.800	57.60000

Calculations

A_1 [in.^{2}]	A_2 [in.^{2}]	$f_{pu(max)}$ [psi]	m [in.]	n [in.]
357.00	466.29	3,157	2.562	5.660

f_{pu} [psi]	C_r [kip]	x [in.]	b_{eff} [in.]	M_{pl1} [in.lb/in.]
3,157	55.414	1.582	21.000	4,174.76

Results

M_n [in.lb/in.]	ϕ	ϕM_n [in.lb/in.]	M_{pl1} [in.lb/in.]
27,562.47	0.900	24,806.22	4,174.76

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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Company:		Page:	11
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Lift Station G575 Baseplate Design	Date:	4/20/2026
Fastening point:			

7.3 Plate bending (Weak Axis), Compression (per AISC DG1, sections 4.3.7, 4.3.8 and Appendix B.4)

$A_1 = B \cdot N$

$A_2 = L \cdot W$

$f_{pu(max)} = \phi \left(0.85 f'_c \sqrt{\frac{A_2}{A_1}} \right) , \sqrt{\frac{A_2}{A_1}} \leq 2$

$m = \frac{B\text{-}0.95d}{2}$

$n = \frac{N\text{-}0.80b_f}{2}$

$M_{pl2} = C_r \cdot \frac{x}{b_{eff}}$

$\phi M_n = \phi \cdot F_y \cdot \frac{t_p^2}{4}$

$M_{pl2} \leq \phi M_n$

Variables

B [in.]	N [in.]	L [in.]	W [in.]	d [in.]	b_f [in.]
17.000	21.000	24.000	19.429	12.500	12.100

F_y [psi]	ϕ	t_p [in.]	P_u [kip]	M_u [ft.kip]
36,000	0.900	1.750	10.800	57.60000

Calculations

A_1 [in.^{2}]	A_2 [in.^{2}]	$f_{pu(max)}$ [psi]	m [in.]	n [in.]
357.00	466.29	3,157	2.562	5.660

f_{pu} [psi]	C_r [kip]	x [in.]	b_{eff} [in.]	M_{pl2} [in.lb/in.]
3,157	14.935	5.660	6.078	13,908.38

Results

M_n [in.lb/in.]	ϕ	ϕM_n [in.lb/in.]	M_{pl2} [in.lb/in.]
27,562.47	0.900	24,806.22	13,908.38

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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Company:		Page:	12
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Lift Station G575 Baseplate Design	Date:	4/20/2026
Fastening point:			

7.4 Plate bending, Tension (per AISC DG1, section 4.3.7)

$$m = \frac{B-0.95d}{2}$$

$$n = \frac{N-0.80b_f}{2}$$

$$M_{pl} = \frac{T_u \cdot x}{b_{eff}}$$

$$\phi M_n = \phi \cdot F_y \cdot \frac{t_p^2}{4}$$

$$M_{pl} \leq \phi M_n$$

Variables

B [in.]	N [in.]	d [in.]	b_f [in.]	F_y [psi]
17.000	21.000	12.500	12.100	36,000

ϕ	t_p [in.]	P_u [kip]	M_u [ft.kip]
0.900	1.750	10.800	57.60000

Calculations

m [in.]	n [in.]
2.562	5.660

T_u [kip]	x [in.]	b_{eff} [in.]
20.395	3.660	5.250

Results

M_n [in.lb/in.]	ϕ	ϕM_n [in.lb/in.]	M_{pl} [in.lb/in.]
27,562.47	0.900	24,806.22	14,218.15

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Company:		Page:	13
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Lift Station G575 Baseplate Design	Date:	4/20/2026
Fastening point:			

8 Installation data

Profile: W shape (AISC), W12X87; (L x W x T x FT) = 12.500 in. x 12.100 in. x 0.515 in. x 0.810 in.

Hole diameter in the fixture: d_f = 1.062 in.

Plate thickness (input): 1.750 in.

Anchor type and diameter: Heavy Hex Head ASTM F 1554 GR. 36 1

Item number: not available

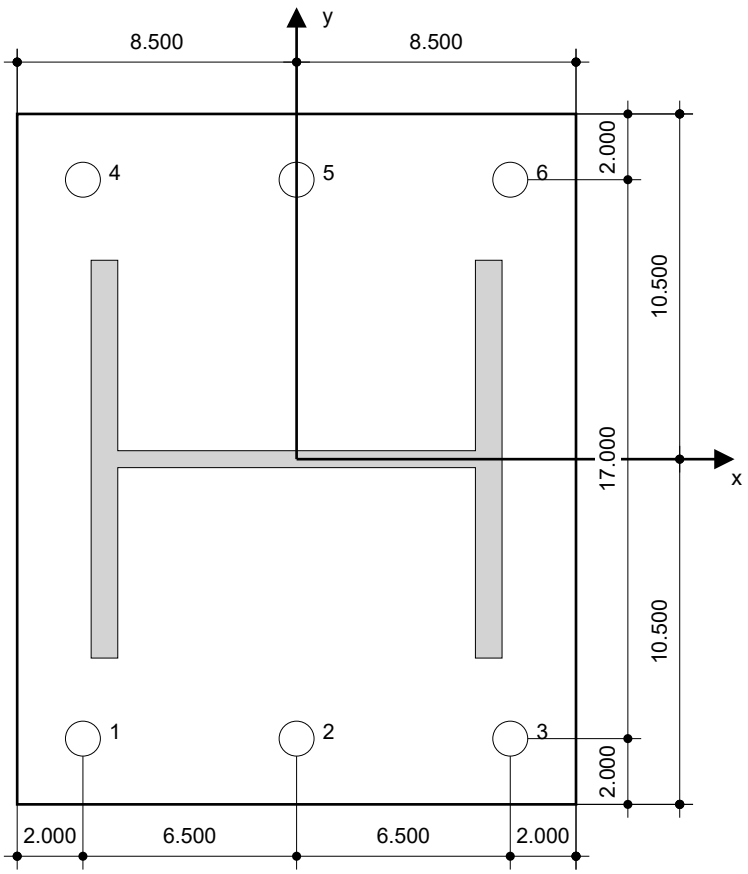
Maximum installation torque: -

Hole diameter in the base material: - in.

Hole depth in the base material: 12.000 in.

Minimum thickness of the base material: 13.172 in.

⌀ 1 in Heavy Hex Head ASTM F 1554 GR. 36 with 12 in nominal embedment depth per Technical data , cast in place installation per MPII



Coordinates Anchor in.

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-6.500	-8.500	5.500	18.500	3.500	20.500
2	0.000	-8.500	12.000	12.000	3.500	20.500
3	6.500	-8.500	18.500	5.500	3.500	20.500
4	-6.500	8.500	5.500	18.500	20.500	3.500
5	0.000	8.500	12.000	12.000	20.500	3.500
6	6.500	8.500	18.500	5.500	20.500	3.500

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Appendix F

G575 Electrical Load Calculations

ELECTRICAL LOAD CALCULATION - LIFT STATION G575

LOAD DESCRIPTION	1 UNIT LOAD	2 QUANTITY	3 P.F	4 = 1*2 CONN'CTD LOAD (VA)	5 DEMAND FACTOR	6 = 4*5 DEMAND LOAD (VA)	7 = 4*3 CONN'CTD LOAD (W)	8 = 6*3 DEMAND LOAD (W)
INTERIOR LIGHTING	2.2 VA/FT^2 (1)	1675 FT^2	0.90	3,685	100%	3,685	3,317	3,317
OUTLETS, RECEPTACLE	180 VA	26 EA	0.90	4,680				
➥ RECEPTACLE LOAD UP TO 10 KVA				4,680	100%	4,680	4,212	4,212
➥ RECEPTACLE LOAD ABOVE 10 KVA				0	50%	0	0	0
LIFT STATION PUMP NO. 1	109,156.0 VA	1 EA	0.81	109,156	100%	109,156	88,416	88,416
LIFT STATION PUMP NO. 2(2)	34,261.0 VA	1 EA	0.86	34,261	0%	0	29,464	0
LIFT STATION PUMP NO. 3(2)	34,261.0 VA	1 EA	0.86	34,261	0%	0	29,464	0
LIFT STATION PUMP NO. 4	109,156.0 VA	1 EA	0.81	109,156	100%	109,156	88,416	88,416
MASCERATOR	6,320.0 VA	1 EA	0.87	6,320	100%	6,320	5,498	5,498
UNIT HEATERS (4 TOTAL)	36,000.0 VA	1 TOT	1.00	36,000	100%	36,000	36,000	36,000
COMPRESSOR	6,320.0 VA	1 EA	0.87	6,320	100%	6,320	5,498	5,498
SUMP PUMPS(3)	6,320.0 VA	2 EA	0.84	12,640	50%	6,320	10,618	5,309
HOIST(4)	3,610.0 VA	1 EA	0.85	3,610	0%	0	3,069	0
EXHAUST FAN EF-3	11,640.0 VA	1 EA	0.80	11,640	100%	11,640	9,312	9,312
DAY TANK	960.0 VA	1 EA	0.85	960	100%	960	816	816
AIR PURIFIER	1,657.0 VA	1 EA	0.85	1,657	100%	1,657	1,408	1,408
CHEMICAL STORAGE TANK	1,200.0 VA	1 EA	1.85	1,200	100%	1,200	2,220	2,220
WATER HEATER	1,800.0 VA	1 EA	1.00	1,800	100%	1,800	1,800	1,800
GENERATOR BATTERY CHARGER	160.0 VA	1 EA	0.90	160	100%	160	144	144
GENERATOR BLOCK HEATER	3,000.0 VA	1 EA	1.00	3,000	100%	3,000	3,000	3,000
TOILET WALL HEATER	1,800.0 VA	1 EA	1.00	1,800	100%	1,800	1,800	1,800
HVAC (AIR HANDLER AND CONDENSER)	3,411.0 VA	1 EA	0.85	3,411	100%	3,411	2,899	2,899
			TOTAL LOAD:	390,397		307,265	327,373	260,067
				TOTAL AMPS @ 480V, 3 PH:		370		

TOTAL SQUARE FOOTAGE: 1,675

FOOTNOTES:

(1) UNIT LOAD FOR MANUFACTURING FACILITY OF 2.2 VA/FT^2, PER NEC TABLE 220.12, IS USED TO APPROXIMATE THE INTERIOR LIGHTING LOAD.

(2) STANDBY LOAD NOT CONSIDERED IN THE LOAD CALCULATION.

(3) ONLY ONE SUMP PUMP IS CONSIDERED IN THE LOAD CALCULATION. THE OTHER IS STANDBY.

(4) HOIST NOT CONSIDERED IN THE LOAD CALCULATION. IS LIKELY TO BE OPERATED WITH LOAD ONLY WHEN REPLACING ONE OF THE PUMPS.

Appendix G

G575 Existing Generator Sizing Analysis

EXISTING GENERATOR LOAD ANLYSIS BASED ON TWO LARGE PUMPS RUNNING

Notes:

1. Generator load calculations are less conservative than Electrical System Load Calculations. Whereas the National Electrical Code provides clear methodology for preparing load calculations, including the use of conservative motor rated amps, generator sizing analyses are more realistic because the actual motor rated amps can be utilized.

2. The generator used in this analysis is the same kW rating and brand as existing but is a current model and may have dome differences compared to the existing model. The software does not allow for modeling generators that are no longer in production. When running sizing simulations for different model units of the same rating, the most pressing concern is motor starting capability which can be affected by differences alternator size, excitation system or engine performance.For this project, motor starting capability is of no concern given that starting inrush current concerns do not apply because the large motor loads are controlled via Adjustable Speed Drives.

rehlko SIZING REPORT

Reject reason : HigherThanMaxLoad

Project Information

Project Name : Camp Le Jeune - G575 - 2 Large Pumps
Customer's Name : US Navy
Customer contact :

Site Requirements

Voltage :	277/480 V
Phase :	3
Frequency Hz :	60 Hz
Alt. Temp. Rise Duty :	130C STANDBY @40C
Qty of Gensets :	1
Fuel Type :	DIESEL
Country :	United States

Application :	Water Utilities
Emission Requirement :	STATIONARY EMERGENCY (US EPA)
Altitude :	500 Feet
Max. Ambient Temp. :	104 F
Min. Genset Loading :	30 %
Max. Genset Loading :	100 %

Site Load Requirements Summary

Running kWe :	255.97
Running kVA :	281.54
Running P.F. :	0.91

Max. Starting kW :	81.40 in Step 1
Max. Starting kVA :	81.40 in Step 1

Generator Selection

Genset Model :	KD230
Engine :	KD09L06T-6DDS
Displacement :	543.11 cu. In
RPM :	1800
Rated kW :	230
Site Alt / Temp De-Rated kW :	230
UL 2200 Certified	

Alternator :	KH01722TO4D
Alternator Leads :	12
Alt. Starting kVA at 35% V Dip :	1015
Cal Alt temp Rise*	80
Excitation System :	MAUX or PMG

Generator Performance Summary

Voltage Dip Limit :	15 %	Calculated Voltage Dip :	7 %
Frequency Dip Limit :	10 %	Calculated Frequency Dip :	3 %
Harmonic Distortion Limit :	12 %	Calculated Harmonic Distortion :	6 %

Report prepared by : Jevaan Lewis

REHLKO Power Solutions Center

9 April 2026

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rehlko SIZING REPORT

OVERLOAD

Calculated Genset % Loaded :	111 %

Report prepared by : Jevaan Lewis

REHLKO Power Solutions Center

9 April 2026

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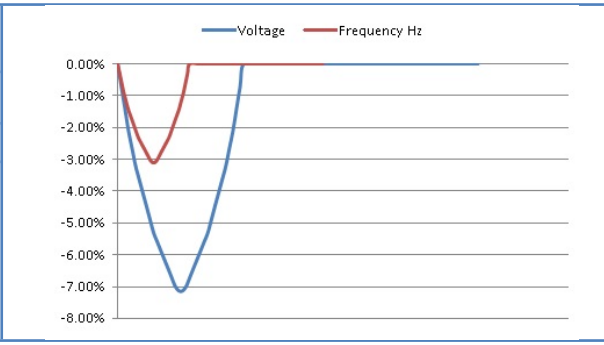
SIZING REPORT

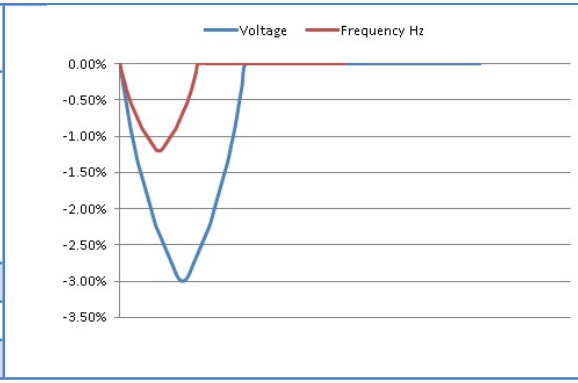
Model : KD230 , Alternator : KH01722TO4D

Load Profile

Step #1	Qty	Run			Start			Volt Dip %	Freq Dip %	Volt. Dist. %
		kW	kVA	PF	kW	kVA	PF			
Linear Load 3 Phase	1	75.70	81.40	0.93	81.40	81.40	1.00			
Step Total		75.70	81.40	0.93	81.40	81.40	1.00	7	3	0
Cum.Total		75.70	81.40	0.93						



Step #2	Qty	Run			Start			Volt Dip %	Freq Dip %	Volt. Dist. %
		kW	kVA	PF	kW	kVA	PF			
Motor **High Flow Pump 1** 110.00 HP 3 Phase Motor code : G Loaded NEMA Design VFD WITH RAMP	2	180.27	200.30	0.90	30.36	33.73	0.90			
Step Total		180.27	200.30	0.90	30.36	33.73	0.90	3	1	6
Cum.Total		255.97	281.54	0.91						
Grand Total		255.97	281.54	0.91				7	3	6



Appendix H

G575 Harmonic Distortion Analysis

TCI HarmonicGuard Solution Center

Report for Lift Station G575 - Active Harmonics Cancellation for 1 Large Pump

Project ID: 152131
Project Location: Camp Le Jeune, NC
Generated for Jevaan Lewis
Company: Stantec
Email: jevaan.lewis@stantec.com
Date/Time: July 20, 2026 at 7:49 PM CDT

Power System Information

Transformer Primary

Enter Data	Yes
Voltage	12.47 kV RMS
Short Circuit Current	4.00 kA RMS

Transformer Secondary

Voltage	480.00 V RMS
Frequency	60.00 Hz
kVA	225.00 kVA
Z	3.10 %

Secondary Correction Target

Harmonic Correction	Yes
Desired iTDD	8.00 %
IEEE-519	Yes
Power Factor Correction	Yes

Non-Linear Loads

Qty	Rectifier Type	Passive Filter	VFD HP	% DC Choke	% AC Line Reactor	KDR Line Reactor	% Load	Notes
1	6 Pulse Diode	None	125 HP	0 %	0 %	0 %	85 %	% Load determined using rated pump horsepower and applying 0.95 demand factor added

Linear Loads

Qty	Load Type	HP	kVA	% Load
1	Other	0 HP	81.4 kVA	100 %

Calculated Solution

Corrective Current Required	132.2 A
Chosen Active Filter Current Rating	150.00 A

Secondary Correction Data

iTDD with Chosen Filter	4.0 %
vTHD with Chosen Filter	0.6 %
ISC/IL (SCR)	39.4
Desired iTDD	8.0 %
iTDD Compliance	iTDD Compliant

Power System Electrical Quantities

	Baseline System	Chosen System	Compliant System
Total RMS Current (IRMS)	218.3	196.1	196.6
Fundamental Current (I60)	204.6	195.9	195.9
Harmonic Current (IH)	76.1	7.8	15.7
iTDD % (iTHD)	37.2	4.0	8.0
Reactive Current (IQ)	58.9	0.0	0.0
vTHD %	5.7	0.6	1.2
kW	162.9	162.9	162.9
kVAR	80.0	6.5	13.0

	Baseline System	Chosen System	Compliant System
kVA	181.5	163.0	163.4
Displacement Power Factor (PF)	0.96	1.00	1.00
Distortion Power Factor (PF)	0.94	1.00	1.00
Total Power Factor (PF)	0.90	1.00	1.00

Warning Messages

No Warnings

Disclaimer: The results of this analysis may not accurately represent actual system performance due to insufficient system data or limitations of the estimation software. TCI, LLC assumes no liability for damages that may occur as a result of equipment placed in service based on the results of this analysis.

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