ENGINEERS CONSTRUCTION, INC.

Submittal Cover Sheet

Submittal Title: **Containment and Access Plan, SHARON IM 089 1 (64)**

Project Name: **SHARON IM 089 1 (64)**

Project Number: **200328**

Date: **2/10/2021**

ECI Submittal Reference Number: **010**

Manufacturer / Supplier / Subcontractor: **Monoko LLC**

Specification / Drawing References: **Special Provision Removal, Containment and Disposal of Lead Paint (Containment Plan); Special Provision Field Painting (Steel Inspection Access Plan)**

Submittal Checked By: **Philipp Foerster**

☒ This submittal is not proposed or deviation from the Contract Documents

☐ This submission includes a proposed deviation from the Contract Documents as clearly identified in this submittal

The undersigned attest that the undersigned has carefully examined this entire submission, and the requirements of the Contract Documents have been met.

By: Philipp Foerster

Supertintendent

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INDEX OF SHEETS:

STATE OF VERMONT
AGENCY OF TRANSPORTATION

PROJECT NO. IM089-1(64)
ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)
WINDSOR COUNTY, VERMONT

ABRASIVE BLASTING CONTAINMENT PLANS

PREPARED FOR:

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760 BAYSHORE DIRVE
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PREPARED BY:

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5406 HOOVER BLVD., SUITE 12
TAMPA, FL 33634
PHONE (813) 249-2220
ENGINEER OF RECORD, PAUL R. STEIJLEN, P.E.
VT P.E. LICENSE NUMBER 107795

SHEET NO.
C-1

SPECIFICATIONS:

STATE OF VERMONT AGENCY OF TRANSPORTATION (VTRANS) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2018 EDITION, AND SUPPLEMENTS THERETO.

DESIGN CRITERIA:

~~DEAD LOAD (PLATFORM):~~	
DEAD LOAD (SCAFFOLD):	3 PSF
LIVE LOAD (UNIFORM PLATFORM):	220 LBS. (32'x28" MAX. 500 LBS. RATED)
LIVE LOAD (UNIFORM SCAFFOLD):	12 PSF (WEIGHT OF 1/2" STEEL SHOT)
LIVE LOAD (CONCENTRATED):	6 PSF (WEIGHT OF 1/4" STEEL SHOT) 500 LBS. (TWO WORKERS MAX.)

MATERIAL PROPERTIES:

STRUCTURAL SHAPES, PLATES & BARS:

STRUCTURAL TUBING:	ASTM A36, Fy = 36,000 PSI
STRUCTURAL BOLTS:	ASTM A500, GRADE B, Fy = 46,000 PSI
TIMBER:	ASTM A325
CABLES:	SOUTHERN PINE NO. 2 (OR BETTER)
METAL DECKING:	6x19 IWRC EIP ASTM A611 OR A653, Fy = 33,000 PSI

CLIPS, SHACKLES, AND EYE HOOKS SHALL BE MANUFACTURED BY CROSBY, OR EQUIVALENT.

REQUIRED PLATFORM CABLE SIZES
(3/8" ∅ MIN. SUPPORT HANGER SPACING = 25'-0" MAX.)

OPTION #	PLATFORM CABLE	PLATFORM CABLE SPACING
1	1/2" ∅	3'-9" (MAX.)
2	9/16" ∅	5'-3" (MAX.)

USE 1/2" ∅ MIN. SCAFFOLD CABLE WITH 3/8" ∅ MIN. SUPPORT HANGERS SPACED AT 25'-0" MAXIMUM.

NO MORE THAN 2 WORKERS SHALL BE ALLOWED PER PLATFORM CABLE OR SCAFFOLD CABLE. LIMIT 500 LB TOTAL WEIGHT OF WORKERS AND ABRASIVE BLASTING ON 500 LB RATED SCAFFOLD. ACCUMULATION OF DEBRIS ON SCAFFOLDING SHALL BE REMOVED TO PREVENT OVERLOAD ON SCAFFOLDING.

STRUCTURAL IMPACT:

THE PLATFORM CONTAINMENT STRUCTURE HAS BEEN ANALYZED FOR AN AVERAGE LIVE LOAD ALLOWANCE OF 16 PSF (APPROXIMATELY ½" AVERAGE DEPTH OF STEEL SHOT, 1.5" MINERAL SLAG ABRASIVE OR 1.5" SAND ABRASIVE, PLUS THE UNIFORM WORKER LOADING. WHEN THE DEPTH OF SPENT ABRASIVES NEARS THE DEPTHS SPECIFIED, THE CONTRACTOR WILL CEASE ABRASIVE BLASTING OPERATIONS AND VACUUM THE SPENT ABRASIVES.

FOR PROJECTS INVOLVING THE INSTALLATION OF SUSPENDED PLATFORM, AASHTO ALLOWS A 36% INCREASE IN STRESS FOR TEMPORARY LOADS (0.55Fy KSI INVENTORY RATING VERSUS 0.75Fy KSI OPERATING RATING). THE UNIFORM DESIGN FOR LOAD GIRDERS BRIDGES IS 64 PSF, AND THUS, THE ANTICIPATED WEIGHT OF THE PLATFORM CONTAINMENT (APPROX. 19 PSF) ADDED TO THIS ORIGINAL DESIGN LOADING RESULTS IN A MAXIMUM D+L LOADING OF 83 PSF ON THE GIRDERS (19 PSF + 64 PSF EQUIVALENT LIVE LOADING). TEMPORARY LOADING APPLIED TO THE BRIDGE MEMBERS RESULT IN A MAXIMUM 30% INCREASE, WHICH IS BELOW THE 36% INCREASED ALLOWED BY AASHTO. SINCE THE METHOD ASSUMES THAT THE EXISTING BRIDGE MEMBERS ARE 100% STRESSED PRIOR TO LOADING, THIS GENERAL COMPARISON IS CONSIDERED VERY CONSERVATIVE.

CONTRACTOR IS HEREBY NOTIFIED THAT BRIDGES THAT ARE CURRENTLY POSTED OR HAVE AN INVENTORY RATING LESS THAN 1.0, SHALL BE EVALUATED FOR ADDITIONAL LOADING DUE TO THE PLATFORM SYSTEM AND CONSTRUCTION EQUIPMENT, IF ANY, AND MAY REQUIRE CLOSURE TO TRAFFIC DURING BLASTING AND PAINTING OPERATIONS.

THE BRIDGE HAS NOT BEEN ANALYZED FOR LOADS IMPOSED BY THE GRIT RECYCLING MACHINE (IF APPLICABLE). AS A RESULT, THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE OWNER FOR PLACEMENT OF ALL EQUIPMENT ALONG THE BRIDGE. THE GRIT RECYCLING MACHINE REAR AXLES SHALL BE CENTERED OVER THE PIERS.

THE CONTAINMENT STRUCTURE HAS BEEN ANALYZED FOR A MAXIMUM WIND VELOCITY OF 40 MPH. IF WINDS NEARING OR EXCEEDING 40 MPH (OR A LESSER WIND IS SPECIFIED IN THE CONTRACT SPECIFICATIONS) ARE PREDICTED, BLASTING AND PAINTING OPERATIONS SHALL CEASE, THE CONTRACTOR SHALL THOROUGHLY COLLECT AND REMOVE ALL SPENT ABRASIVE MATERIAL AND DEBRIS GENERATED FROM THE BLASTING AND PAINTING ACTIVITIES USING A VACUUM TRUCK AND/OR PUMP, AND THE PAINT CONTAINMENT TARPAULINS SHALL BE ROLLED AND SECURED IN PLACE.

BASED ON THE MAXIMUM WIND VELOCITY OF 40 MPH (3.79 PSF WIND LOAD PER AASHTO), THE RESULTING LOAD TRANSFERRED TO A BRIDGE STRUCTURE IS 76 PLF, BASED ON A CONTAINMENT HEIGHT OF 20'-0". SINCE AASHTO SPECIFIES A LATERAL LOADING OF 300 PLF FOR DESIGN OF GIRDER BRIDGES, THE MAXIMUM ANTICIPATED WIND LOAD OF 76 PLF IS ACCEPTABLE. WIND LOADING ON GIRDER BRIDGES DOES NOT GOVERN.

GENERAL:

THESE DRAWINGS DEPICT THE PAINT CONTAINMENT DESIGNS TO BE UTILIZED BY MONOKO, LLC., FOR WINDSOR COUNTY, VERMONT FOR THE FOLLOWING BRIDGES:

BRIDGE 17N (VERMONT COUNTY) I-89 OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

BRIDGE 17S (VERMONT COUNTY) I-89 OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

THE CONTRACTOR SHALL PROVIDE MAINTENANCE OF TRAFFIC AND LANE CLOSURES AS PER THE CONTRACT SPECIFICATIONS AND TRAFFIC CONTROL PLANS PROVIDED WITH THE CONTRACT. THE EQUIPMENT USED IN ANY TRAVEL LANE OR PAVED SHOULDER SHALL HAVE THE ABILITY TO BE MOVED OFF THE ROADWAY IN 30 MINUTES OR LESS.

FOR WORK OVER OR NEAR WATER, OSHA 29 CFR 1926.106 REQUIRES THE CONTRACTOR TO PROVIDE LIFE JACKETS, BUOYANT VEST, RING BUOYS AND A LIFE SAVING BOAT READY FOR IMMEDIATE RESPONSE. HOWEVER, PERSONNEL UTILIZING AN OSHA APPROVED PERSONAL SAFETY HARNESS AND LANYARDS ARE NOT REQUIRED TO WEAR LIFE VESTS.

PER SSPC GUIDE 12, PAINTING AND INSPECTION WILL BE PERFORMED WITH AN ILLUMINATION OF 20 FOOT-CANDLES FOR GENERAL, 50 FOOT-CANDLES FOR WORK AND 200 FOOT -CANDLES FOR INSPECTIONS. LIGHTING WILL BE TESTED WITH A PORTABLE LIGHT METER, OR AS REQUIRED BY THE CONTRACT. IF THE MINIMUM ILLUMINATION IS NOT MAINTAINED, THE CONTRACTOR SHALL PROVIDE AUXILIARY LIGHTS.

THE CONTRACTOR SHALL PROVIDE A MULTI-STAGE DECONTAMINATION TRAILER AND WATER WASH FACILITY FOR THE DURATION OF THE PROJECT, LOCATED AT AN APPROPRIATE SITE DETERMINED BY THE CONTRACTOR.

WORKERS WILL ACCESS THE BELOW-DECK CONTAINMENTS AT THE ABUTMENTS, FROM THE BRIDGE DECK ABOVE OR EXISTING GROUND BELOW USING OSHA-APPROVED LADDERS. THE LADDERS WILL BE SECURED TO THE BRIDGE RAILINGS AND/OR TRUSS STEEL AND TO THE PLATFORM SYSTEM.

FOR WORK PERFORMED FROM 500 LBS RATED ALUMINUM SCAFFOLDS SUPPORTED BY 1/2"∅ CABLES RIGGED ALONG THE ENTIRE LENGTH OF THE BRIDGE, WORKER SAFETY TIE-OFF CABLES AND WORKER HARNESSES WILL BE UTILIZED DURING ALL WORK, INCLUDING INSTALLATION & REMOVAL OF THE PLATFORM SYSTEMS & DURING TRAVEL UP & DOWN THE LADDERS, IN ACCORDANCE WITH OSHA GUIDELINES.

THE SUSPENDED PLATFORM DESIGNS, DETAILS AND INSTALLATION SPECIFICATIONS INCLUDED IN THIS PACKAGE WERE PREPARED UNDER THE DIRECTION OF THE CONTRACTOR. BY ACCEPTING THESE PLANS FOR SUBMITTAL, THE CONTRACTOR CONFIRMS THAT THE PLANS HAVE BEEN REVIEWED FOR CORRECTNESS, AND THAT THE SYSTEMS WILL BE INSTALLED IN ACCORDANCE WITH THE PLANS.

THE CONTRACTOR FULLY UNDERSTANDS & AGREES THAT A2B ENGINEERING, LLC. AND THEIR CERTIFYING ENGINEER(S) ARE NOT RESPONSIBLE FOR THE ULTIMATE TECHNIQUES AND/OR METHODS OF CONSTRUCTION USED ON THIS PROJECT, OR THE SAFETY PRECAUTIONS & PROGRAMS INCIDENT THERETO, OR FOR ANY LOSS OR DAMAGES RESULTING FROM THE CONTRACTOR'S FAILURE TO COMPLY WITH LAWS AND REGULATIONS (PRIMARILY OSHA) APPLICABLE TO THE FURNISHING, INSTALLING AND/OR PERFORMANCE OF WORK.

THE CONTRACTOR FULLY UNDERSTANDS & AGREES THAT A2B ENGINEERING, LLC. HAS PREPARED THESE SUBMITTALS WITH THE UNDERSTANDING THAT THE CONTRACTOR AND THEIR EMPLOYEES HAVE THE KNOWLEDGE & EXPERTISE IN THE PROPER RIGGING OF THE CATENARY CONTAINMENT & WORKER ACCESS SYSTEMS PRESENTED ON THESE DRAWINGS, INCLUDING ALL OSHA REQUIREMENTS, AND IS NOT IN NEED OF DETAILED INSTALLATION AND/OR DISMANTLING PROCEDURES FOR SUCH INSTALLATIONS.

THE CONTRACTOR FULLY UNDERSTANDS & AGREES THAT BY ACCEPTING THESE DRAWINGS FOR SUBMITTAL, THEY ARE FULLY RESPONSIBLE FOR COMPLYING WITH ALL FEDERAL, STATE & LOCAL CODES & REGULATIONS (PRIMARILY OSHA) AND HERE-BY HOLDS A2B ENGINEERING, LLC. AND THEIR CERTIFYING ENGINEER(S) HARMLESS, AND INDEMNIFIES THEM FOR ANY LOSS OR DAMAGES RESULTING FROM THE CONTRACTOR'S FAILURE TO COMPLY WITH ANY/ALL APPLICABLE CODES, REGULATIONS AND/OR ANY MANUFACTURER'S INSTALLATION REQUIREMENTS, REGARDLESS OF WHETHER SAID INFORMATION IS OR IS NOT INCLUDED AS PART OF THESE SUBMITTALS.

THESE DRAWINGS & CALCULATIONS (IF APPLICABLE) HAVE BEEN PREPARED FOR THIS PROJECT ONLY. A2B ENGINEERING, LLC. AND THEIR CERTIFYING ENGINEER(S) HAVE NO LIABILITY SHOULD ANY PORTIONS OF THESE DRAWINGS AND/OR CALCULATIONS BE USED FOR DIFFERENT PROJECT.

THESE PLANS WERE PREPARED WITHOUT THE BENEFIT OF AS-BUILT BRIDGE PLANS. DUE TO UNCERTAINTIES OF THE EXISTING STRUCTURE, THE CONTRACTOR MAY MAKE MINOR MODIFICATIONS TO THE PAINT CONTAINMENT STRUCTURE DETAILED IN THESE PLANS. A2B ENGINEERING, LLC. SHALL BE NOTIFIED OF ANY MODIFICATIONS TO ENSURE THAT THE STRUCTURAL INTEGRITY OF THE PAINT CONTAINMENT STRUCTURE IS NOT COMPROMISED.

PER SSPC GUIDE 6 CLASS 1A CONTAINMENT CLASSIFICATION, THIS CONTAINMENT AND VENTILATION SYSTEM HAS BEEN DESIGNED USING THE FOLLOWING COMPONENTS IN ACCORDANCE WITH SSPC GUIDE 6 TABLE A, REQUIRED ONLY FOR A0170R, A4277, A4297 & A48891 BRIDGES:

CLASS 1A:

- A2 FLEXIBLE CONTAINMENT MATERIALS
- B1 AIR IMPENETRABLE
- C2 FLEXIBLE SUPPORT STRUCTURE
- D1 FULL SEAL
- E1 ENTRYWAY THROUGH AIRLOCK DOORS
- F1 CONTROLLED AIR SUPPLY (INTAKE)
- G2 NATURAL INPUT AIR FLOW
- H2 VISUAL VERIFICATION
- I1 MINIMUM SPECIFIED
- J1 AIR FILTRATION REQUIRED

STATE OF VERMONT
PAUL R. STEIJLEN
NO. 107795
CIVIL
2-10-21
LICENSED
PROFESSIONAL ENGINEER

Bridge Nos. 17N & 17S

REVISIONS		
DATE	BY	DESCRIPTION

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STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

SHEET TITLE: GENERAL NOTES (1 OF 2)

REF. DWG. NO.:

PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

SHEET NO.: C-2

$FILES $USERS $DATES $TIMES

CONTAINMENT ENCLOSURE:

THE ABRASIVE BLASTING CONTAINMENT SYSTEM SHALL CONFORM TO THE REQUIREMENTS OF OSHA 1926 SUBPART L, OSHA 29 CFR 1910.28, ANSI A10.8 AND SSPC GUIDE 6.

ALL WORKER BREATHING EQUIPMENT, CLOTHING, OTHER PROTECTIVE EQUIPMENT AND WORK ACTIVITIES PERFORMED WITHIN THE CONTAINMENT STRUCTURE SHALL BE IN ACCORDANCE WITH OSHA REGULATIONS FOR THE REMOVAL OF LEAD PAINT.

ALL ABRASIVE BLAST CLEANING CONTAINMENTS, INCLUDING GROUND COVER, SIDEWALLS AND ENDWALLS, SHALL BE CONSTRUCTED OF 100% AIR IMPERMEABLE FIRE RESISTANT TARPAULINS. ADJACENT TARPAULIN PANELS SHALL BE FASTENED TOGETHER BY ROLLING AND CLAMPING OR BY CLAMPING TO LUMBER TO CREATE A CONTINUOUS IMPENETRABLE SEAL. THE CONTRACTOR MAY USE ANY APPROPRIATE METHOD AVAILABLE (TAPE, SPRAY FOAM, ETC) TO PROVIDE A CONTINUOUS SEAL TO CONTAIN DUST EMISSIONS (ABRASIVE BLASTING) AND/OR SOLVENT CLEANING/WATER WASHING OPERATIONS. SEE MISCELLANEOUS CONTAINMENT DETAILS SHEETS.

FOR BRIDGE TO GRADE CONTAINMENTS, THE TARPAULIN BASE SHALL BE SEALED WITH SANDBAGS OR SIMILAR WEIGHTS. FOR VERTICAL CONTAINMENTS, THE CONTRACTOR MAY UTILIZE CABLES ANCHORED WITH WEIGHTS OR ANCHORED TO THE GROUND TO SUPPORT THE VERTICAL TARPAULIN WALLS.

FOR PLATFORM AND CABLE SUPPORTED CONTAINMENTS, TARPAULIN WALLS SHALL BE SECURED TO APPROPRIATE BRIDGE ELEMENTS TO SEAL THE ENCLOSURE.

EXISTING BRIDGE DRAINS ENCLOSED WITHIN THE PAINT CONTAINMENT STRUCTURE SHALL BE TEMPORARILY PLUGGED OR WATER RUNOFF DIRECTED AWAY FROM THE CONTAINMENT ENCLOSURE AS SPECIFIED OR PERMITTED IN THE CONTRACT SPECIFICATIONS. AT THE CONCLUSION OF EACH WORK DAY, ALL PLUGGED DECK DRAINS SHALL BE UNPLUGGED TO RESTORE DECK DRAINAGE. AT THE CONCLUSION OF THE BRIDGE CLEANING AND PAINTING OPERATIONS RESTORE BRIDGE DRAINAGE TO THE SATISFACTION OF THE ENGINEER.

WHEN ABRASIVE BLASTING IS PERFORMED NEAR THE TARPAULIN WALL, THE ABRASIVE BLAST SHALL BE DIRECTED AWAY FROM THE TARPAULIN WALL. WHEN WORK IS PERFORMED NEAR AN INLET OPENING, THE OPENING SHALL BE TEMPORARILY SEALED TO MINIMIZE LOSS OF EMISSIONS.

TARPAULINS SHALL BE 100% AIR/WATER IMPERMEABLE TO CONTAIN THE WASTE WATER AND BLASTING DEBRIS AND ALLOW FOR VACUUMING.

FOR SSPC TYPE 1A CONTAINMENTS, WORKERS SHALL ACCESS EACH CONTAINMENT THROUGH DOUBLE DOOR AIRLOCK ENTRANCE WHICH ALLOWS THE WORKERS TO SEAL ONE DOOR PRIOR TO ENTERING/EXITING THE CONTAINMENT THROUGH THE OTHER DOOR. TARPAULIN DOORS SHALL BE CLOSED AND SEALED DURING BLASTING OPERATIONS TO PREVENT LOSS OF EMISSIONS. MINIMIZE PASSAGE IN AND OUT OF CONTAINMENT STRUCTURES DURING BLASTING OPERATIONS. DURING SANDBLASTING OPERATIONS, ALL WORKERS/PERSONAL SHALL BE CLEANED WITH A HEPA VACUUM PRIOR TO LEAVING THE CONTAINMENT.

AT THE CONCLUSION OF EACH WORK DAY, THE CONTRACTOR SHALL THOROUGHLY COLLECT AND REMOVE ALL SPENT ABRASIVE MATERIAL AND DEBRIS GENERATED FROM THE BLASTING AND PAINTING ACTIVITIES USING A VACUUM TRUCK AND/OR PUMP. DURING SANDBLASTING OPERATIONS, ALL WORKER/PERSONNEL SHALL BE CLEANED WITH A HANDHELD HEPA VACUUM PRIOR TO LEAVING THE CONTAINMENT.

PRIOR TO DISASSEMBLING THE PAINT CONTAINMENT STRUCTURE, ALL SURFACES WITHIN THE CONTAINMENT, INCLUDING SIDEWALLS, ENDWALLS AND GROUND COVER, SHALL BE BLOWN DOWN TO ACHIEVE THE CLEANLINESS SPECIFIED IN THE CONTRACT, OR GENERALLY ACCEPTED PAINTING PRACTICES.

ALL WASTE DEBRIS SHALL BE SEALED AND STORED IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED WASTE HANDLING PLANS. COLLECTED AND SEALED WASTE MATERIAL SHALL BE APPROPRIATELY LABELED AS HAZARDOUS WASTE. THE STORAGE SITE AREA SHALL PROVIDE FOR DRAINAGE TO PREVENT WATER RUN-OFF FROM PONDING AROUND THE SEALED CONTAINERS. THE WASTE STORAGE SITE SHALL BE SECURED TO PREVENT UNAUTHORIZED ACCESS.

IF THE ENGINEER DETERMINES THAT THE PAINT CONTAINMENT SYSTEM IS NOT EFFECTIVE IN RESTRICTING BLASTING AND PAINTING EMISSIONS, OR IN COLLECTING BLASTING DEBRIS, BLASTING AND PAINTING OPERATIONS SHALL CEASE AND DEFICIENCIES CORRECTED PRIOR TO RESUMING WORK.

CONTAINMENT NOTES:

ALL WORK SHALL BE ASSEMBLED IN ACCORDANCE WITH THESE DRAWINGS, THE MANUFACTURER'S INSTRUCTIONS AND CRITERIA, INDUSTRY GUIDELINES AND THE MOST CURRENT EDITION OF ALL FEDERAL, STATE AND LOCAL REGULATIONS, STATUTES ORDINANCES, AND THE PROJECT SPECIFICATIONS. A2B ENGINEERING, LLC. SHALL BE NOTIFIED WHERE DISCREPANCIES EXIST BETWEEN THESE DRAWINGS AND THE MANUFACTURER'S INSTRUCTIONS TO VERIFY THE APPROPRIATE CRITERIA.

THE CONTRACTOR IS SOLELY RESPONSIBLE TO ENSURE THAT ALL FALL PROTECTION IS INSTALLED PER OSHA AND PROJECT SPECIFICATIONS.

PRIOR TO CONSTRUCTION OF THE PAINT CONTAINMENT STRUCTURE ALL MATERIAL SHALL BE THOROUGHLY INSPECTED TO ENSURE THAT THEY CONTAIN NO DEFICIENCIES THAT WILL COMPROMISE THE STRUCTURAL INTEGRITY OF THE PAINT CONTAINMENT STRUCTURE. THE CONTRACTOR SHALL PERFORM WEEKLY INSPECTIONS OF THE PAINT CONTAINMENT STRUCTURE, OR AS NEEDED, TO ENSURE THE STRUCTURAL INTEGRITY OF THE STRUCTURE REMAINS SECURE.

VENTILATION SYSTEM:

THE CONTRACTOR SHALL PROVIDE MECHANICAL EXHAUST VENTILATION FOR THE ABRASIVE BLASTING CONTAINMENT STRUCTURES USING ONE OR MORE MOBILE DUST COLLECTORS. THE CONTRACTOR PROPOSES TO USE ONE (1) 45,000 AT 13" W.G. CFM MOBILE DUST COLLECTOR MANUFACTURED BY ADVANCED RECYCLING SYSTEMS, INC. THE DUST COLLECTOR HAS AN ASSUMED DUST EXHAUST CAPACITY BASED ON THE NUMBER OF DUCTS PROVIDED AS:

EXHAUST CAPACITY WITH 4 - 20 INCH DIAMETER DUCTS:	48,000 CFM
EXHAUST CAPACITY WITH 3 - 20 INCH DIAMETER DUCTS:	45,000 CFM
EXHAUST CAPACITY WITH 2 - 20 INCH DIAMETER DUCTS:	40,000 CFM
EXHAUST CAPACITY WITH 1 - 20 INCH DIAMETER DUCT:	24,000 CFM

REFER TO PLAN SHEETS FOR NUMBER OF EXHAUST DUCTS AND INLET AREA REQUIREMENTS.

THE MAIN OBJECTIVE FOR USING THE NEGATIVE AIR EXHAUST VENTILATION SYSTEM IS TO CONTAIN AIRBORNE PARTICULATE WITHIN THE CONTAINMENT STRUCTURE AND PROVIDE AIR FLOW THROUGH THE CONTAINMENT STRUCTURE. CONTAINMENT SIDEWALLS, ENDWALLS AND GROUND COVERS SHALL BE CONSTRUCTED AND SEALED TO PREVENT EXCESSIVE LEAKS BETWEEN THE PANELS AND ALONG THE GROUND. A PRELIMINARY VENTILATION SYSTEM TEST OF EACH CONTAINMENT SHALL BE PERFORMED PRIOR TO STARTING ABRASIVE BLASTING OPERATIONS. AIR FLOW THROUGH THE CONTAINMENT SHALL BE VERIFIED AT MULTIPLE LOCATIONS THROUGHOUT THE CONTAINMENT USING A HAND-HELD MANOMETER. IF THE EXHAUST VENTILATION SYSTEM IS UNABLE TO ACHIEVE THE SPECIFIED AIR FLOW THROUGH THE CONTAINMENT STRUCTURE OR ADEQUATELY REMOVE AIRBORNE PARTICULATE MATTER, THE CONTRACTOR SHALL PROVIDE ADDITIONAL DUST COLLECTORS AND EXHAUST DUCTS, OR REDUCE THE SIZE OF THE ACTIVE PAINT CONTAINMENT ENCLOSURE BY INSTALLING INTERNAL TARPAULIN WALLS. THE EXHAUST VENTILATION SYSTEM SHALL REMAIN IN OPERATION DURING CLEANING AND VACUUMING OPERATIONS.

VENTILATION SYSTEM TABLE (CROSS-DRAFT)				
NO. OF 20" ⊙ DUCTS PROVIDED	4	3	2	1
VOLUME Q, CFM	48,000	45,000	40,000	24,000
MAX. CONTAINMENT AREA, SQ. FT.(V=100 FT/MIN.)	480.0	450.0	400.0	240.0
MIN. CONTAINMENT AREA, SQ. FT.(V=300 FT/MIN.)	160.0	150.0	133.3	80.0
MAX. INLET AREA, SQ. FT. (V=700 FT/MIN)	68.6	64.3	57.1	34.3
MIN. INLET AREA, SQ. FT. (V=1000 FT/MIN)	48.0	45.0	40.0	24.0

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STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

sUSERS

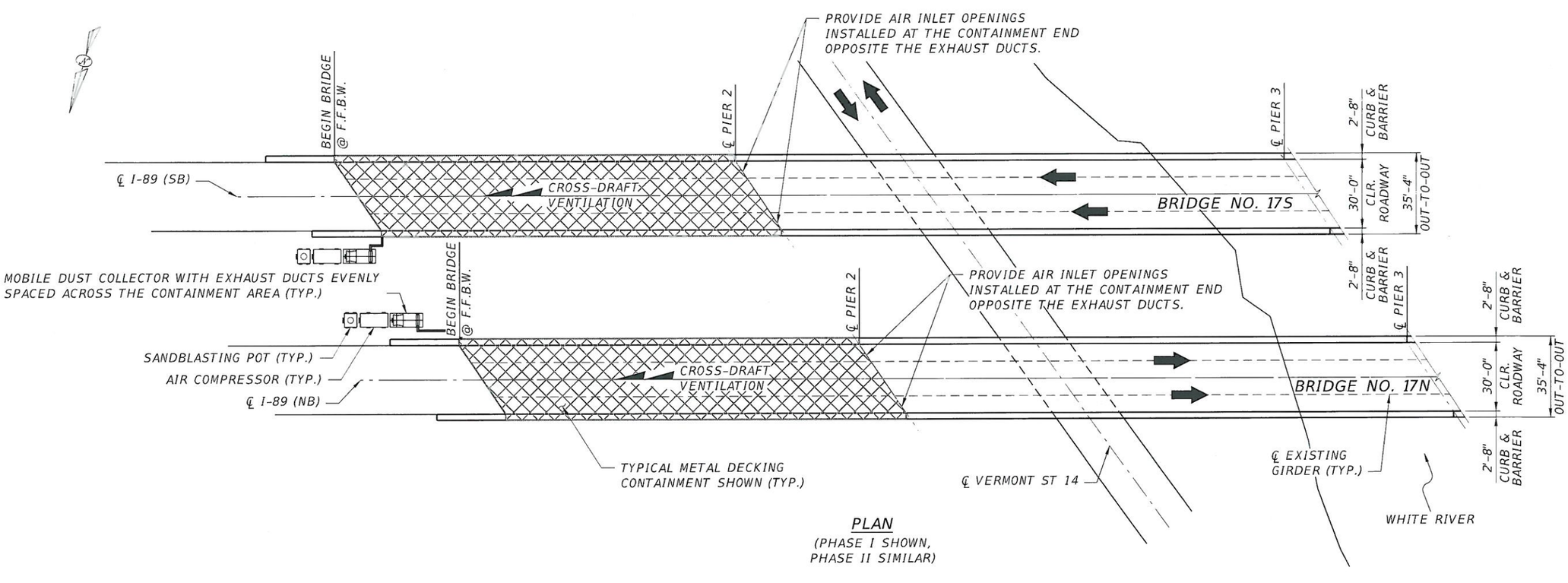
SHEET TITLE: GENERAL NOTES (2 OF 2)

REF. DWG. NO.:

PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

SHEET NO.: C-3

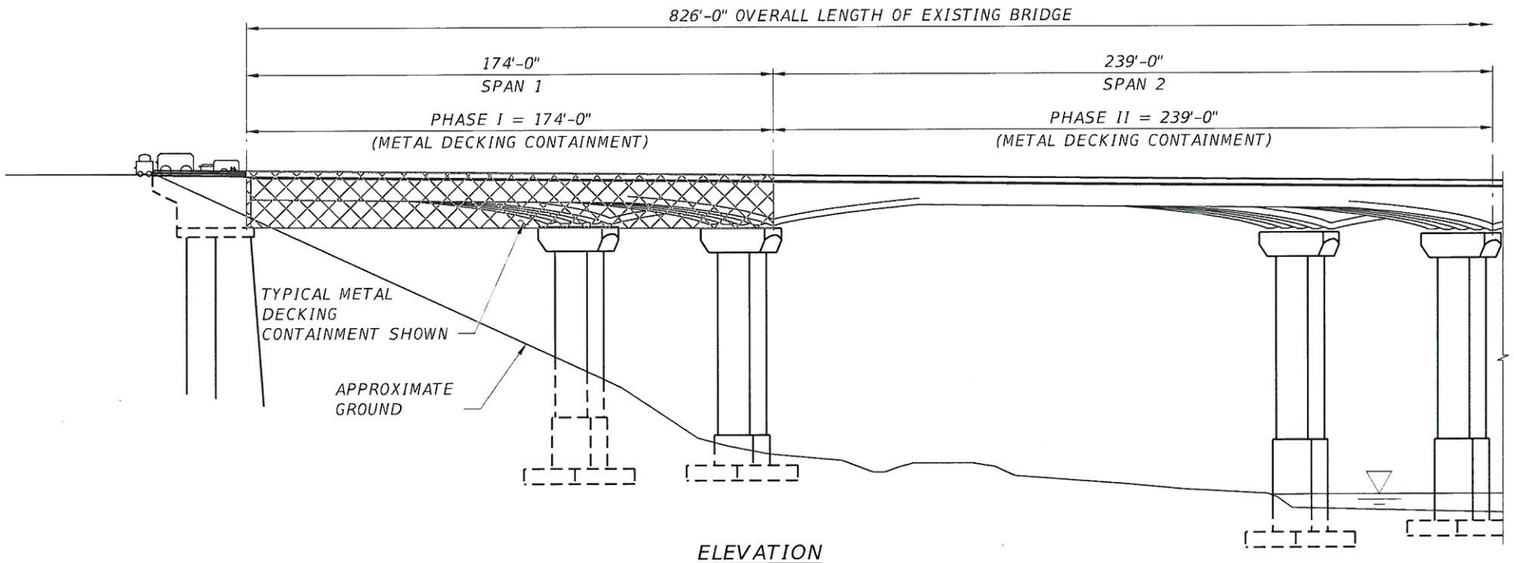
sDATES sTIMES



PLAN
(PHASE I SHOWN, PHASE II SIMILAR)

NOTES:

1. THESE PLANS WERE PREPARED WITHOUT THE BENEFIT OF AS-BUILT BRIDGE PLANS. THE CONTRACTOR SHALL MAKE ALLOWANCE FOR BRIDGE ELEMENTS AND MODIFICATIONS NOT SHOWN ON THESE PLANS.
2. WORK PHASES I-II SHOWN SCHEMATICALLY. REFERENCE MOT PLANS FOR LIMITS OF WORK PHASES.
3. WORK PHASES I-II MAY BE WORKED IN ANY ORDER AT THE CONVENIENCE OF THE CONTRACTOR'S MEANS AND METHODS, TRAFFIC PATTERNS AND DENSITY, OR OTHER SITE CHARACTERISTICS THAT INFLUENCE A PREFERRED WORK AREA.
4. THE CONTRACTOR HAS THE OPTION TO USE ADDITIONAL MOBILE DUST COLLECTORS, OR PLACE LONGITUDINAL OR TRANSVERSE INTERMEDIATE TARPAULIN WALLS.
5. FOR ADDITIONAL DETAILS, SEE CONTAINMENT MISCELLANEOUS DETAILS SHEETS.
6. CONTRACTOR HAS THE OPTION TO USE BRIDGE-TO-GRADE CONTAINMENT 15'-0" FROM THE END BENTS TO ALLOW ACCESS TO CABLES



ELEVATION
(PHASE I SHOWN, PHASE II SIMILAR)

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PAUL R. STEIJLEN
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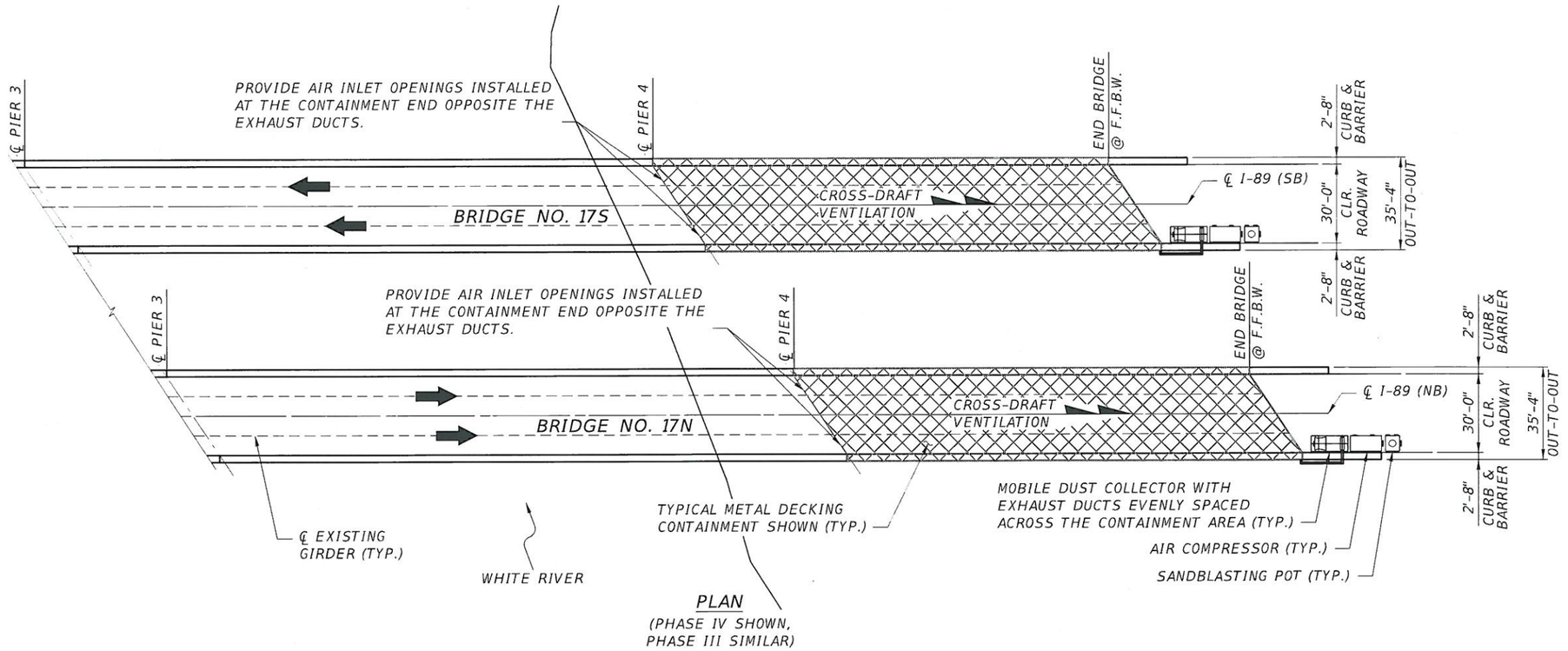
SHEET TITLE: PLAN & ELEVATION (1 OF 2)

REF. DWG. NO.:

PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

SHEET NO.: C-4

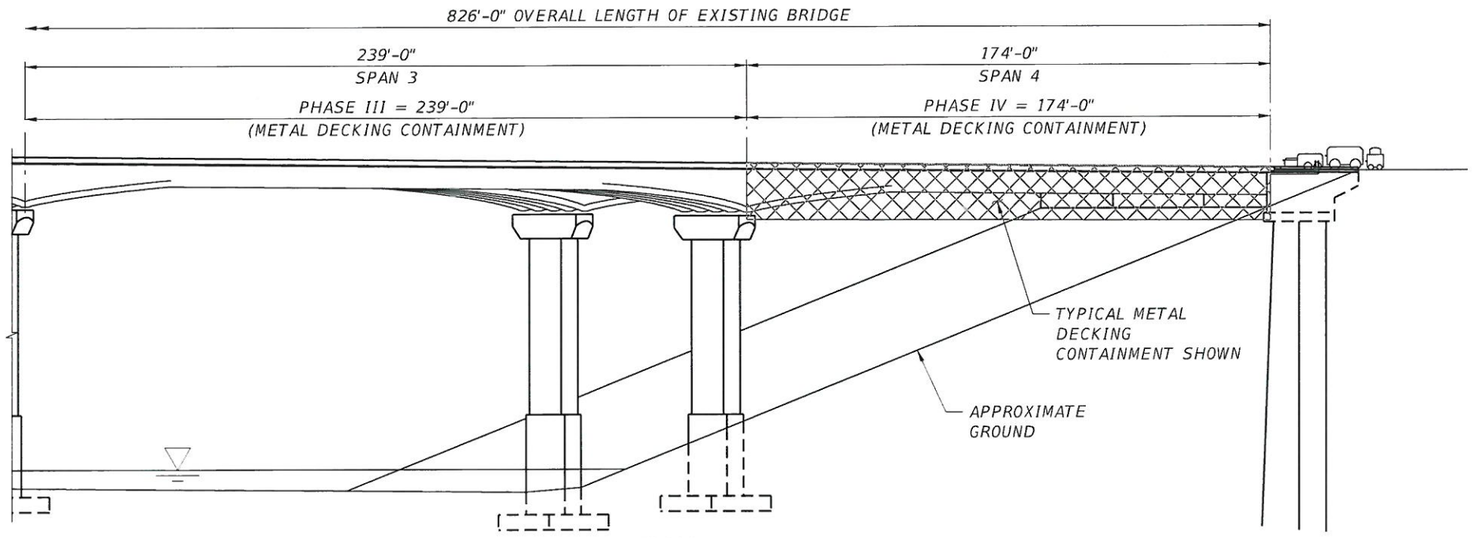
sFILES sUSERS sDATES sTIMES



PLAN
(PHASE IV SHOWN, PHASE III SIMILAR)

NOTES:

1. THESE PLANS WERE PREPARED WITHOUT THE BENEFIT OF AS-BUILT BRIDGE PLANS. THE CONTRACTOR SHALL MAKE ALLOWANCE FOR BRIDGE ELEMENTS AND MODIFICATIONS NOT SHOWN ON THESE PLANS.
2. WORK PHASES III-IV SHOWN SCHEMATICALLY. REFERENCE MOT PLANS FOR LIMITS OF WORK PHASES.
3. WORK PHASES III-IV MAY BE WORKED IN ANY ORDER AT THE CONVENIENCE OF THE CONTRACTOR'S MEANS AND METHODS, TRAFFIC PATTERNS AND DENSITY, OR OTHER SITE CHARACTERISTICS THAT INFLUENCE A PREFERRED WORK AREA.
4. THE CONTRACTOR HAS THE OPTION TO USE ADDITIONAL MOBILE DUST COLLECTORS, OR PLACE LONGITUDINAL OR TRANSVERSE INTERMEDIATE TARPAULIN WALLS.
5. FOR ADDITIONAL DETAILS, SEE CONTAINMENT MISCELLANEOUS DETAILS SHEETS.
6. CONTRACTOR HAS THE OPTION TO USE BRIDGE-TO-GRADE CONTAINMENT 15'-0" FROM THE END BENTS TO ALLOW ACCESS TO CABLES



ELEVATION
(PHASE IV SHOWN, PHASE III SIMILAR)

STATE OF VERMONT
PAUL R. STEIJLEN
NO. 107795
CIVIL
2-15-21
LICENSED
PROFESSIONAL ENGINEER

Bridge Nos. 17N & 17S

REVISIONS		
DATE	BY	DESCRIPTION

$FILES

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A2B ENGINEERING, LLC.
5406 HOOVER BLVD., SUITE 12
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MONOKO, LLC.
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CHECKED BY: PDB 02/21
DESIGNED BY: MAT 02/21
CHECKED BY: PRS 02/21

STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

$USERS

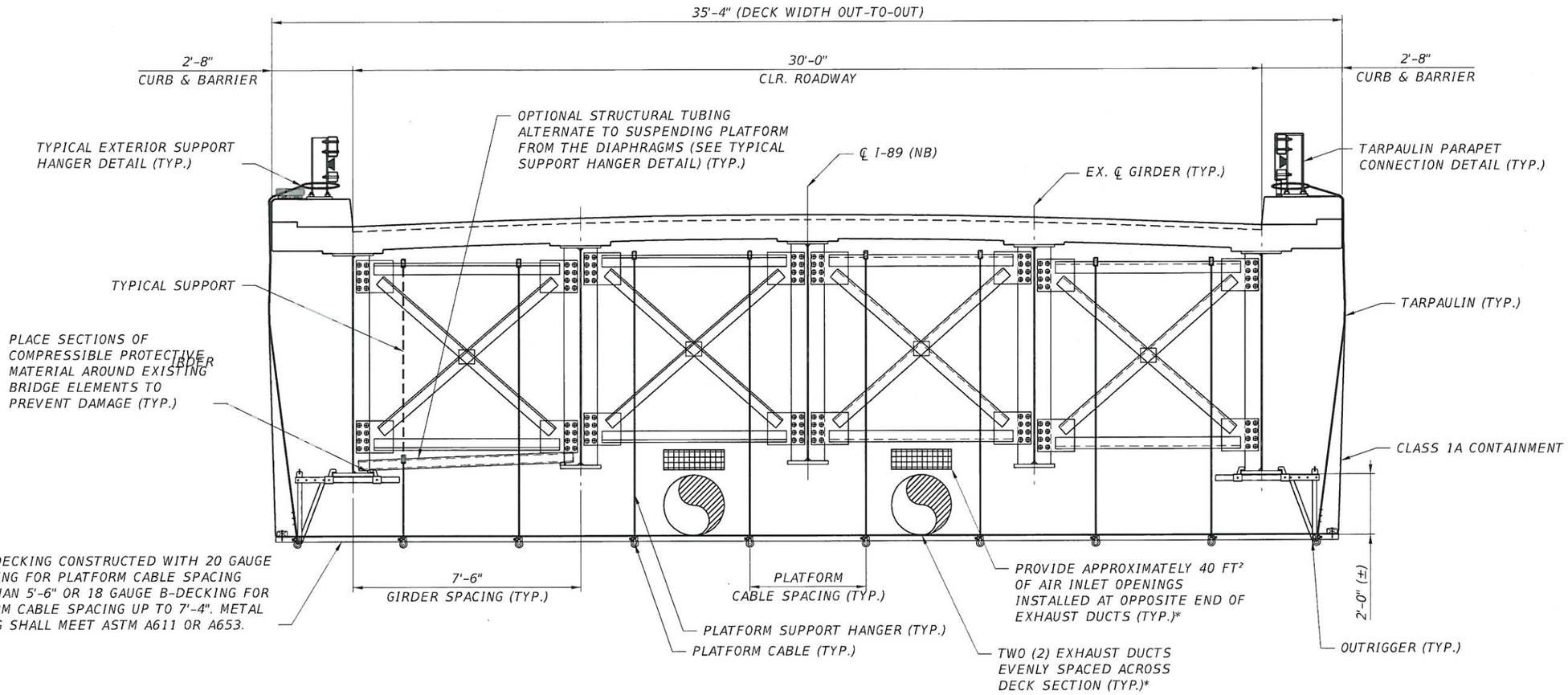
SHEET TITLE: PLAN & ELEVATION (2 OF 2)

REF. DWG. NO.:

PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

SHEET NO.: C-5

$DATES $TIMES



TYPICAL SECTION - METAL DECKING CONTAINMENT

(MOBILE DUST COLLECTOR NOT SHOWN FOR CLARITY)
(BRIDGE NO. 17N SHOWN, BRIDGE NO. 17S SIMILAR)

* BASED ON MAXIMUM CONTAINMENT AREA OF 228 FT² AS MEASUREDPERPENDICULAR TO THE DIRECTION OF CROSS-DRAFT (SEE VENTILATION SYSTEM TABLE ON GENERAL NOTES SHEETS)

NOTES:

1. THESE PLANS WERE PREPARED WITHOUT THE BENEFIT OF AS-BUILT BRIDGE PLANS. THE CONTRACTOR SHALL MAKE ALLOWANCE FOR BRIDGE ELEMENTS AND MODIFICATIONS NOT SHOWN ON THESE PLANS.
2. THE CONTRACTOR SHALL AVOID ATTACHING/CONNECTING TO BRIDGE ELEMENTS EXHIBITING SIGNIFICANT SECTION LOSS.
3. FOR ADDITIONAL DETAILS, SEE CONTAINMENT MISCELLANEOUS DETAILS SHEETS.
4. CONTRACTOR TO PROVIDE LIFE LINES MEETING OSHA 1926.502 REQUIREMENTS.

STATE OF VERMONT
PAUL R. STEIJLEN
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CIVIL
2-18-21
LICENSED
PROFESSIONAL ENGINEER

Bridge Nos. 17N & 17S

REVISIONS		
DATE	BY	DESCRIPTION

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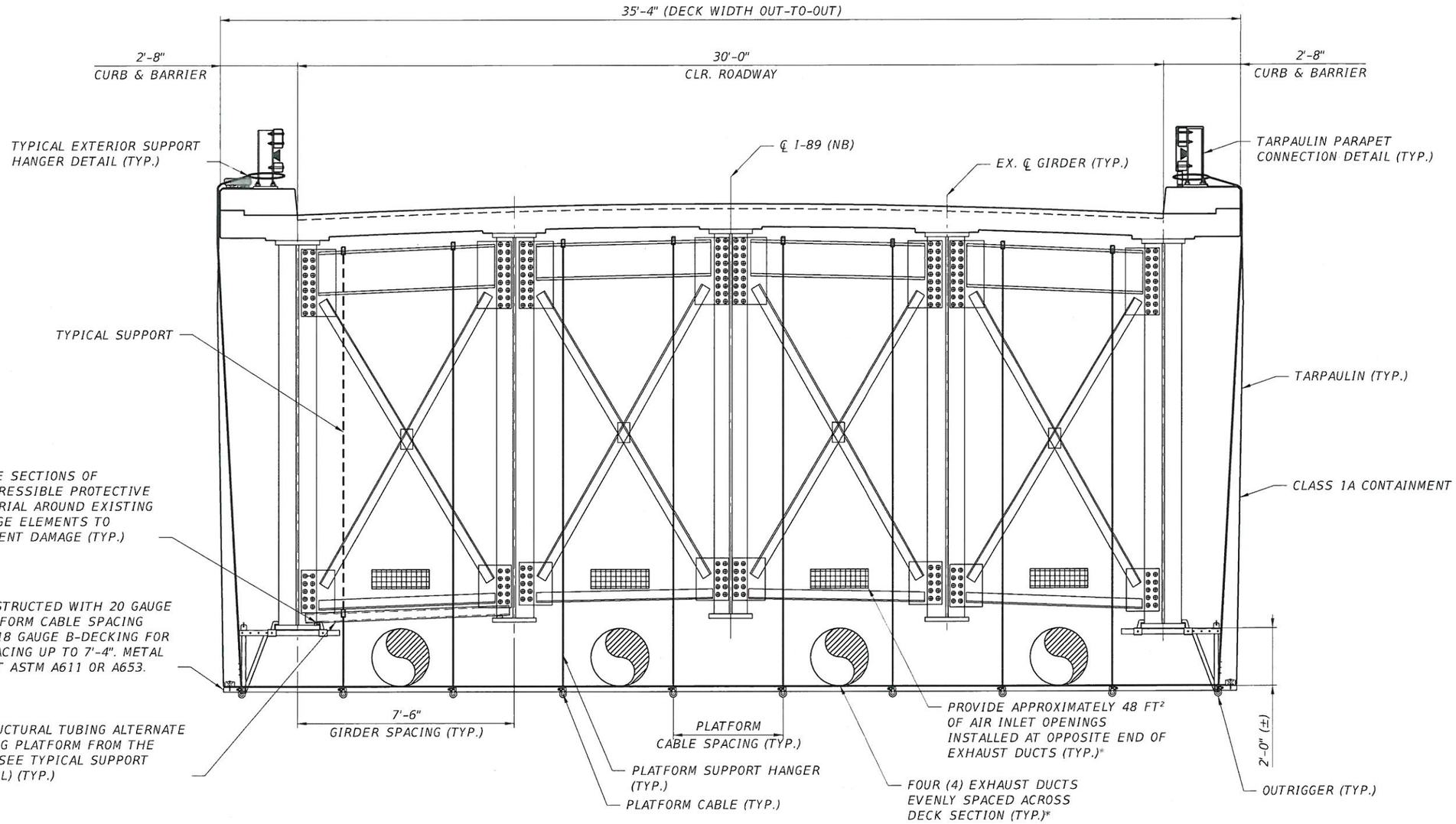
STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

SHEET TITLE: CONTAINMENT SECTION DETAILS (1 OF 2)
REF. DWG. NO.
PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)
SHEET NO. C-6

SFILES SUSERS SDATES STIMES



* BASED ON MAXIMUM CONTAINMENT AREA OF 425 FT² AS MEASURED PERPENDICULAR TO THE DIRECTION OF CROSS-DRAFT (SEE VENTILATION SYSTEM TABLE ON GENERAL NOTES SHEETS)

TYPICAL SECTION - METAL DECKING CONTAINMENT

(MOBILE DUST COLLECTOR NOT SHOWN FOR CLARITY)
(BRIDGE NO. 17N SHOWN, BRIDGE NO. 17S SIMILAR)

NOTES:

1. THESE PLANS WERE PREPARED WITHOUT THE BENEFIT OF AS-BUILT BRIDGE PLANS. THE CONTRACTOR SHALL MAKE ALLOWANCE FOR BRIDGE ELEMENTS AND MODIFICATIONS NOT SHOWN ON THESE PLANS.
2. THE CONTRACTOR SHALL AVOID ATTACHING/CONNECTING TO BRIDGE ELEMENTS EXHIBITING SIGNIFICANT SECTION LOSS.
3. FOR ADDITIONAL DETAILS, SEE CONTAINMENT MISCELLANEOUS DETAILS SHEETS.
4. CONTRACTOR TO PROVIDE LIFE LINES MEETING OSHA 1926.502 REQUIREMENTS.

STATE OF VERMONT
PAUL R. STEIJLEN
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Bridge Nos. 17N & 17S

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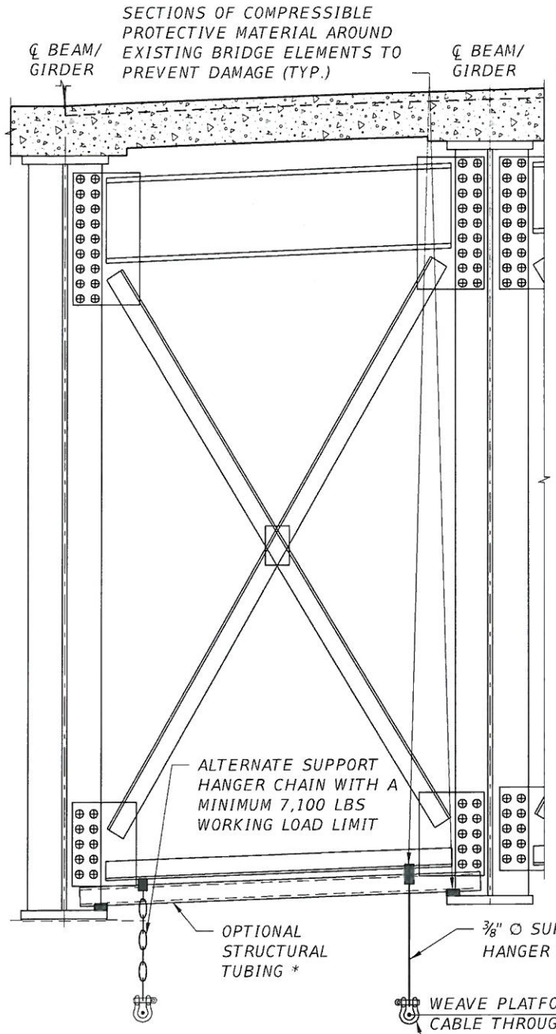
STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

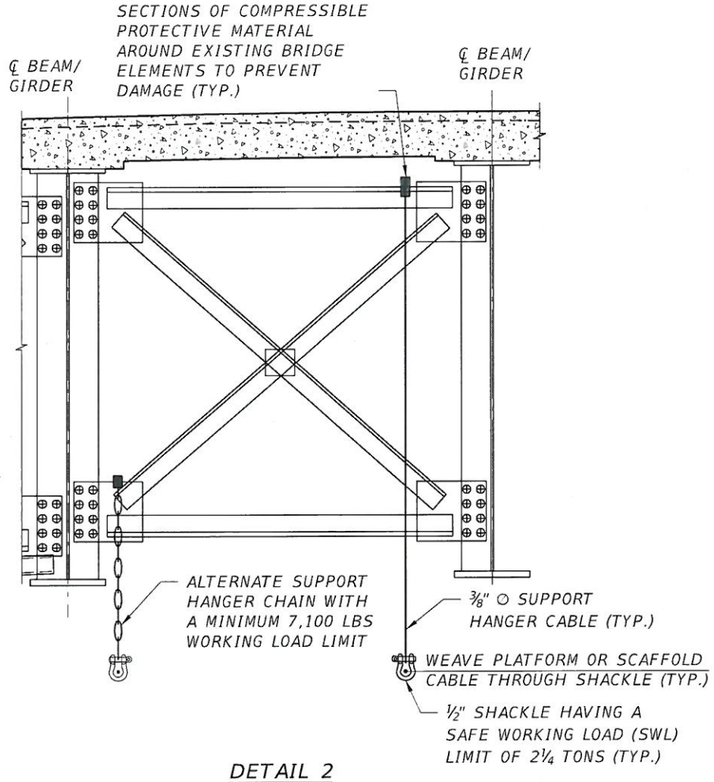
SHEET TITLE: CONTAINMENT SECTION DETAILS (2 OF 2)
REF. DWG. NO.:
PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)
SHEET NO.: C-7

sFILES sUSERS sDATES sTIMES



* USE TS 4x4x¼ FOR SPACING UP TO 9'-6" OR TS 4x4x⅜ FOR SPACING UP TO 11'-0"

DETAIL 1
TYPICAL SUPPORT HANGER



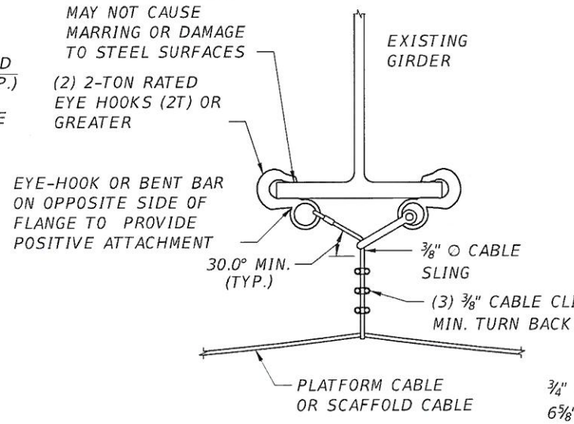
DETAIL 2
TYPICAL SUPPORT HANGER

INSTALLATION NOTES:

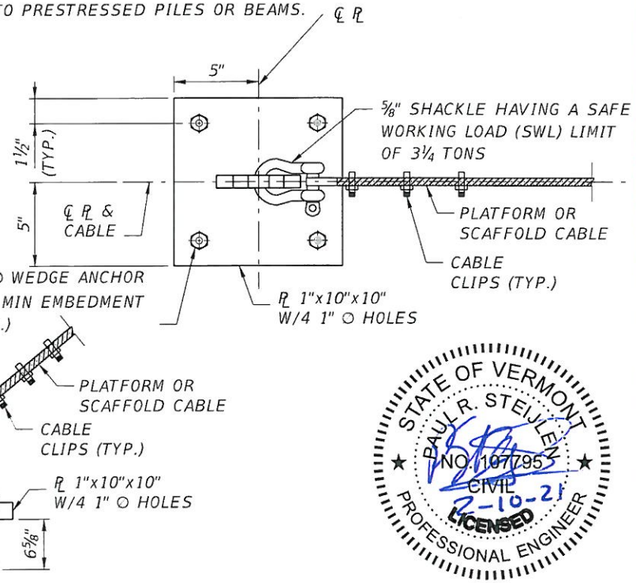
1. DRILL (4) HOLES, USING THE MANUFACTURER'S RECOMMENDED DRILL BIT SIZE, INTO CONCRETE USING ANCHOR PLATE AS A TEMPLATE. (HOLES FOR ANCHOR BOLTS SHALL BE DRILLED ¼" MINIMUM DEEPER THAN THE MINIMUM EMBEDMENT LENGTH FOR ALL ANCHOR BOLTS.)
2. INSTALL ANCHOR BOLTS PER MANUFACTURER'S INSTRUCTIONS.
3. INSTALL ⅝" SHACKLE (OR GREATER) ONTO THE ANCHOR PLATE.
4. INSTALL MAIN CABLE ONTO SHACKLE.
5. CONSULT WITH SPECIALTY ENGINEER IF THE ANCHOR PLATE HAS TO BE REPOSITIONED DUE TO FAILED PROOF LOADING OF ANCHOR BOLTS.
6. PLYWOOD CAN BE USED TO BRIDGE SMALL GAPS. CONTRACTOR SHALL SCREW PLYWOOD INTO METAL DECKING USING SHEET METAL SCREWS OR SELF TAPPING SCREWS.

GENERAL NOTES:

1. OBTAIN APPROVAL FROM OWNER OR THE RESIDENT ENGINEER PRIOR TO INSTALLATION OF THE ANCHOR PLATE. CONSULT WITH RESIDENT ENGINEER REGARDING ANY ENCASED CONDUITS, REINFORCEMENT, PIPES, OR ANY OTHER KNOWN OBSTRUCTIONS PRIOR TO DRILLING.
2. STRUCTURAL STEEL SHALL CONFORM TO ASTM A36.
3. WELD ELECTRODES SHALL BE E70XX.
4. TO RESTORE CONCRETE:
   - GRIND THE ANCHOR BOLT HEAD PROTRUDING OUT OF THE CONCRETE SURFACE LEVEL TO CONCRETE.
   - HAMMER THE REMAINING BOLT INTO THE CONCRETE.
   - APPLY A COAT OF ZINC PRIMER TO THE EXPOSED ANCHOR.
   - APPLY A COAT OF NON-SHRINK GROUT TO THE AREA & SMOOTH OUT THE AREA.
   - NO ANCHORS ARE VISIBLE.
5. MINIMUM 8" EDGE DISTANCE AND 6" CENTER TO CENTER OF BOLTS IS REQUIRED.
6. CONTRACTOR SHALL ATTACH THE ANCHOR PLATES TO SOUND CONCRETE. CONCRETE THAT IS SPALLED SHALL NOT BE CONSIDERED AS SOUND. CONCRETE WITH MAP CRACKS AND EFFLORESCENCE SHOULD HAVE PULL OUT TESTS CONDUCTED ON ALL ANCHOR BOLTS TO ENSURE THAT THE PROPER CAPACITY CAN BE ACHIEVED.
7. ANCHOR PLATE SHALL NOT BE ATTACHED TO PRESTRESSED PILES OR BEAMS.



ALTERNATE SUPPORT HANGER



OPTIONAL ANCHOR PLATE ATTACHMENT

STATE OF VERMONT
PAUL R. STEIJLEN
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2-10-21
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Bridge Nos. 17N & 17S

REVISIONS		
DATE	BY	DESCRIPTION

sFILES

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DESIGNED BY: MAT 02/21
CHECKED BY: PRS 02/21

STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

sUSERS

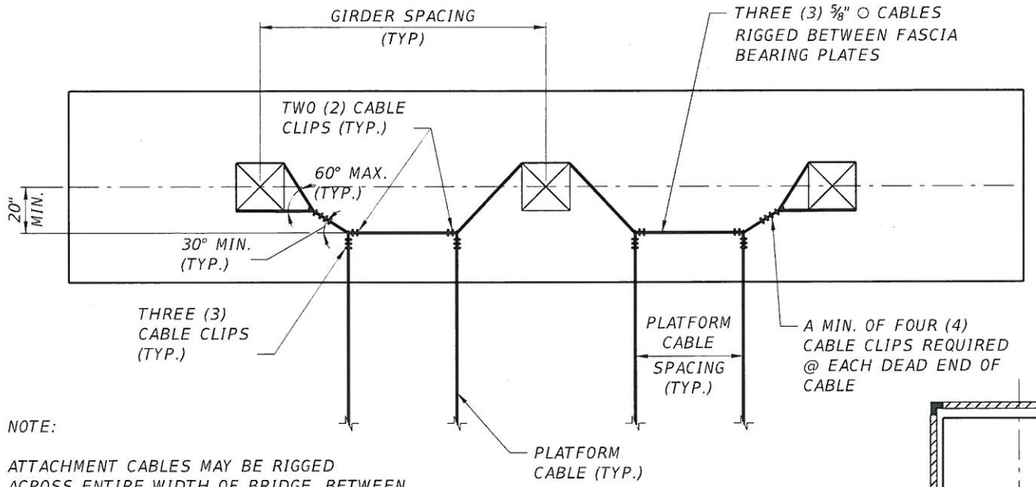
SHEET TITLE: CONTAINMENT MISCELLANEOUS DETAILS (1 OF 5)

REF. DWG. NO.

PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

SHEET NO. C-8

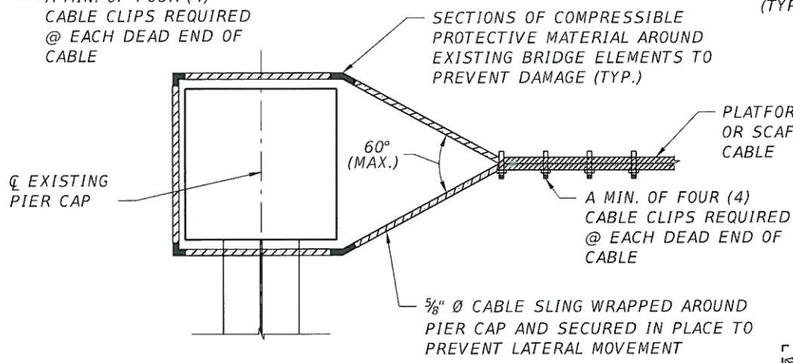
sDATES sTIMES



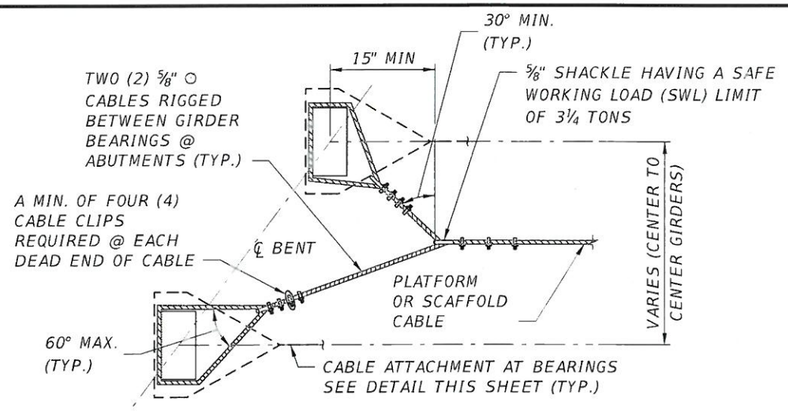
NOTE:

ATTACHMENT CABLES MAY BE RIGGED ACROSS ENTIRE WIDTH OF BRIDGE, BETWEEN FASCIA GIRDER BEARINGS AND/OR BETWEEN INDIVIDUAL PAIRS OF BEARINGS.

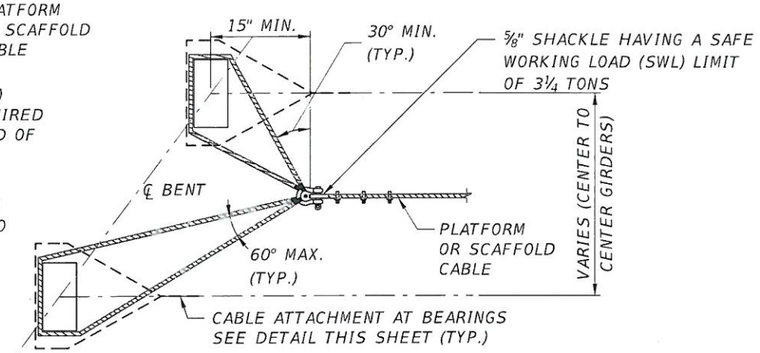
TRANSVERSE CABLE ATTACHMENT



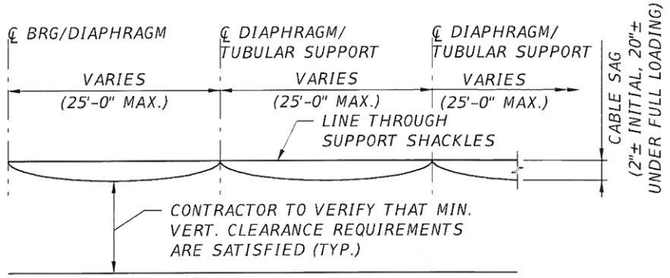
CABLE ATTACHMENT AT PIER CAP



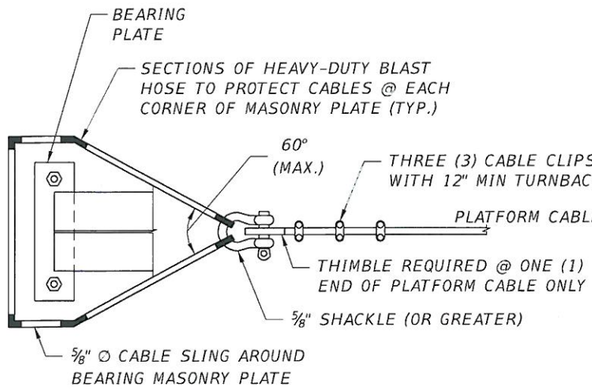
MID BAY CABLE ATTACHMENTS



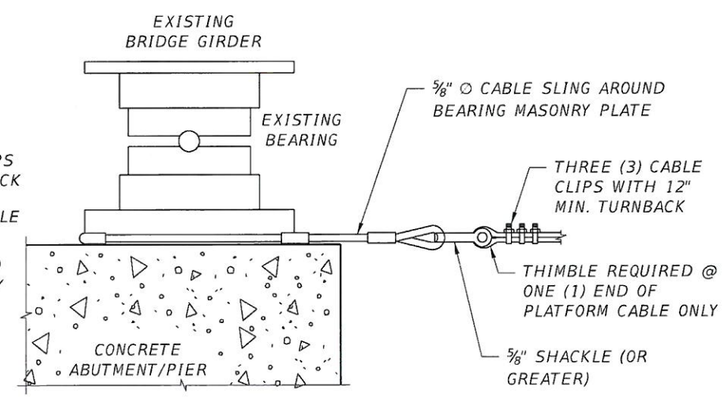
MID BAY CABLE ATTACHMENTS ALTERNATE



DESIGN CABLE SAG



PLAN VIEW



ELEVATION

CABLE ATTACHMENT AT BEARINGS

STATE OF VERMONT
PAUL R. STEIJLEN
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2-18-21
LICENSED
PROFESSIONAL ENGINEER

Bridge Nos. 17N & 17S

REVISIONS		
DATE	BY	DESCRIPTION

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DESIGNED BY:	MAT 02/21
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STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

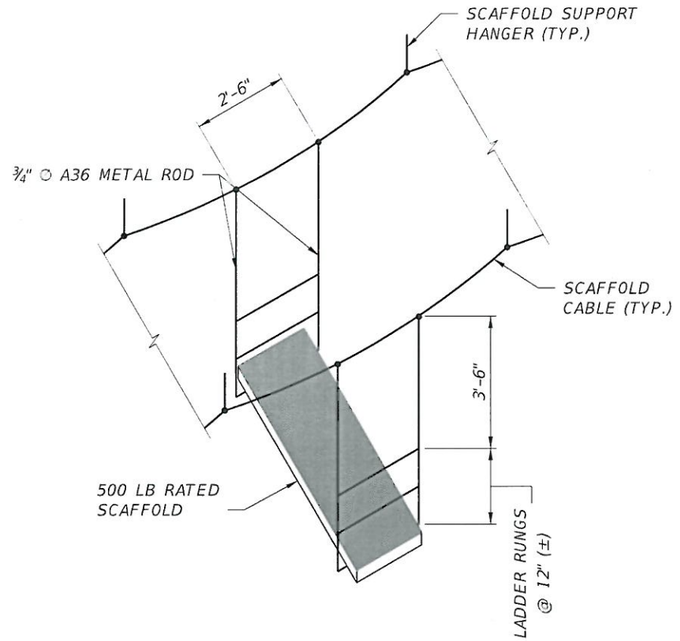
SHEET TITLE: CONTAINMENT MISCELLANEOUS DETAILS (2 OF 5)

REF. DWG. NO.

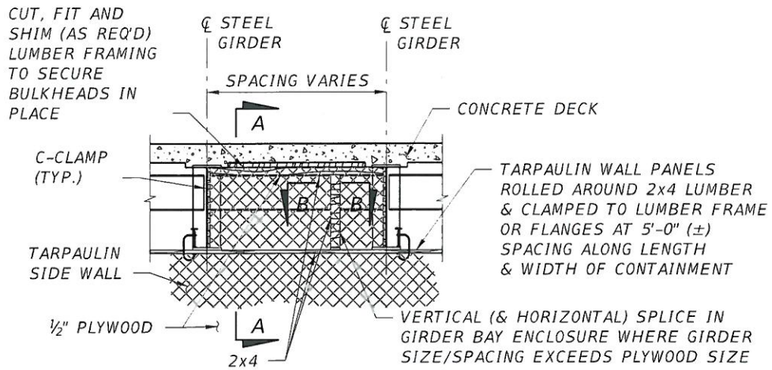
PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

SHEET NO. C-9

SFILES SUSERS SDATES STIMES



SCAFFOLD ISOMETRIC
(OPTIONAL SUSPENDED SCAFFOLD)

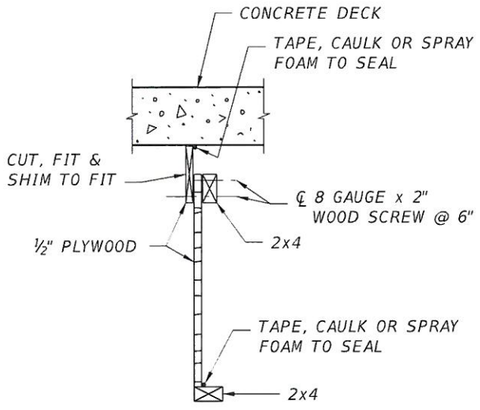


GIRDER BAY ENCLOSURE

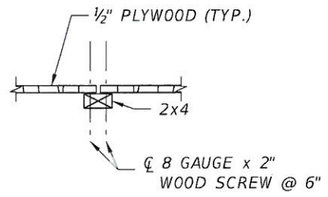
CABLE CLIP INSTALLATION			
CABLE DIA	MIN. CABLE TURNBACK, IN.	MIN. TORQUE FT-LBS	NO. OF CLIPS
½"	11.5"	65	3
9/16"	12"	95	3
⅝"	12"	95	3

NOTE:

ALL CABLES & CLIPS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDED PROCEDURES. IF CABLES SEPARATE AT 60° MAX. ANGLE, ADD ONE ADDITIONAL CLIP.



SECTION A-A



SECTION B-B

Bridge Nos. 17N & 17S

REVISIONS		
DATE	BY	DESCRIPTION

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STATE OF VERMONT
AGENCY OF TRANSPORTATION

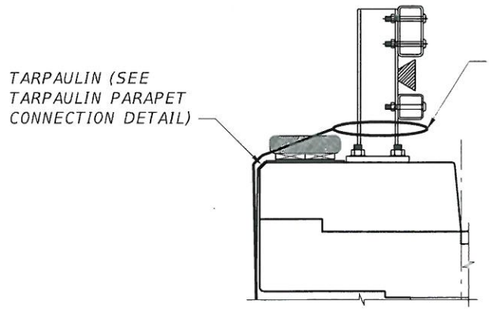
ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

SHEET TITLE: CONTAINMENT MISCELLANEOUS DETAILS (3 OF 5)

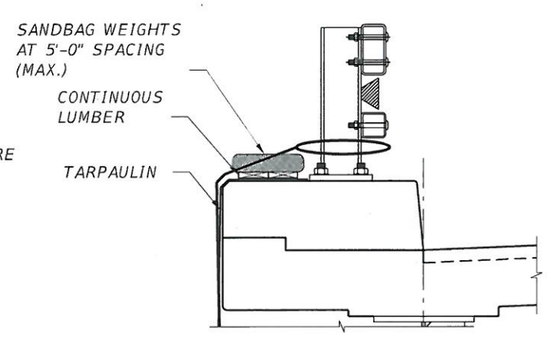
REF. DWG. NO.:

PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

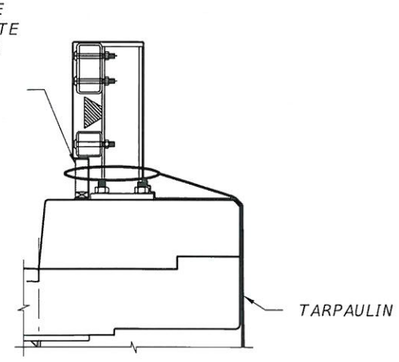
SHEET NO.: C-10



EXTERIOR SUPPORT HANGER



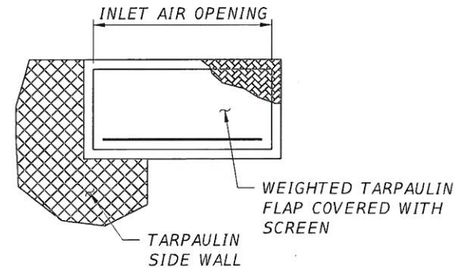
DETAIL 1



DETAIL 2

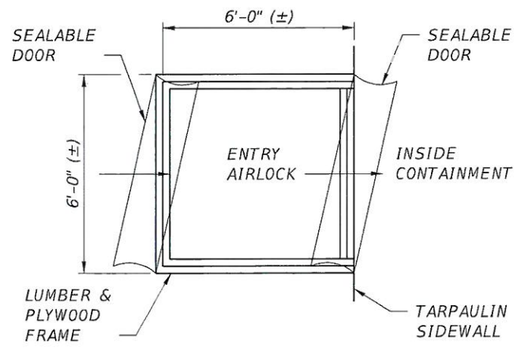
TARPAULIN PARAPET CONNECTION

ADJACENT TARPAULIN CONNECTION ALTERNATIVES



INLET AIR OPENING

INSTALL INLET AIR OPENINGS WITHIN TARPAULIN WALLS AND/OR GIRDER BAY ENCLOSURES AS REQUIRED



CONTAINMENT ENTRY

STATE OF VERMONT
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Bridge Nos. 17N & 17S

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DAS 02/21	PDB 02/21	MAT 02/21	PRS 02/21

STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

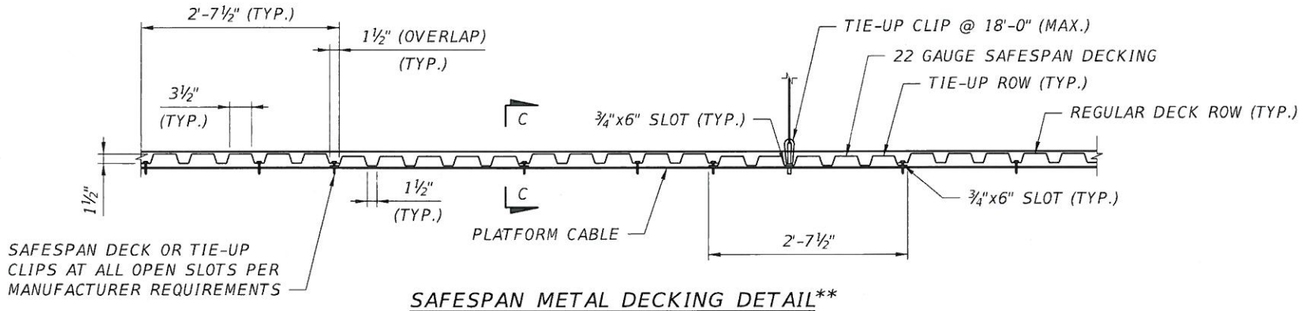
SHEET TITLE: CONTAINMENT MISCELLANEOUS DETAILS (4 OF 5)

REF. DWG. NO.:

PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

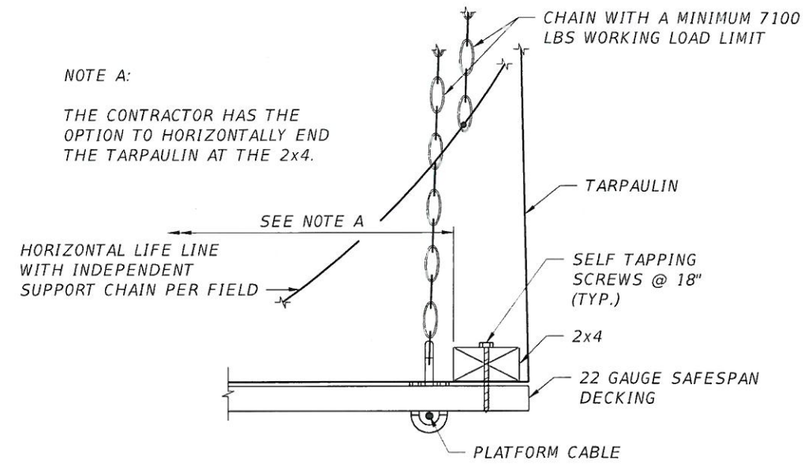
SHEET NO.: C-11

sFILES sUSERS sDATES sTIMES

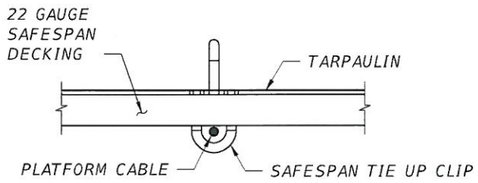


SAFESPAN METAL DECKING DETAIL**

(100% TIE-OFF REQUIRED AT ENDS)



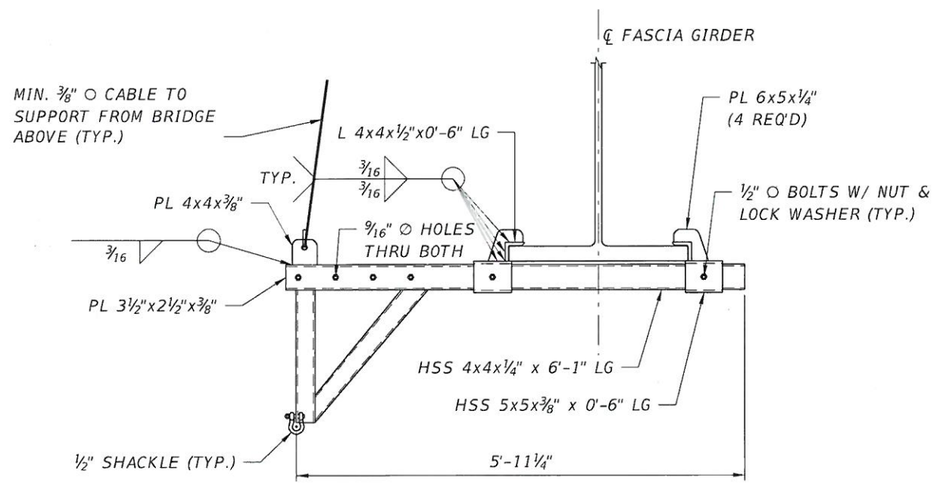
METAL DECKING END DETAIL**



SECTION C-C

(TIE-UP CLIP SHOWN, DECK CLIP IS SIMILAR)

** DETAILS SHOWN ARE SCHEMATIC. SEE SAFESPAN SYSTEM SHOP DRAWINGS. CONTRACTOR HAS THE OPTION TO USE SAFESPAN BEAM CLAMPS, IF PREFERRED.



TYPICAL OUTRIGGER DETAIL

Bridge Nos. 17N & 17S

REVISIONS		
DATE	BY	DESCRIPTION

PAUL STEIJLEN P.E.
P.E. LICENSE NUMBER 107795 (VT)
A2B ENGINEERING, LLC.
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DRAWN BY: DAS 02/21
CHECKED BY: PDB 02/21
DESIGNED BY: MAT 02/21
CHECKED BY: PRS 02/21

STATE OF VERMONT
AGENCY OF TRANSPORTATION

ROAD NO.	COUNTY	PROJECT ID
I-89	WINDSOR	IM089-1(64)

SHEET TITLE: CONTAINMENT MISCELLANEOUS DETAILS (5 OF 5)

REF. DWG. NO.

PROJECT NAME: ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14 (PRINCIPLE ARTERIAL-NHS)

SHEET NO. C-12

$FILES $USERS $DATES $TIMES

ABRASIVE BLASTING CONTAINMENT PLANS

ROUTE NO. I-89 BRIDGES 17N & 17S OVER THE WHITE RIVER AND VT-14

Franklin County, Vermont
Project No. BHF 0814(1)

Table of Contents

Prepared for:

Monoko, LLC
760 Bayshore Drive
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February 2021

A2B Engineering, LLC

Paul R. Steijlen, P.E.
VT License No. 107795

Appendix A
Structural Impact

A2B ENGINEERING, LLC
CONSULTING ENGINEERS

Structural Impact:

The platform containment structure has been analyzed for a live load of 18 psf (Approximately 0.5 in. average depth of steel shot, 1.5" mineral slag abrasive or 1.5" sand abrasive plus uniform worker loading). When the depth of the spent abrasives nears the depths specified, the contractor will cease abrasive blasting operations and vacuum the spent abrasives.

The scaffold structure has been analyzed for approximately 1/4" average depth of steel shot. The configuration of the scaffold was taken to be 32 feet by 28 inches (max) with a 2 person, 500 lb rated scaffold.

Design Loads:

Platform Design Criteria:

Dead Load =	3	psf	(Platform)
Live Load (Uniform) =	12	psf	(0.5 in. steel shot)
Live Load (Uniform) =	6	psf	(2 workers)

Scaffold Design Criteria:

Length =	32	ft	(max per scaffold)
Width =	28	in	(max per scaffold)
Dead Load =	220	lb	(scaffold)
Weight of steel shot =	6	psf	(0.25 in. steel shot)
Live Load (Concentrated) =	250	lb	(per worker)

No more than 2 workers shall be allowed per platform cable or scaffold cable. Limit 500 lb. total weight of workers and abrasive blasting on 500 lb. rated scaffold

Wind Loads:

The containment structure has been analyzed for a maximum wind velocity of 40 mph. If winds nearing or exceeding 40 mph (or a lesser wind is specified in the contract specifications) are predicted, blasting and painting operations shall cease, and the paint containment tarpaulins shall be rolled and secured in place.

Design Variables:

Height to C.G. of Cont. Area = **50 ft** (Conservative)

Height and Exposure Factor Kz = **1.1**
(ASCE 7-10 Table 27.3-1, z = 50 ft, Exposure C)

Topographic Factor Kzt = **1.0**
(ASCE 7-10 Figure 26.8-1)

Wind Directionality Kd = **0.85**
(ASCE 7-10 Table 26.6-1, Building C & C)

Wind Velocity V = **40 mph**

Wind Pressure $Pz = 0.00256*K_z*K_{zt}*K_d*V^2$ **(psf)**

Wind Pressure **Pz =** **3.79 psf**

Design Pressure:

Height of Cont. Area = **20 ft** (Conservative)

Wind Pressure = Height*Pz = 76.0 plf

NOTE:

Based on the maximum wind velocity of 40 mph (3.79 psf wind load per AASHTO), the resulting load transferred to a bridge structure is 76 plf, based on a containment height of 20 ft.

Since AASHTO 3.8.1.2 specifies a lateral loading of 300 plf minimum, for design of girder bridges and 450 plf for truss bridges, the maximum anticipated load of 76 plf is acceptable. Therefore, wind loading on girder bridges or truss bridges does not govern.

Appendix B
Platform Design

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Platform Cable Design Summary (Metal Decking):

Option #	Platform Cable Size (in.)	Platform Support Hanger (in.)	Max. Platform Support Hanger Spacing	Max. Platform Cable Spacing	Platform Cable Load Ratio	Platform Support Hanger Load Ratio	Chain Hanger Load Ratio	Maximum Shackle Load Ratio	Overall Design Check
1	1/2	3/8	25.00	3.75	1.00	1.27	2.39	1.53	OK
2	9/16	3/8	25.00	5.25	1.01	1.00	1.89	1.21	OK

Option # 1

Platform Cable Size =	1/2	in.
Minimum Support Hanger Size =	3/8	in.
Maximum Support Hanger Spacing =	25.00	ft.
Maximum Cable Spacing =	3.75	ft.
Minimum Shackle Size =	5/8	in. (for Platform Support Hangers)
Minimum Shackle Size =	1/2	in. (for Platform Cables)
Design Cable Sag =	18	in.

Option # 2

Platform Cable Size =	9/16	in.
Minimum Support Hanger Size =	3/8	in.
Maximum Support Hanger Spacing =	25.00	ft.
Maximum Cable Spacing =	5.25	ft.
Minimum Shackle Size =	5/8	in. (for Platform Support Hangers)
Minimum Shackle Size =	1/2	in. (for Platform Cables)
Design Cable Sag =	18	in.

A2B ENGINEERING, LLC CONSULTING ENGINEERS	Subject:	Abrasive Blasting Containment Plans (Windsor County, Vermont) Route No. I-89 Bridges 17N & 17S Over The White River and VT-14		
	Comp by: MAT	Date: 02/05/21	Sheet Number:	
	Check by: PRS	Job No: 187-31-1		

Suspended Platform System Design (Metal Decking with 0.5 in. dia. Platform Cable @ 3.75 ft. spacing):

1. Bridge Structure:	Max. Hanger Spacing	25.00	ft.	
2. Worker Loading:	Tributary cable width	**3.75**	ft.	maximum
	No. workers / platform cable	2		(250 lb. ea. OSHA)
	Equiv. worker loading	5.33	psf	
3. D+L Loading:	Metal Decking =	3.00	psf	
	18-oz floor tarpaulins =	0.13	psf	
	Dead Load =	3.13	psf	
	Dead Load (min) =	3.00	psf	
	Dead Load =	**3.13**	psf	
	Assume depth of grit =	1/2	in	
	Uniform grit loading	12.00	psf	1/2 in. layer
	Equiv. worker loading	6.00	psf	2 workers
	Live Load =	**18.00**	psf	(Grit + Worker Loading)
	Total Design Loading (Service)	**21.13**	psf	
	Total Design Loading (Ultimate)	**126.75**	psf	(Using FS = 6)
4. Platform Cable Analysis: **(Longitudinals)**	Platform Cable Size	1/2	in.	dia.6x19 IWRC, EIP
	Platform Cable Weight	0.46	plf	
	Platform Cable strength.	13.30	tons	
	Platform Cable strength.	12.80	tons	(pre-tensioned with 1000 lbf)

Max. tension at center of cable span, $H = w L^2 / 8 d$

Uniform cable load,	w =	475.8	plf	
Max. cable span,	L =	25.00	ft.	
Min. req'd deflect,	d =	15.0	in	(5% of length and 12 inch min.)
Use =	d =	18.0	in	
Tension (center)	H =	12.39	tons	

Max. tension at end supports, $T = [H^2 + (w L / 2)^2]^{0.5}$

Design Cable Tension =	12.74	tons
Cable Stress Ratio	**1.00 >= 1.0 OK**	

Use Shackle Size =	5/8	in
Working Load limit =	3.25	tons
Factor of Safety =	6	
Shackle Strength =	19.5	tons
Design Load at supports =	12.74	tons
Shackle Load Ratio =	1.53	
Shackle Check =	**Ok**	

4. Platform Support Hangers Analysis:

Max. tributary hanger area..	93.8	sq.ft.
Max. hanger load,	11883	lbf
Max. hanger load,	5.94	tons
Platform Support Hangers	3/8	in. dia. 6x19 IWRC, EIP (min)
Platform Support Hangers Weight	0.26	plf
Platform Support Hangers Strength	7.55	tons
Hanger Stress Ratio	**1.27 >= 1.0 OK**	

Min. Chain Working Load	7100	lb (min)
Factor of Safety	4	
Chain Strength	14.2	tons
Design Load at supports =	5.94	tons
Chain Hanger Stress Ratio =	**2.39 >= 1.0 OK**	

Use Shackle Size =	1/2	in
Working Load limit =	2.00	tons
Factor of Safety =	6	
Shackle Strength =	12	tons
Design Load at supports =	5.94	tons
Shackle Load Ratio =	2.02	
Shackle Check =	**Ok**	

A2B ENGINEERING, LLC CONSULTING ENGINEERS	Subject: Abrasive Blasting Containment Plans (Windsor County, Vermont) Route No. I-89 Bridges 17N & 17S Over The White River and VT-14		
	Comp by: MAT Check by: PRS	Date: 02/05/21 Job No: 187-31-1	Sheet Number:

Suspended Platform System Design (Metal Decking with 0.5625 in. dia. Platform Cable @ 5.25 ft. spacing):

1. Bridge Structure:	Max. Hanger Spacing	25.00	ft.	
2. Worker Loading:	Tributary cable width	**5.25**	ft.	maximum
	No. workers / platform cable	2		(250# ea. OSHA)
	Equiv. worker loading	3.81	psf	
3. D+L Loading:	Metal Decking =	3.00	psf	
	18-oz floor tarpaulins =	0.13	psf	
	Dead Load =	3.13	psf	
	Dead Load (min) =	3.00	psf	
	Dead Load =	**3.13**	psf	
	Assume depth of grit =	1/2	in	
	Uniform grit loading	12.00	psf	1/2 in. layer
	Equiv. worker loading	4.00	psf	2 workers
	Live Load =	**16.00**	psf	(Grit + Worker Loading)
	Total Design Loading (Service)	**19.13**	psf	
	Total Design Loading (Ultimate)	**114.75**	psf	(Using FS = 6)
4. Platform Cable Analysis: **(Longitudinals)**	Platform Cable Size	9/16	in.	dia.6x19 IWRC, EIP
	Platform Cable Weight	0.59	plf	
	Platform Cable strength.	16.80	tons	
	Platform Cable strength.	16.30	tons	(pre-tensioned with 1000 lbf)

Max. tension at center of cable span, $H = w L^2 / 8 d$

Uniform cable load,	w =	603.0	plf	
Max. cable span,	L =	25.00	ft.	
Min. req'd deflect,	d =	15.0	in	(5% of length and 12 inch min.)
Use =	d =	18.0	in	
Tension (center)	H =	15.70	tons	

Max. tension at end supports, $T = [H^2 + (w L / 2)^2]^{0.5}$

Design Cable Tension =	16.15	tons
Cable Stress Ratio	**1.01 >= 1.0 OK**	

Use Shackle Size =	5/8	in
Working Load limit =	3.25	tons
Factor of Safety =	6	
Shackle Strength =	19.5	tons
Design Load at supports =	16.15	tons
Shackle Load Ratio =	1.21	
Shackle Check =	**Ok**	

4. Platform Support Hangers Analysis:

Max. tributary hanger area..	131.3	sq.ft.
Max. hanger load,	15061	lbf
Max. hanger load,	7.53	tons
Platform Support Hangers	3/8	in. dia. 6x19 IWRC, EIP (min)
Platform Support Hangers Weight	0.26	plf
Platform Support Hangers Strength	7.55	tons
Hanger Stress Ratio	**1.00 >= 1.0 OK**	

Min. Chain Working Load	7100	lb (min)
Factor of Safety	4	
Chain Strength	14.2	tons
Design Load at supports =	7.53	tons
Chain Hanger Stress Ratio =	**1.89 >= 1.0 OK**	

Use Shackle Size =	1/2	in
Working Load limit =	2.00	tons
Factor of Safety =	6	
Shackle Strength =	12	tons
Design Load at supports =	7.53	tons
Shackle Load Ratio =	1.59	
Shackle Check =	**Ok**	

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	Comp by: CAS	Date: 02/03/21	Sheet Number:	
	Check by: PRS	Job No: 187-31-1		

Alternate Support Hanger Analysis:

1. Bridge Configuration:

a.	Flange Plate Width, w =	12.00	in.	
b.	Flange Plate Thickness, t =	3/4	in.	
c.	Fy (A36) =	36	ksi	

2. D+L Loading:

e.	Dead Load =	3.00	psf	(min. platform loading)
f.	Live Load =	18.00	psf	(Grit + Workers)
g.	Total Design Loading =	21.00	psf	(e + f)

3. Hanger Loads:

h.	Max Girder Spacing =	10.00	ft	
i.	Max Diaphragm Spacing =	25.00	ft	(Conservative)
j.	Max. Tributary Hanger Area =	250.00	ft^2	(h * i)
k.	(1) Additional Worker at ea. Hanger =	250.00	lb	(conservative)
l.	Maximum Hanger Load, P =	5.50	kips	(g * j) + k

4. Analysis:

m.	Eccentricity, v =	6.0	in.	
n.	Moment, Mmax =	16.50	k-in	(l / 2 * m)
o.	Section Modulus, S =	1.13	in^3	(1/6 * 2 * m * b^2)
p.	fb = (Mmax) / Sx	14.67	ksi	
q.	Fb = 0.66 * Fy =	23.76	ksi	
r.	Capacity/Demand Ratio =	1.62		

Check: Ok

NOTE:

M = (l / 2 * k)

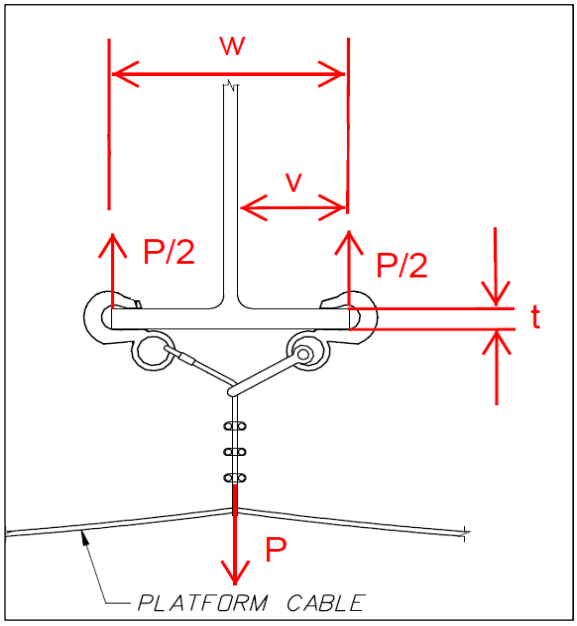
S = (1/6 * 2 * k * b^2)

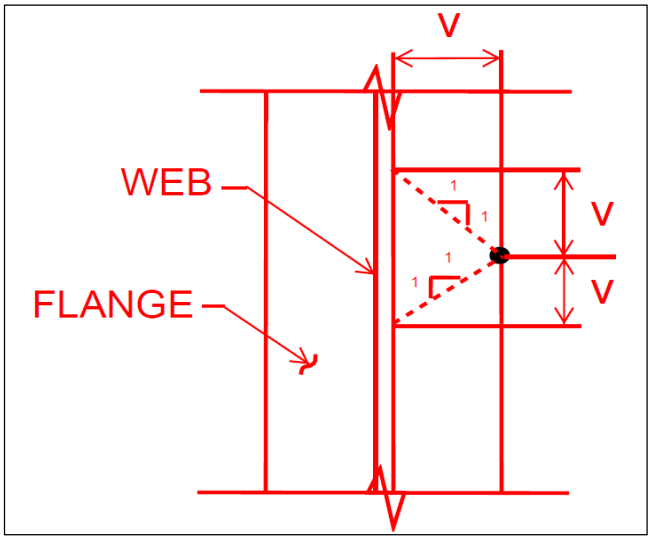
M/S = 1.5 * l / b^2 <= 0.66 * Fy

b >= SQRT(1.5 * l / (0.66 * Fy))

r.	Flange Plate Thickness =	3/4	in.	(b)
s.	Min. Flange Plate Thickness =	0.59	in.	

Check: Ok





Appendix C
Scaffold Design

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	Comp by: CAS Check by: PRS		Date: 02/03/21 Job No: 187-31-1	Sheet Number:

1. Scaffold Configuration:

Length =	32	ft.
Width =	28	in.
Weight =	213	lb
Assume Weight =	220	lb

2. Abrasive Cleaning Material:

Assume 0 inch of steel shot will cover the scaffold

Depth =	0	in.
Density of the shot =	280	pcf
Weight of the shot =	0.00	psf

3. Total Loads:

With full workers and no shot

Dead Load =	220.00	lb (see note below)
Live Load ** =	800	lb (see note below)

NOTE: The scaffold cable carries the load from two scaffolds where the length of scaffold exceeds 32 ft.
** Assuming four 200 lb workers (average weight) all at one cable at adjoining ends of the scaffold.

Use 1/2 " dia. 6x19 IWRC, EIP, or better

Cable diameter =	1/2	in
Cable weight =	0.46	plf
Cable strength =	13.3	tons

NOTE: The cable carries the DL from 2 scaffolds + 10% for overlap

Spacing =	25	ft
PickupSpacing =	25	ft
d = 5% of PickupSpacing =	15	in.
d =	15	in.
Use d =	18	in.
Tension at the center =	4.34	kips
Tension at the support =	4.37	kips

FS of the cable = 6.08 >= 6.0 OK

Use Shackle Size =	5/8	in
Working Load limit =	3.25	tons
Working Load at supports	2.19	tons
Shackle Load Ratio =	1.49	

Shackle Check = Ok

4. Scaffold Support Hanger:

Hanger support load =	1020	lb
Use =	1100	lb

Use 3/8 " dia. 6x19 IWRC, EIP cables

Hanger diameter =	3/8	in
Hanger weight =	0.26	plf
Hanger strength =	7.55	tons

FS of the hanger = 13.73 >= 6.0 OK

Min. Chain working load =	7100	lb (min)
Chain Design Load =	1020	lb
Use =	1100	lb

Chain Hanger Stress Ratio = 6.45 >=1.0 OK

Use Shackle Size =	3/8	in
Working Load limit =	1.00	tons
Working Load at supports =	0.55	tons
Shackle Load Ratio =	1.82	

Shackle Check = Ok

5. Optional Suspended Scaffold:

Hanger support load =	910	lb per two rods
Misc. rod loads =	100	lb
3/4" diameter metal rod, Fy =	36	ksi
Total weight on one rod =	505	lb
Area 3/4" Rod =	0.44	in^2
fa = P/A =	1.14	ksi

Metal Rod Check = Ok

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	Comp by: CAS Check by: PRS		Date: 02/03/21 Job No: 187-31-1	Sheet Number:

1. Scaffold Configuration:

Length =	32	ft.
Width =	28	in.
Weight =	213	lb
Assume Weight =	220	lb

2. Abrasive Cleaning Material:

Assume 1/4 inch of steel shot will cover the scaffold

Depth =	1/4	in.
Density of the shot =	280	pcf
Weight of the shot =	5.83	psf

3. Total Loads:

With full shot and no workers

Dead Load =	655.56	lb (see note below)
Live Load =	0	lb (see note below)

NOTE: The scaffold cable carries the load from two scaffolds where the length of scaffold exceeds 32 ft.

Use 1/2 " dia. 6x19 IWRC, EIP, or better

Cable diameter =	1/2	in
Cable weight =	0.46	plf
Cable strength =	13.3	tons

NOTE: The cable carries the DL from 2 scaffolds + 10% for overlap

Spacing =	25	ft
PickupSpacing =	25	ft
d = 5% of PickupSpacing =	15	in.
d =	15	in.
Use d =	18	in.
Tension at the center =	3.00	kips
Tension at the support =	3.02	kips

FS of the cable = 8.80 >= 6.0 OK

Use Shackle Size =	5/8	in
Working Load limit =	3.25	tons
Working Load at supports =	1.51	tons
Shackle Load Ratio =	2.15	

Shackle Check = Ok

4. Scaffold Support Hanger:

Hanger support load =	656	lb
Use =	700	lb

Use 3/8 " dia. 6x19 IWRC, EIP cables

Hanger diameter =	3/8	in
Hanger weight =	0.26	plf
Hanger strength =	7.55	tons

FS of the hanger = 21.57 >= 6.0 OK

Min. Chain working load =	7100	lb (min)
Chain Design Load =	656	lb
Use =	700	lb

Chain Hanger Stress Ratio = 10.14 >=1.0 OK

Use Shackle Size =	3/8	in
Working Load limit =	1.00	tons
Working Load at supports =	0.35	tons
Shackle Load Ratio =	2.86	

Shackle Check = Ok

5. Optional Suspended Scaffold:

Hanger support load =	328	lb per two rods
Misc. rod loads =	100	lb
3/4" diameter metal rod, Fy =	36	ksi
Total weight on one rod =	214	lb
Area 3/4" Rod =	0.44	in^2
fa = P/A =	0.48	ksi

Metal Rod Check = Ok

Appendix D
Miscellaneous Hardware

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Cable Anchorage Plate Connection:

Design the cable anchor plate attachment. The cable needs only sufficient tension to reduce the sag and support the cable. The connection must be designed to resist the allowable working load of the cable with a factor of safety of 4 per OSHA.

The members used to construct the paint containment platform will be checked for compliance with OSHA requirements for scaffolding - 29 CFR, Part 1910 Standard Number 1910.28:

1910.28(a)(4): Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load.

1910.28.(a)(22): Wire or fiber rope used for scaffold suspension shall be capable of supporting at least six times the intended load.

1. Material Properties:

Nom. Strength of 0.625 " diam. 6 x 19 EIP IWRC cable =	20.6	tons
$RopeWeight_{cable}$ =	0.72	plf
Allowable Strength of cable, $T_{cable.allow}$ =	6.87	kips
Chain link platform analysis, the cable load at the support is (Service Loads):		
$P_{anchor.plate.design} = DL + LL_u$ =	21.00	psf
$Weight_{anchor.plate}$ =	110.97	plf
$T_{support.anchor.plate}$ =	5.94	kips

The allowable load in the cable exceeds the service load at the anchor plate. Therefore, use the allowable load in the cable to design the anchor plate.

Structural Steel (A36 steel):	F_{y_A36} =	36	ksi
	F_{u_A36} =	58	ksi
Weld Metal (E70XX electrodes)	F_{u_weld} =	70	ksi
	E =	29000	ksi
	d = 18 in	Lspan = 25	ft

2. Check the anchorage capacity:

3/4" diam. Anchor with a 6 5/8" embedment, $F_{t.u}$ =	10980	lbf
Allowable Tension for a 6 5/8" embedment, $F_{t.allow}$ =	2.75	kips
Number of anchors required for pure tension =	2.50	(Use 4 anchors)
Ult. shear value for a 3/4" diam. Anchor $F_{v.u}$ =	20320	lbf
Allow. Shear (3/4" diam., 6 5/8" embedment) $F_{v.allow}$ =	5.08	kips
No. Anchors required for pure shear =	1.85	

From the chain link platform analysis, the longitudinal pickup point spacing is:

Sag = atan [d / (0.5 * Longspan)] 6.84 degrees

Anchor plate connection can accommodate 4 anchors. From the analysis, a minimum of 4 wedge anchors are required. Since the cable angle from the pier cap anchorage to the anchor plate may vary, check the deck anchorage for 0, 5, 10, 15 and 20 degrees.

No. of anchors assumed:	No. Anchors =	4
For the cable at a 0 degree angle:	Ø =	0 degrees
$f_{t.cable} = T_{cable.allow}(\sin Ø)$	$f_{t.cable}$ =	0 kips
$f_{v.cable} = T_{cable.allow}(\cos Ø)$	$f_{v.cable}$ =	6.87 kips
Combined Stress Ratio	Dem./Capacity CSR =	0.34 < 1.0 OK

No. of anchors assumed:	No. Anchors =	4
For the cable at a 5 degree angle:	Ø =	5 degrees
$f_{t.cable} = T_{cable.allow}(\sin Ø)$	$f_{t.cable}$ =	0.60 kips
$f_{v.cable} = T_{cable.allow}(\cos Ø)$	$f_{v.cable}$ =	6.84 kips
Combined Stress Ratio	Dem./Capacity CSR =	0.39 < 1.0 OK

No. of anchors assumed:	No. Anchors =	4
For the cable at a 10 degree angle:	Ø =	10 degrees
$f_{t.cable} = T_{cable.allow}(\sin Ø)$	$f_{t.cable}$ =	1.19 kips
$f_{v.cable} = T_{cable.allow}(\cos Ø)$	$f_{v.cable}$ =	6.76 kips
Combined Stress Ratio	Dem./Capacity CSR =	0.44 < 1.0 OK

No. of anchors assumed:	No. Anchors =	4
For the cable at a 15 degree angle:	Ø =	15 degrees
$f_{t.cable} = T_{cable.allow}(\sin Ø)$	$f_{t.cable}$ =	1.78 kips
$f_{v.cable} = T_{cable.allow}(\cos Ø)$	$f_{v.cable}$ =	6.63 kips
Combined Stress Ratio	Dem./Capacity CSR =	0.49 < 1.0 OK

No. of anchors assumed:	No. Anchors =	4
For the cable at a 20 degree angle:	Ø =	20 degrees
$f_{t.cable} = T_{cable.allow}(\sin Ø)$	$f_{t.cable}$ =	2.35 kips
$f_{v.cable} = T_{cable.allow}(\cos Ø)$	$f_{v.cable}$ =	6.45 kips
Combined Stress Ratio	Dem./Capacity CSR =	0.53 < 1.0 OK

3. Weld Design:

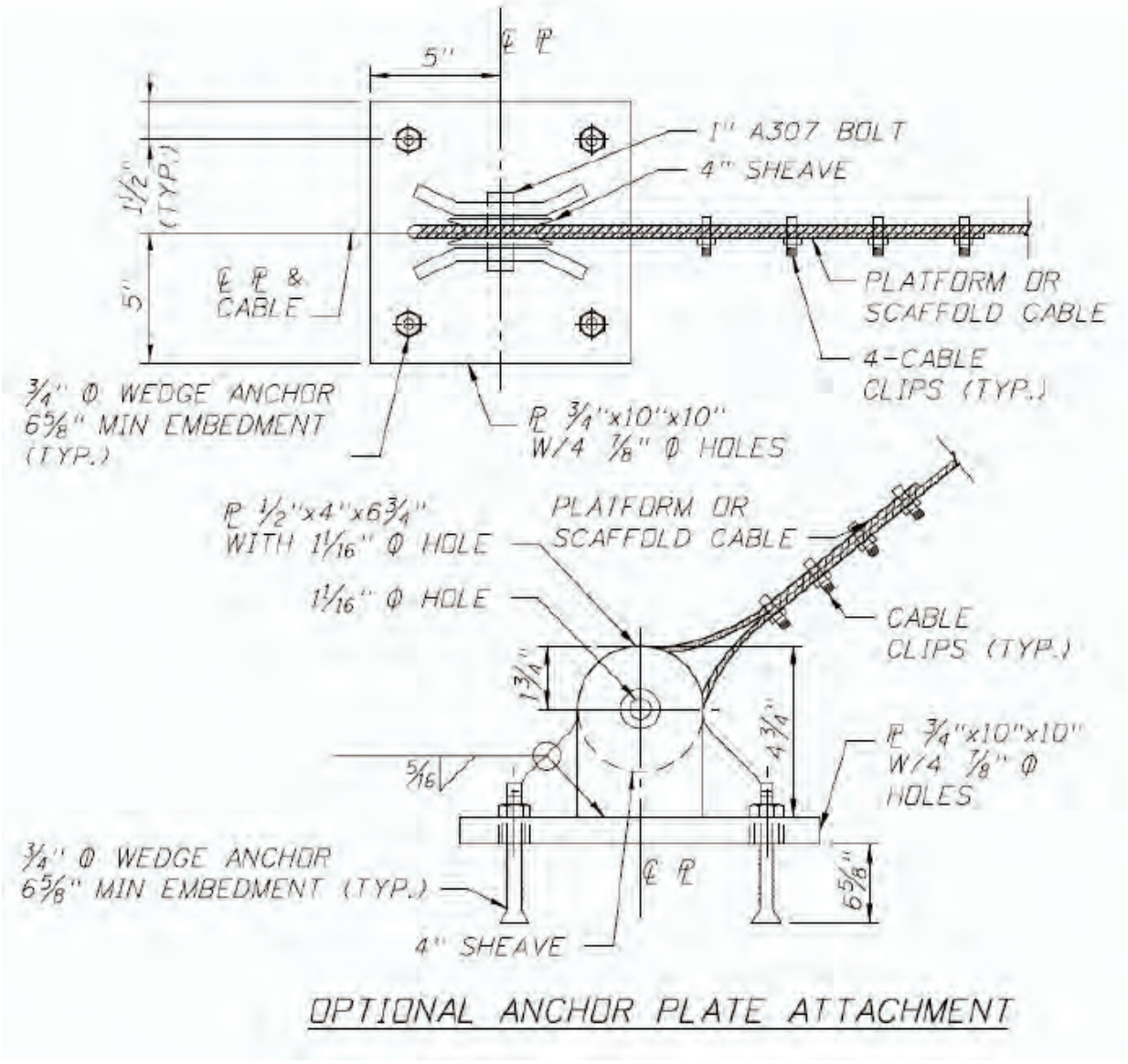
Design for a tension load: $T_{design} = T_{cable}$, T_{design} =		41.2 kips
For a 3/4" x 5" x 5" plate, min. weld or strength, t_{weld} =		0.20 in.
Minimum weld size =		3.14 in.

Minimum weld size is 2/16"
Per AASHTO Standard Specifications, Section 10.23.2.2, the minimum size weld for a 1" plate is 5/16" (0.3857 in.), therefore, specify the minimum weld size.

4. Determine the Minimum Connection Plate Size:

The bearing width of a 0.75 " shackle, b =		0.88 in.
Edge Distance, b_{edge} =		1.88 in.
Plate Thickness Used: th_{plate} =		0.75 in.
$d_{edge.min}$ = 1.875 in. - 0.5 * 1.25 in. =		1.25 in.
Asf = 2 * th_{plate} * $d_{edge.min}$ =		1.88 in^2 (conservative)
Shear Rupture, Pn = 0.6 * F_{u_A36} * Asf		65.25 kips
Shear Rupture Check:		OK

Limit the factored shear rupture through the connection plate per the Steel Construction Manual, AISC, 14th Ed., Part 16, Section D5.1:
The 1 1/4" diam. Hole is at 1 7/8" from the edge, therefore, the minimum edge dist. Is:

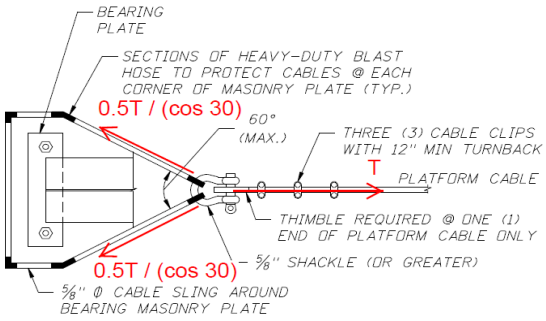


OPTIONAL ANCHOR PLATE ATTACHMENT

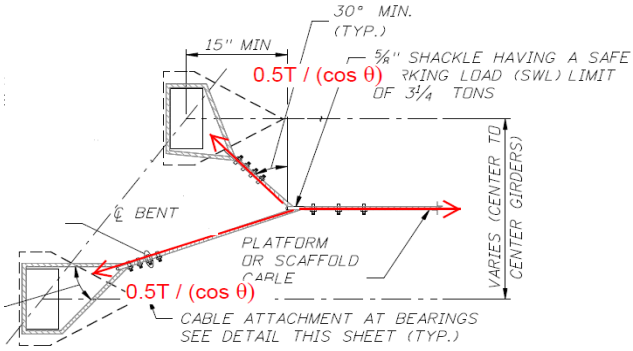
A2B ENGINEERING, LLC CONSULTING ENGINEERS	Subject:	Abrasive Blasting Containment Plans (Windsor County, Vermont) Route No. I-89 Bridges 17N & 17S Over The White River and VT-14			
	Comp by:	CAS	Date:	02/03/21	Sheet Number:
	Check by:	PRS	Job No:	187-31-1	

The following calculations are based on a worst-case-scenario, where 5/8" cables are tensioned.

Cable Attachment at Bearings:



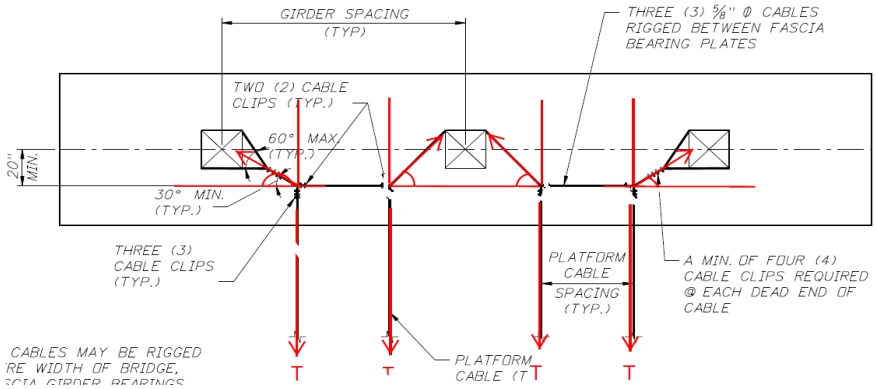
Mid Bay Cable Attachments:



Max. Tension on 5/8" Platform Cable, T =	20.6	tons
0.5 T / (cos (max. angle/2)) = T		
Angle =	30.0	deg
Specify a Maximum Angle of =	**30.0**	**deg**

Max. Tension on 5/8" Platform Cable, T =	20.6	tons
T / cos(angle) = 2T (2 cables)		
Angle =	30.0	deg
Specify a Maximum Angle of =	**30.0**	**deg**

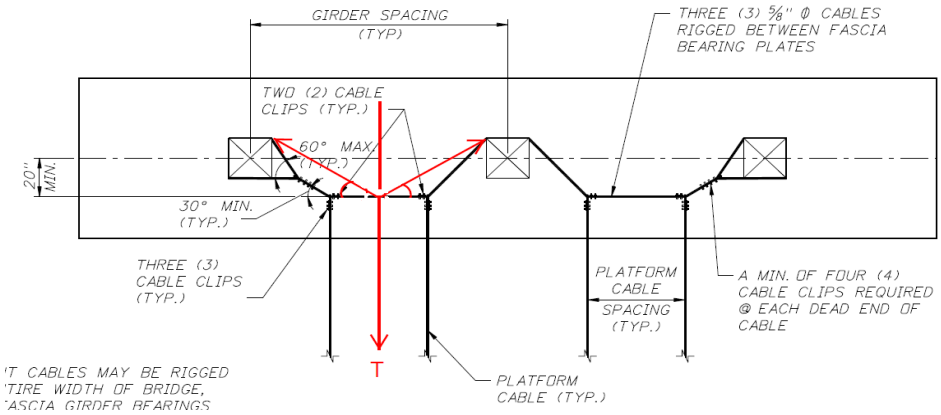
Transverse Cable Attachment:



Max. Tension on 5/8" Platform Cable, T =	20.6	tons
T / cos(angle) = 3T (3 cables)		
Angle =	19.5	deg
Specify a Maximum Angle of =	**30.0**	**deg**

Max. Tension on 5/8" Platform Cable, T =	20.6	tons
T / cos(angle) = 2T (2 cables)		
Angle =	30.0	deg
Specify a Maximum Angle of =	**30.0**	**deg**

Alternate Transverse Cable Attachment:

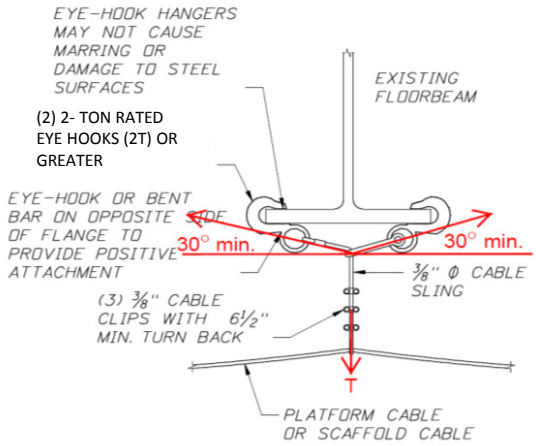


Max. Tension on 5/8" Platform Cable, T =	20.6	tons
0.5T / cos(angle) = 3T		
Angle =	9.6	deg
Specify a Maximum Angle of =	**30.0**	**deg**

Alternate Support Hanger:

1/2" Platform Support Cable:

Max. Tension, T =	13.3	tons
0.5T /sin(angle) = T		
Angle =	30.0	deg
Specify a Minimum Angle of =	**30.0**	**deg**



ALTERNATE SUPPORT HANGER

Scaffold Eye Hook Check:

2-Ton Rated Eye Hooks =	2	tons
Max. Hook Load (Ult.) =	3.30	tons
Hook Factor of Safety =	5	
Max. Hook Load (Service) =	0.66	tons
Eye Hook Check:	**Ok**	

Chain Link Eye Hook Check:

2-Ton Rated Eye Hooks =	2	tons
Max. Hanger Load (Ult.) =	8.91	tons
Factor of Safety =	5	
Max. Hook Load (Service) =	1.78	tons
Eye Hook Check:	**Ok**	

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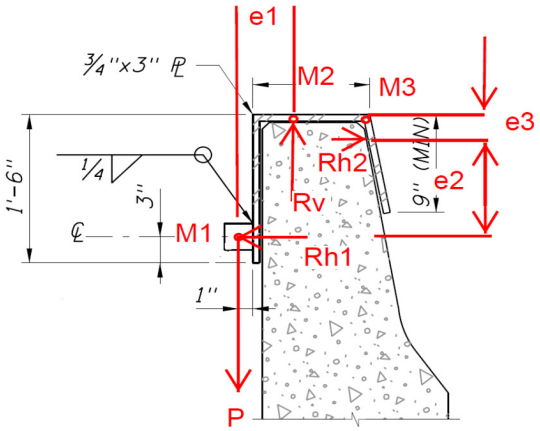
	Comp by: CAS Check by: PRS	Date: 02/03/21 Job No: 187-31-1	Sheet Number:	

Exterior Support Hanger Calcs.



Max. Hanger Spacing =	25.00	ft.
Tributary cable width =	5.25	ft. max
Max. tributary hanger area =	65.6	ft^2
Dead Load =	3	psf
Live Load =	18	psf
Total Design Loading =	21	psf
Max. Hanger Load, P =	1378.13	lb
P = Rv =	1378.13	lb
e1 =	0.31	ft
e2 =	1.08	ft
Sum Moments: Rv*e1 - Rh2*e2 = 0		
Rh2 =	397.536	lb
Sum Horiz. Forces: Rh1 = Rh2	397.536	lb
e3 =	0.17	ft
M2 =	430.664	lb-ft
S Plate =	0.28	in^3
fb = M / S =	18.38	ksi
Fy =	36	ksi
Fb = 0.67 * Fy =	24.12	ksi
Capacity/Demand Ratio =	1.31	
Check:	**Ok**	
M3 =	66.26	lb-ft
S Plate =	0.28	in^3
fb = M / S =	2.83	ksi
Fy =	36	ksi
Fb = 0.67 * Fy =	24.12	ksi
Capacity/Demand Ratio =	8.53	
Check:	**Ok**	

A2B ENGINEERING, LLC CONSULTING ENGINEERS	Subject:	Abrasive Blasting Containment Plans (Windsor County, Vermont) Route No. I-89 Bridges 17N & 17S Over The White River and VT-14		
	Comp by: CAS	Date: 02/03/21	Sheet Number:	
	Check by: PRS	Job No: 187-31-1		

Intermediate Containment Support Analysis:

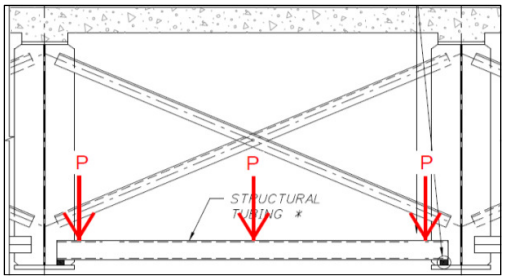
Use a TS 4x4x1/4 supported on the bridge beams bottom flanges for the intermediate pickup point supports.

TS 4 x 4 x 1/4:

DL_{TS} =	12.21	plf	I_{TS} =	7.8	in^4
A_{TS} =	3.37	in^2	T_{ts} =	0.233	in
B_{ts} =	4	in	b_Tts =	14.2	-
S_{TS} =	3.9	in^3	h_T_{ts} =	14.2	-
h_{TS} =	4	in	F_{yHSS} =	46	KSI (ASTM A-500, Grade B)

Check Shear:

Tributary Cable Width =	5.25	ft
Max. Hanger Spacing =	25	ft
Dead Load =	3.00	psf
Live Load =	18.00	psf
Support Load on the TS 4 x 4 x 1/4 =	2756.25	lbf
fv =	3.33	ksi
$0.33*F_{yHSS}$ =	15.18	ksi
Capacity/Demand Ratio =	4.56	



Conservative to use 3 loads P on tubing

TS Check for Shear: Ok

Bending Analysis:

Check the max. bending moment in the TS with the cable load centered between two girders.
Reference AISC Beam Equation 7

Max. Girder Spacing =	9.5	ft
M_{max} =	6.55	kip-ft (M = PL/4)
$fy = M_{max}/S_{TS}$ =	20.14	ksi
$0.6*F_{yHSS}$ =	27.60	ksi
Capacity/Demand Ratio =	1.37	

TS Check for Bending: Ok

Check the max. bending moment in the TS with two cable loads centered between two girders.
Reference AISC 9th edition Beam Equation 41

Mmax =	6.86	kip-ft
fy = Mmax/STS =	21.10	ksi
$0.6*F_{yHSS}$ =	27.60	ksi
Capacity/Demand Ratio =	1.31	

TS Check for Bending: Ok

A2B ENGINEERING, LLC CONSULTING ENGINEERS	Subject:	Abrasive Blasting Containment Plans (Windsor County, Vermont) Route No. I-89 Bridges 17N & 17S Over The White River and VT-14		
	Comp by: CAS	Date: 02/03/21	Sheet Number:	
	Check by: PRS	Job No: 187-31-1		

Intermediate Containment Support Analysis:

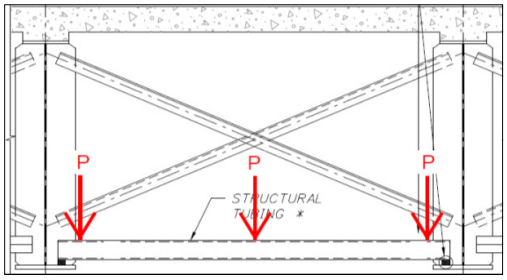
Use a TS 4x4x3/8 supported on the bridge beams bottom flanges for the intermediate pickup point supports.

TS 4 x 4 x 3/8:

DL_{TS} =	17.2 plf		I_{TS} =	10.3 in^4	
A_{TS} =	4.78 in^2		T_{ts} =	0.349 in	
B_{ts} =	4 in		b_Tts =	8.46 -	
S_{TS} =	5.13 in^3		h_T_{ts} =	8.46 -	
h_{TS} =	4 in		F_{yHSS} =	46 KSI	(ASTM A-500, Grade B)

Check Shear:

Tributary Cable Width =	5.25	ft
Max. Hanger Spacing =	25	ft
Dead Load =	3.00	psf
Live Load =	18.00	psf
Support Load on the TS 4 x 4 x 3/8=	2756.25	lbf
fv =	2.22	ksi
0.33*F_{yHSS} =	15.18	ksi
Capacity/Demand Ratio =	6.83	



Conservative to use 3 loads P on tubing

TS Check for Shear: Ok

Bending Analysis:

Check the max. bending moment in the TS with the cable load centered between two girders.
Reference AISC Beam Equation 7

Max. Girder Spacing =	11	ft	
M_{max} =	7.58	kip-ft	(M = PL/4)
fy = M_{max}/S_{TS} =	17.73	ksi	
0.6*F_{yHSS} =	27.60	ksi	
Capacity/Demand Ratio =	1.56		

TS Check for Bending: Ok

Check the max. bending moment in the TS with two cable loads centered between two girders.
Reference AISC 9th edition Beam Equation 41

Mmax =	8.79	kip-ft
fy = Mmax/STS =	20.56	ksi
0.6*F_{yHSS} =	27.60	ksi
Capacity/Demand Ratio =	1.34	

TS Check for Bending: Ok

Tubular Steel Outriggers

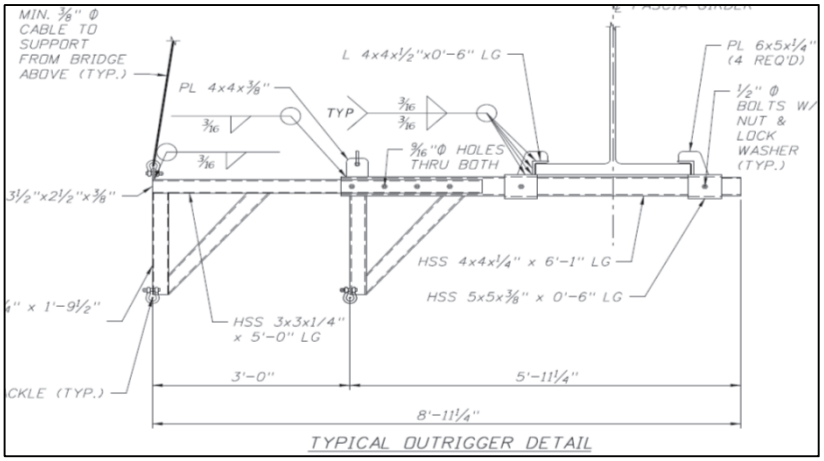
A. Load on Outrigger:

Dead Load =	3.13	psf
Live Load =	16.00	psf
Anticipated Uniform Load =	**19.13**	**psf**

B. For a maximum 25.00 -ft. outrigger spacing, an estimated platform dead & live loading of 19.13 psf and 1 worker at the end of the outrigger, the max. anticipated load for which the outrigger is to be designed is:

Max. Cable Spacing = 5.25 ft.
Tributary Width = 5.25 ft. (Conservative)

P = (25.00)x(5.25)x(19.1) + 250 lbs = **2,760 lbs.**
SPACING WIDTH DL + LL WORKER



C. Maximum moment, Mmax = **3.51** kip-ft (From RAM Elements Analysis)

D. Analyzing a TS 4x4X1/4 outrigger arm, S_x = 3.90 in^3
Fy = 36 ksi

fy = 3.51 k-ft x (12) / 3.90 in^3 = **10.8 ksi < 21.6 ksi OK**

fv = 2.76 kip / (2 x 3 in x 0.25 in.) = **1.84 ksi < 11.88 ksi OK**

Note: Each outrigger is to be supported from the bridge parapets or guide railing posts above to eliminate the cantilever bending within the outrigger arm.

Typical Outrigger Connection Calculations:

A. Plate Check:

Plate Width, b =	3	in.	
Plate Thickness, h =	0.5	in.	
Section Modulus, S =	0.125	$in.^3$	
Minimum Yield Stress, F_y =	36	ksi	
Flange Width, b_f =	12	in.	(Conservative)
Reaction =	1.12	kips	(From RAM Elements Analysis)
Moment Arm, a =	0.75	in.	
Moment on Plate, M_{pl}=	0.84	kip-in	
Bending Stress, f_b =	6.72	ksi	
Allow. Bending Stress, F_b =	21.6	ksi	
Capacity/Demand Ratio =	3.21		

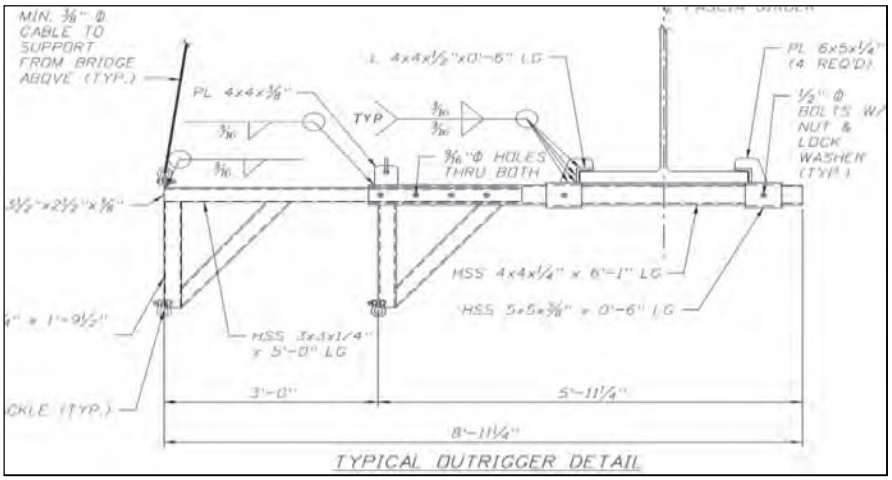
Plate Check: OK

===>> Support each outrigger from the bridge parapets or guide railing posts above to eliminate the cantilever bending within the outrigger arm.

B. Weld Check:

Weld Size =	3/16	in.	
Filler Metal Strength =	70	ksi	
Weld Effective Area, A_e =	0.80	$in.^2$	
Nom. Stress Weld Metal, F_{nw} =	42	ksi	(AISC 14th Ed.- Table J2.5)
Reaction =	1.12	kips	(From RAM Elements Analysis)
Weld Design Strength, R_n =	33.41	kips	(AISC 14th Ed.- Eqn. J2-3)
Capacity/Demand Ratio =	29.83		

Weld Check: OK



Available Shear Strength on Bolts:

Available Shear, 5/8" Bolt =	16.60	kips	(From Table 7-1, AISC 14th Ed.)
5/8" Bolt Area =	0.31	$in.^2$	
1/2" Bolt Area =	0.20	$in.^2$	
Available Shear, 1/2" Bolt =	10.62	kips	
Service Design Cable Tension =	5.38	kips	
Cable Angle =	20	deg	
ASD Shear Load on Bolts =	1.84	kips/cable	
Number of Cables on Outrigger =	3		
Total ASD Shear Load =	5.52	kips	
Capacity/Demand Ratio =	1.92		

Bolt Shear Check: OK

Available Axial Compression on HSS 4x4x1/4:

Legnth, L =	9.00	ft.	
Effective Length Factor, K =	1.00		(Pinned-Pinned Connection)
Effective Length Factor, K =	2.00		(Cantilever with Fixed End)
Effective Length, KL =	18.00	ft.	(Conservative)
Pn/Ω Axial Comp., HSS 4x4x1/4 =	25.10	kips	(From Table 4-4, AISC 14th Ed.)
Total ASD Shear Load =	5.52	kips	
Capacity/Demand Ratio =	4.54		

Axial Comp. Check: OK


Y
Z
X

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Geometry data

GLOSSARY

Cb22, Cb33	: Moment gradient coefficients
Cm22, Cm33	: Coefficients applied to bending term in interaction formula
d0	: Tapered member section depth at J end of member
DJX	: Rigid end offset distance measured from J node in axis X
DJY	: Rigid end offset distance measured from J node in axis Y
DJZ	: Rigid end offset distance measured from J node in axis Z
DKX	: Rigid end offset distance measured from K node in axis X
DKY	: Rigid end offset distance measured from K node in axis Y
DKZ	: Rigid end offset distance measured from K node in axis Z
dL	: Tapered member section depth at K end of member
Ig factor	: Inertia reduction factor (Effective Inertia/Gross Inertia) for reinforced concrete members
K22	: Effective length factor about axis 2
K33	: Effective length factor about axis 3
L22	: Member length for calculation of axial capacity
L33	: Member length for calculation of axial capacity
LB pos	: Lateral unbraced length of the compression flange in the positive side of local axis 2
LB neg	: Lateral unbraced length of the compression flange in the negative side of local axis 2
RX	: Rotation about X
RY	: Rotation about Y
RZ	: Rotation about Z
TO	: 1 = Tension only member 0 = Normal member
TX	: Translation in X
TY	: Translation in Y
TZ	: Translation in Z

Nodes

Node	X [ft]	Y [ft]	Z [ft]	Rigid Floor
1	0.00	0.00	0.00	0
2	9.00	0.00	0.00	0
3	1.50	0.00	0.00	0
4	4.50	0.00	0.00	0
5	6.00	0.00	0.00	0
6	7.50	0.00	0.00	0
7	9.00	-1.79	0.00	0
8	6.00	-1.79	0.00	0

Restraints

Node	TX	TY	TZ	RX	RY	RZ
1	1	1	1	1	0	0
3	0	1	1	0	0	0

Members

Member	NJ	NK	Description	Section	Material	d0 [in]	dL [in]	lg factor
1	1	3	Horiz. 4x4	HSS_SQR 4X4X1_4	A36	0.00	0.00	0.00
2	3	4	Horiz. 4x4	HSS_SQR 4X4X1_4	A36	0.00	0.00	0.00
3	4	5	Horiz. 4x4	HSS_SQR 4X4X1_4	A36	0.00	0.00	0.00
4	5	6	Horiz. 3x3	HSS_SQR 3X3X1_4	A36	0.00	0.00	0.00
5	6	2	Horiz. 3x3	HSS_SQR 3X3X1_4	A36	0.00	0.00	0.00
6	5	8	Vert. 3x3	HSS_SQR 3X3X1_4	A36	0.00	0.00	0.00
7	2	7	Vert. 3x3	HSS_SQR 3X3X1_4	A36	0.00	0.00	0.00
8	8	4	Diag. 3x3	HSS_SQR 3X3X1_4	A36	0.00	0.00	0.00
9	7	6	Diag. 3x3	HSS_SQR 3X3X1_4	A36	0.00	0.00	0.00

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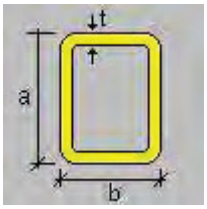
Section information

Section name: HSS_SQR 4X4X1_4 **(US)**

Dimensions



a	=	4.000	[in]	Height
b	=	4.000	[in]	Width
T	=	0.233	[in]	Thickness

Properties

Ag	:	3.370	[in2]	Gross area of the section.
I 33	:	7.800	[in4]	Moment of inertia about local axis 3.
I 22	:	7.800	[in4]	Moment of inertia about local axis 2.
I 23	:	0.000	[in4]	Product of inertia.
Ang 3' to 3	:	0.000	--	Angle to the principal axis. (°)
I 33'	:	7.800	[in4]	Moment of inertia about principal axis 3.
I 22'	:	7.800	[in4]	Moment of inertia about principal axis 2.
Dist. to cg 3	:	0.000	[in]	Distance from the geometric center to the gravity center of the section in the axis 3 direction.
Dist. to cg 2	:	0.000	[in]	Distance from the geometric center to the gravity center of the section in the axis 2 direction.
J	:	12.800	[in4]	Saint-Venant torsion constant.
Xsc'	:	0.000	[in]	Distance from the c.g. to the shear center with reference to the principal axis 3.
Ysc'	:	0.000	[in]	Distance from the c.g. to the shear center with reference to the principal axis 2.
Cw	:	0.000	[in6]	Section warping constant.
ro	:	2.150	[in]	Polar radius of gyration.
J 33'	:	0.000	[in]	Property to consider torsional – flexural buckling about principal axis 3.
J 22'	:	0.000	[in]	Property to consider torsional – flexural buckling about principal axis 2.
S 33 top	:	3.900	[in3]	Top elastic section modulus about local axis 3.
S 33 bot	:	3.900	[in3]	Bottom elastic section modulus about local axis 3.
S 22 top	:	3.900	[in3]	Top elastic section modulus about local axis 2.
S 22 bot	:	3.900	[in3]	Bottom elastic section modulus about local axis 2.
S 33' top	:	3.900	[in3]	Top elastic section modulus about principal axis 3.
S 33' bot	:	3.900	[in3]	Bottom elastic section modulus about principal axis 3.
S 22' top	:	3.900	[in3]	Top elastic section modulus about principal axis 2.
S 22' bot	:	3.900	[in3]	Bottom elastic section modulus about principal axis 2.
Z 33	:	4.700	[in3]	Plastic section modulus about local axis 3.
Z 22	:	4.700	[in3]	Plastic section modulus about local axis 2.
Z 33'	:	4.700	[in3]	Plastic section modulus about principal axis 3.
Z 22'	:	4.700	[in3]	Plastic section modulus about principal axis 2.
Max 3	:	2.000	[in]	Coordinate of the farthest positive extremity of the section in relation to local axis 3.
Min 3	:	-2.000	[in]	Coordinate of the farthest negative extremity of the section in relation to local axis 3.
Max 2	:	2.000	[in]	Coordinate of the farthest positive extremity of the section in relation to local axis 2.
Min 2	:	-2.000	[in]	Coordinate of the farthest negative extremity of the section in relation to local axis 2.
Aw3	:	1.538	[in2]	Flange area for shear.
Aw2	:	1.538	[in2]	Web area for shear.
C	:	6.563	[in3]	Torsional constant.
Qmod2'	:	1.74E+05	[in3]	Shear modulus for principal axis 2.
Qmod3'	:	1.74E+05	[in3]	Shear modulus for principal axis 3.

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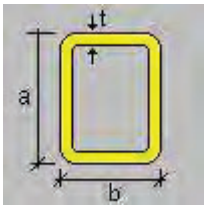
Section information

Section name: HSS_SQR 3X3X1_4 **(US)**

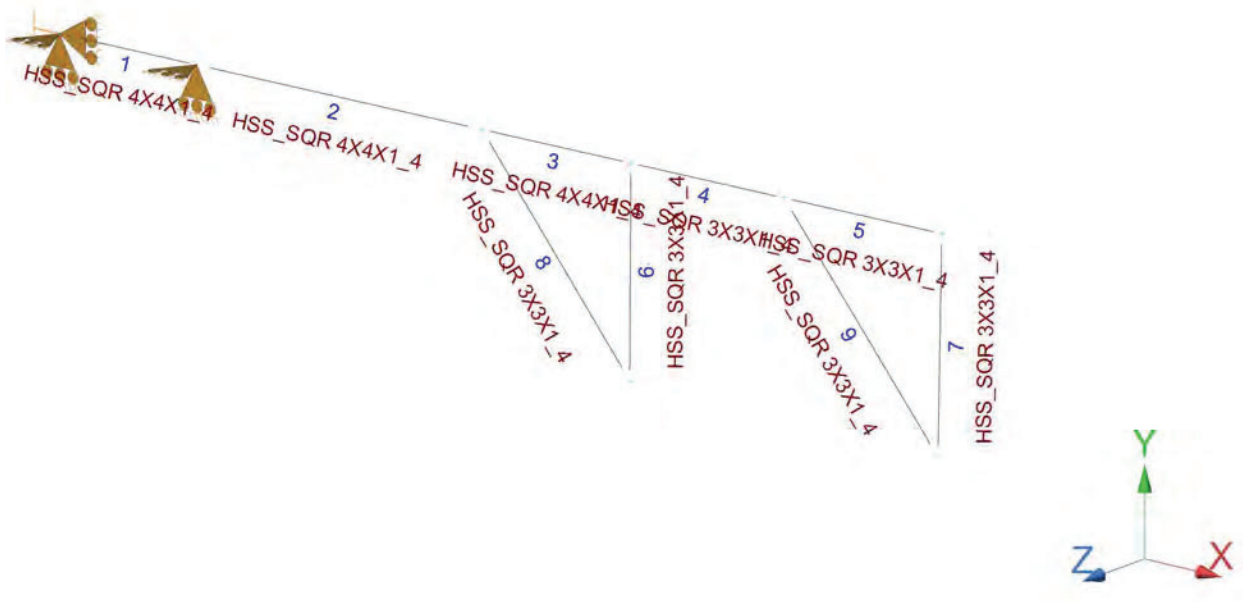
Dimensions



a	=	3.000	[in]	Height
b	=	3.000	[in]	Width
T	=	0.233	[in]	Thickness

Properties

Ag	:	2.440	[in2]	Gross area of the section.
I 33	:	3.000	[in4]	Moment of inertia about local axis 3.
I 22	:	3.000	[in4]	Moment of inertia about local axis 2.
I 23	:	0.000	[in4]	Product of inertia.
Ang 3' to 3	:	0.000	--	Angle to the principal axis. (°)
I 33'	:	3.000	[in4]	Moment of inertia about principal axis 3.
I 22'	:	3.000	[in4]	Moment of inertia about principal axis 2.
Dist. to cg 3	:	0.000	[in]	Distance from the geometric center to the gravity center of the section in the axis 3 direction.
Dist. to cg 2	:	0.000	[in]	Distance from the geometric center to the gravity center of the section in the axis 2 direction.
J	:	5.080	[in4]	Saint-Venant torsion constant.
Xsc'	:	0.000	[in]	Distance from the c.g. to the shear center with reference to the principal axis 3.
Ysc'	:	0.000	[in]	Distance from the c.g. to the shear center with reference to the principal axis 2.
Cw	:	0.000	[in6]	Section warping constant.
ro	:	1.571	[in]	Polar radius of gyration.
J 33'	:	0.000	[in]	Property to consider torsional – flexural buckling about principal axis 3.
J 22'	:	0.000	[in]	Property to consider torsional – flexural buckling about principal axis 2.
S 33 top	:	2.000	[in3]	Top elastic section modulus about local axis 3.
S 33 bot	:	2.000	[in3]	Bottom elastic section modulus about local axis 3.
S 22 top	:	2.000	[in3]	Top elastic section modulus about local axis 2.
S 22 bot	:	2.000	[in3]	Bottom elastic section modulus about local axis 2.
S 33' top	:	2.000	[in3]	Top elastic section modulus about principal axis 3.
S 33' bot	:	2.000	[in3]	Bottom elastic section modulus about principal axis 3.
S 22' top	:	2.000	[in3]	Top elastic section modulus about principal axis 2.
S 22' bot	:	2.000	[in3]	Bottom elastic section modulus about principal axis 2.
Z 33	:	2.500	[in3]	Plastic section modulus about local axis 3.
Z 22	:	2.500	[in3]	Plastic section modulus about local axis 2.
Z 33'	:	2.500	[in3]	Plastic section modulus about principal axis 3.
Z 22'	:	2.500	[in3]	Plastic section modulus about principal axis 2.
Max 3	:	1.500	[in]	Coordinate of the farthest positive extremity of the section in relation to local axis 3.
Min 3	:	-1.500	[in]	Coordinate of the farthest negative extremity of the section in relation to local axis 3.
Max 2	:	1.500	[in]	Coordinate of the farthest positive extremity of the section in relation to local axis 2.
Min 2	:	-1.500	[in]	Coordinate of the farthest negative extremity of the section in relation to local axis 2.
Aw3	:	1.072	[in2]	Flange area for shear.
Aw2	:	1.072	[in2]	Web area for shear.
C	:	3.518	[in3]	Torsional constant.
Qmod2'	:	2.36E+05	[in3]	Shear modulus for principal axis 2.
Qmod3'	:	2.36E+05	[in3]	Shear modulus for principal axis 3.


1
HSS_SQR 4X4X1_4
2
HSS_SQR 4X4X1_4
3
HSS_SQR 4X4X1_4
4
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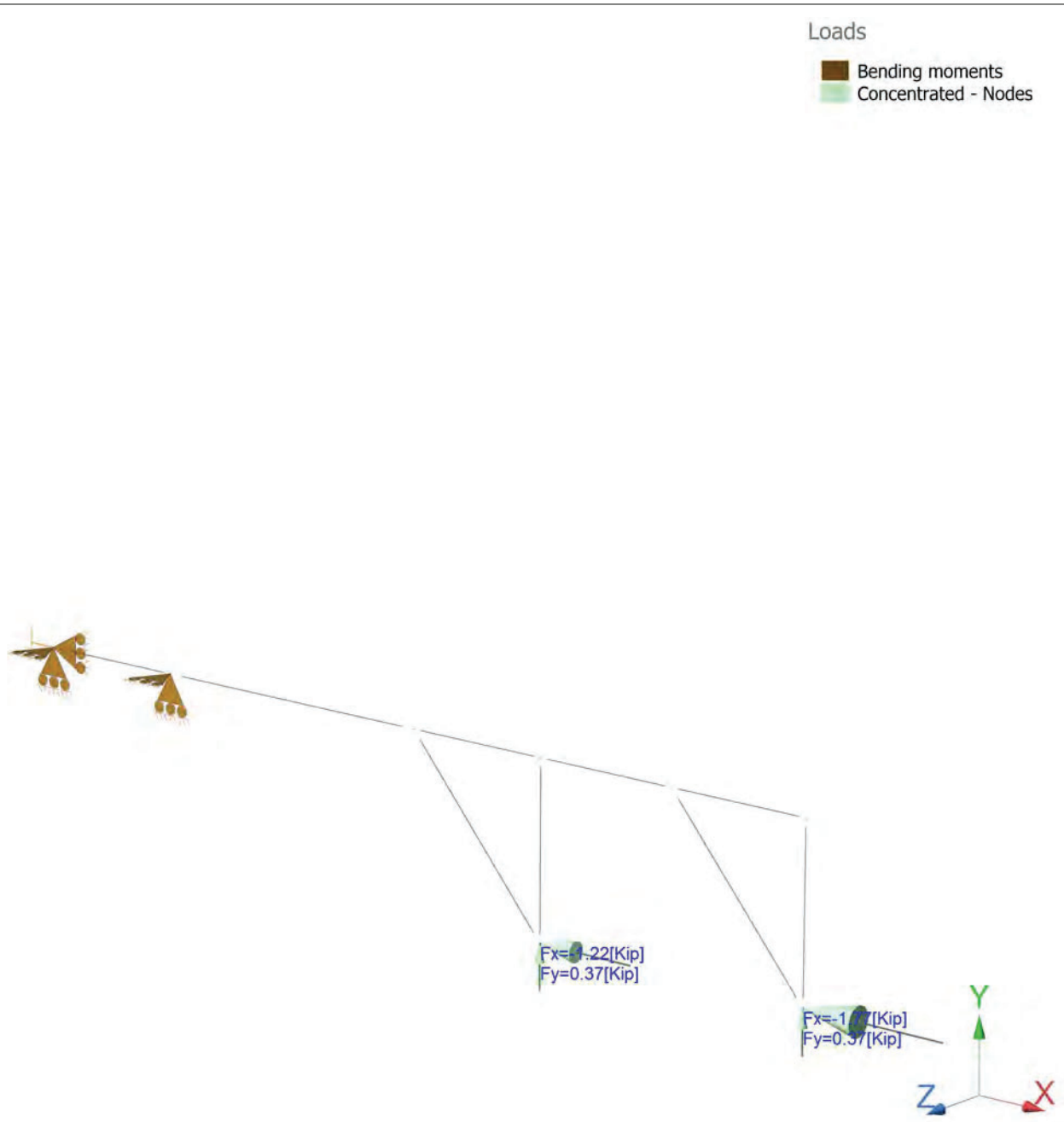
5
HSS_SQR 3X3X1_4
6
HSS_SQR 3X3X1_4
7
HSS_SQR 3X3X1_4
8
HSS_SQR 3X3X1_4
9
HSS_SQR 3X3X1_4
Y
Z
X

Units system: English
File name: C:\Users\Laptop1\Desktop\Monoko\RAM R1.etz\
Load condition: DL=Dead Load



Units system: English
File name: C:\Users\Laptop1\Desktop\Monoko\RAM R1.etz\

Load data

GLOSSARY

Comb : Indicates if load condition is a load combination

Load conditions

Condition	Description	Comb.	Category
DL	Dead Load	No	DL
S1	DL	Yes	
D1	DL	Yes	

Load on nodes

Condition	Node	FX [Kip]	FY [Kip]	FZ [Kip]	MX [Kip*ft]	MY [Kip*ft]	MZ [Kip*ft]
DL	7	-1.77	0.37	0.00	0.00	0.00	0.00
	8	-1.22	0.37	0.00	0.00	0.00	0.00

Self weight multipliers for load conditions

Condition	Description	Self weight multiplier			
		Comb.	MultX	MultY	MultZ
DL	Dead Load	No	0.00	-1.00	0.00
S1	DL	Yes	0.00	0.00	0.00
D1	DL	Yes	0.00	0.00	0.00

Earthquake (Dynamic analysis only)

Condition	a/g	Ang. [Deg]	Damp. [%]
DL	0.00	0.00	0.00
S1	0.00	0.00	0.00
D1	0.00	0.00	0.00

Units system: English
File name: C:\Users\Laptop1\Desktop\Monoko\RAM R1.etz\

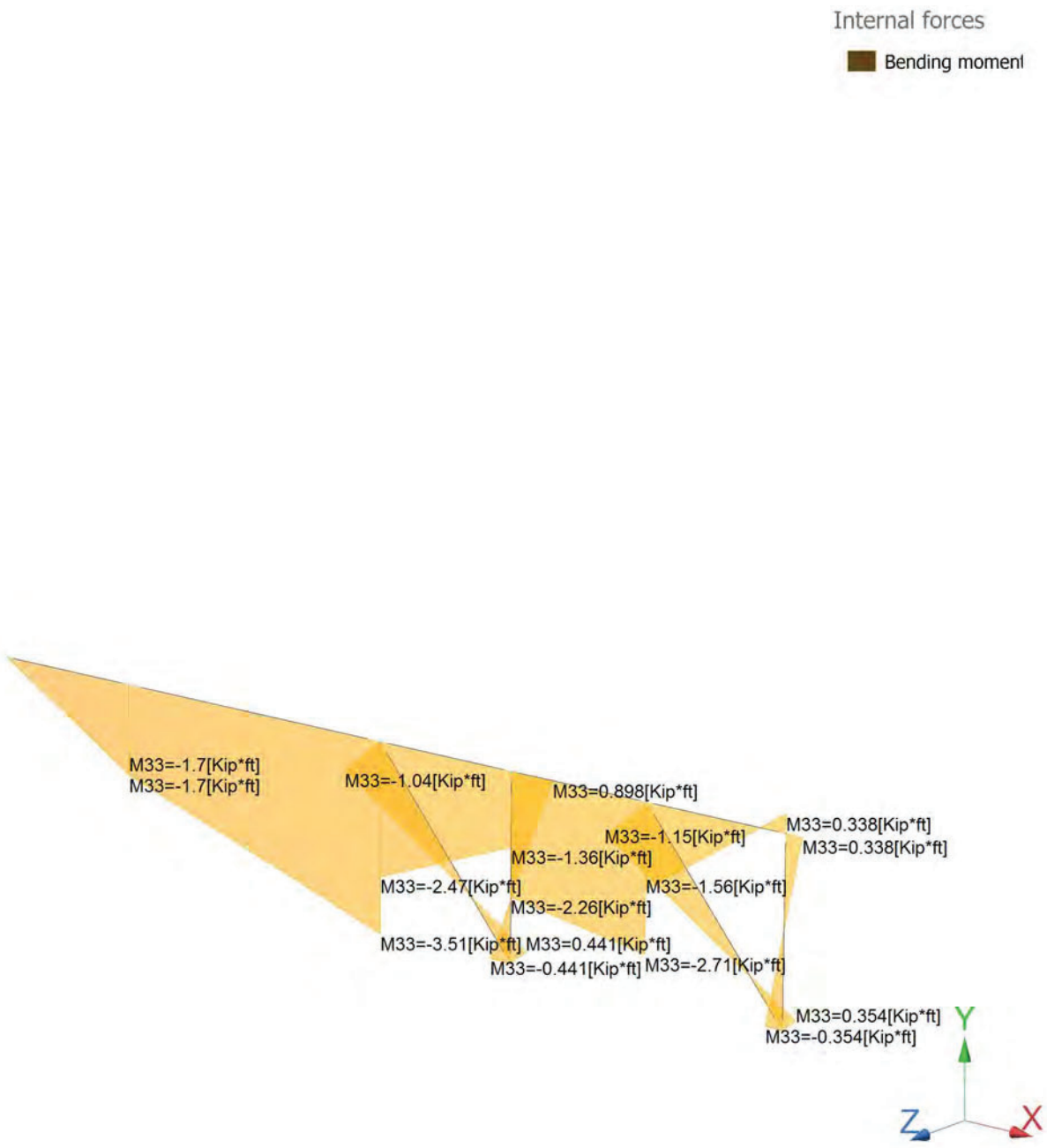
Steel Code Check

Report: Summary - Group by member

Load conditions to be included in design :
D1=DL

Description	Section	Member	Ctrl Eq.	Ratio	Status	Reference
Diag. 3x3	***HSS_SQR 3X3X1_4***	**8**	D1 at 100.00%	0.17	OK	Eq. H1-1b
		9	D1 at 100.00%	0.19	OK	Eq. H1-1b
Horiz. 3x3		**4**	D1 at 100.00%	**0.41**	**OK**	Eq. H1-1b
		5	D1 at 0.00%	0.23	OK	Eq. H1-1b
Horiz. 4x4	***HSS_SQR 4X4X1_4***	**1**	D1 at 100.00%	0.15	OK	Eq. H1-1b
		2	D1 at 100.00%	**0.29**	**OK**	Eq. H1-1b
		3	D1 at 0.00%	0.20	OK	Eq. H1-1b
Vert. 3x3	***HSS_SQR 3X3X1_4***	**6**	D1 at 0.00%	**0.14**	**OK**	Eq. H1-1b
		7	D1 at 100.00%	0.06	OK	Eq. H1-1b

Units system: English
File name: C:\Users\Laptop1\Desktop\Monoko\RAM R1.etz\
Load condition: DL=Dead Load



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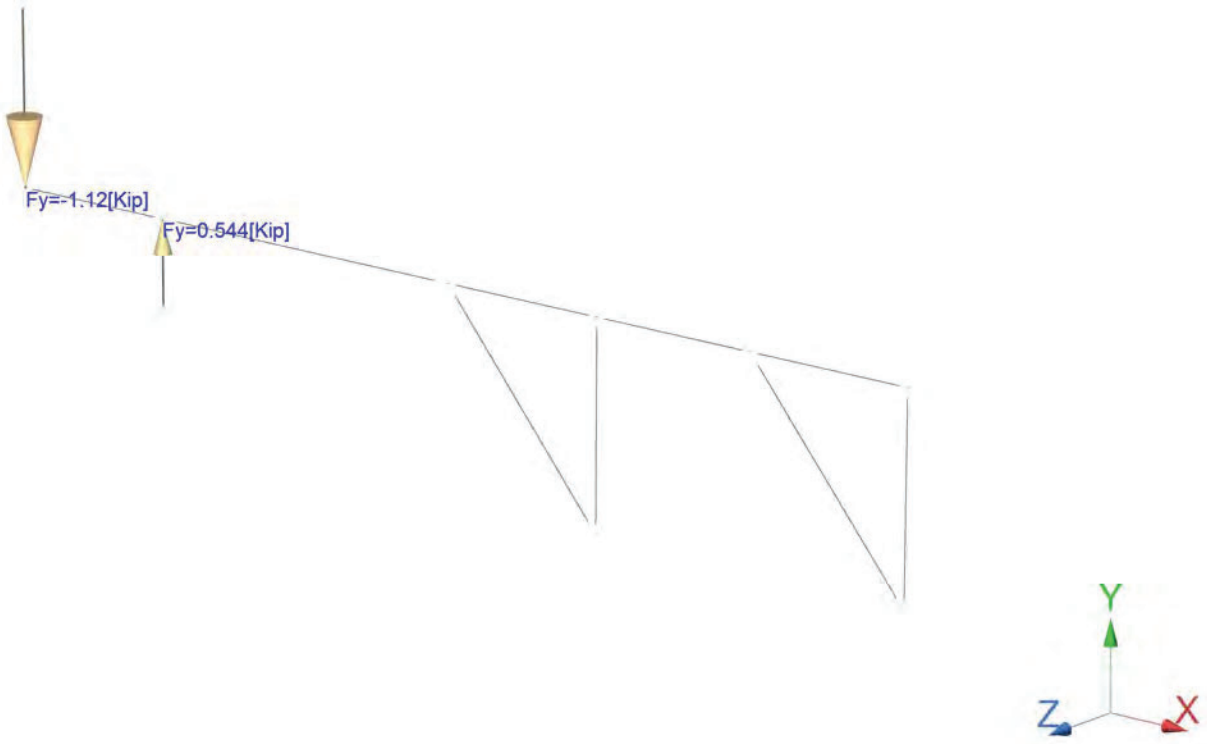

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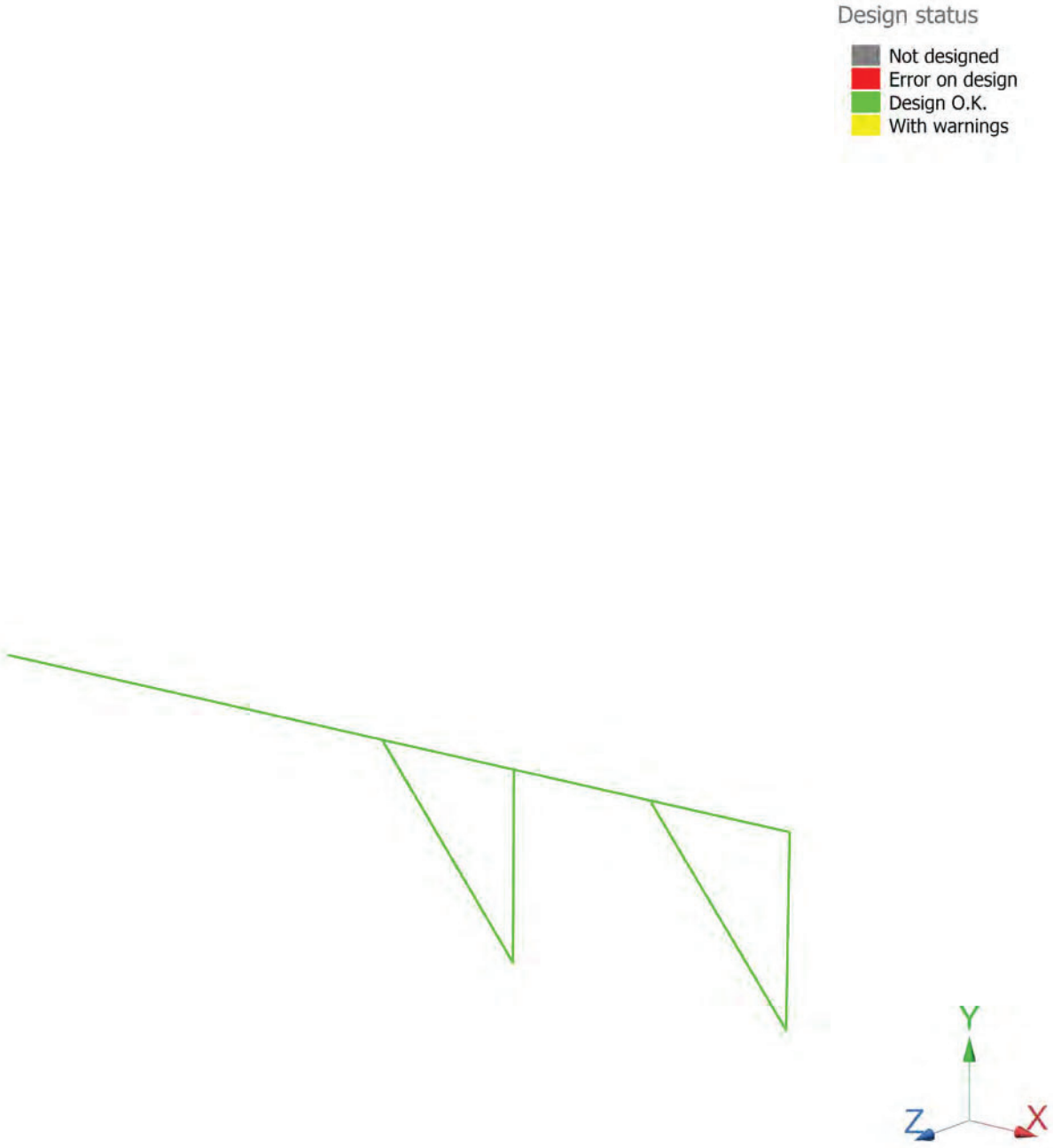
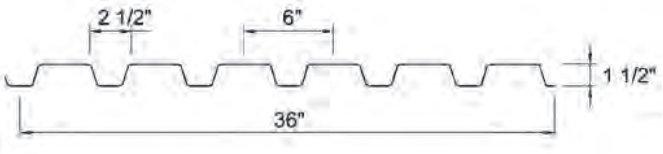
Load condition: D1=DL



B, BA, BV DECK



Height	1 1/2 in.
Fy (minimum)	33 ksi
Modulus of Elasticity	29500 ksi

SECTION PROPERTIES

Gage	Fy (ksi)	Coverage (in)	Thickness (in)	Weight (psf)	I (in^4/ft)	Sp (in^3/ft)	Sn (in^3/ft)
22	33	36	0.0295	1.63	0.177	0.189	0.198
20	33	36	0.0358	1.96	0.213	0.235	0.247
18	33	36	0.0474	2.57	0.290	0.315	0.316

ALLOWABLE UNIFORM LOADS

Span Condition	Gage	Allowable Total (Dead + Live) Uniform Load (psf) Center to Center Span (ft. - in.)										Max. Constr. Span (ctr. to ctr.)
		5 - 0	5 - 6	6 - 0	6 - 6	7 - 0	7 - 6	8 - 0	8 - 6	9 - 0	9 - 6	
Single	22	91	71	57	47	40	34	30	27	24	22	5 - 8
	20	111	86	69	56	47	40	35	31	27	25	6 - 7
	18	136	119	94	76	63	53	46	40	35	31	8 - 2
Double	22	107	88	74	63	54	47	42	37	33	30	6 - 8
	20	133	110	92	79	68	59	52	46	41	37	7 - 10
	18	170	140	118	101	87	76	66	59	53	47	9 - 6
Triple	22	133	110	93	79	68	59	50	44	38	34	6 - 9
	20	166	137	115	98	84	70	59	51	45	39	7 - 11
	18	213	176	146	125	107	93	78	67	58	51	9 - 8

Notes

1. Section properties are calculated using the AISI Cold Formed Steel Design Specifications, 1996 Edition.
2. Loads and maximum construction spans are based on the SDI Design Manual for Composite Decks, Form Decks and Roof Decks, Publication No. 30.
3. Maximum cantilever spans are based on SDI criteria and are sensitive to adjacent spans. For this table, adjacent span is assumed to be at least 1.5 times longer than the cantilever span.
4. Minimum end bearing length shall be 1 1/2".
5. Loads shown in RED are governed by the live load deflection not in excess of 1/240 of span. 10 psf dead load has been included.
6. Perforations which are placed in the vertical ribs of type BA deck reduce the strength less than 5%.

FACTORY MUTUAL SPANS

Gage	Max. Ctr. to Ctr. Span (ft.-in.)
22	6 - 0
20	6 - 6
18	7 - 5

CANTILEVER SPANS

Gage	Maximum Cantilever Span (ft.-in.)
22	2 - 0
20	2 - 4
18	2 - 8

- Type B deck provides the best balance of strength and economy of all the 1 1/2" deep roof decks. 1" (minimum) rigid roofing insulation is required to be used with type B deck.
- Available with nested side laps only.
- Available as an acoustic deck. Type BA deck is manufactured with perforations in the vertical ribs, having a NRC rating of 0.60 with 1 1/2" (minimum) rigid roofing insulation.
- Available as a vented deck. Type BV deck is manufactured with slot vents in the bottom flutes. The openings equal 0.5% of total surface. Type BV deck is to be specified when venting is required for cementitious insulation fills. Type BV deck is manufactured at our Lake City, FL facility only.
- Type B deck is Factory Mutual approved. Type BA and BV decks are not Factory Mutual approved.
- Type B, BA and BV decks are manufactured from steel conforming to ASTM A1008-00 Grades C, D or E or from A653/A653M-00 structural quality grade SQ33 or higher. The minimum yield strength used by NMBS is 33 KSI.
- Minimum attachment to supporting structural members requires connections at all side lap ribs plus a sufficient number of interior ribs to limit the spacing between connections to 18". Side laps are to be fastened together between supports, at a maximum spacing of 36" o.c. whenever the deck span exceeds 5'-0". Connections can be made either by welding using a minimum 5/8" diameter puddle weld or properly designed mechanical fasteners.

Trubolt Wedge Type Anchor

Performance Data (2 pages)

Product Information: Suggested Specifications
Selection and Order Information (2 pages)
Installation Instructions :Approvals and Listing

PERFORMANCE TABLE

Trubolt Wedge Anchors			Ultimate Tension and Shear Values (Lbs/kN) in Concrete*							
ANCHOR DIA In. (mm)	INSTALLATION TORQUE Ft. Lbs (Nm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	f'c = 2000 PSI (13.8 MPa)		f'c = 4000 PSI (27.6 MPa)		f'c = 6000 PSI (41.4 MPa)	
				TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
1/4 (6.4)	4 (5.4)	1-1/8 (28.6) 1-15/16 (49.2) 2-1/8 (54.0)	WS-Carbon or WS-G Hot-Dipped Galvanized or WW-304 S.S. or SWW-316 S.S.	1,180 (5.2) 2,100 (9.3) 2,260 (10.1)	1,400 (6.2) 1,680 (7.5) 1,680 (7.5)	1,780 (7.9) 3,300 (14.7) 3,300 (14.7)	1,400 (6.2) 1,680 (7.5) 1,680 (7.5)	1,900 (8.5) 3,300 (14.7) 3,300 (14.7)	1,400 (6.2) 1,680 (7.5) 1,680 (7.5)
3/8 (9.5)	25 (33.9)	1-1/2 (38.1) 3 (76.2) 4 (101.6)		1,680 (7.5) 3,480 (15.5) 4,800 (21.4)	2,320 (10.3) 4,000 (17.8) 4,000 (17.8)	2,240 (10.0) 5,940 (26.4) 5,940 (26.4)	2,620 (10.3) 4,140 (18.4) 4,140 (18.4)	2,840 (12.6) 6,120 (27.2) 6,120 (27.2)	3,160 (14.1) 4,500 (20.0) 4,500 (20.0)
1/2 (12.7)	55 (74.6)	2-1/4 (57.2) 4-1/8 (104.8) 6 (152.4)		4,660 (20.7) 4,660 (20.7) 5,340 (23.8)	4,760 (21.2) 7,240 (32.2) 7,240 (32.2)	5,100 (22.7) 9,640 (42.9) 9,640 (42.9)	4,760 (21.2) 7,240 (32.2) 7,240 (32.2)	7,040 (31.3) 10,820 (48.1) 10,820 (48.1)	7,040 (31.3) 8,160 (36.3) 8,160 (36.3)
5/8 (15.9)	90 (122.0)	2-3/4 (69.9) 5-1/8 (130.2) 7-1/2 (190.5)		6.580 (29.3) 6.580 (29.3) 7,060 (31.4)	7,120 (31.7) 9,600 (42.7) 9,600 (42.7)	7,180 (31.9) 14,920 (66.4) 15,020 (66.8)	7,120 (31.7) 11,900 (52.9) 11,900 (52.9)	9,720 (43.2) 16,380 (72.9) 16,380 (72.9)	9,616 (42.8) 12,520 (55.7) 12,520 (55.7)
3/4 (19.1)	110 (149.2)	3-1/4 (82.6) 6-5/8 (168.3) 10 (254.0)		7,120 (31.7) 10,980 (48.8) 10,980 (48.8)	10,120 (45.0) 20,320 (90.4) 20,320 (90.4)	10,840 (48.2) 17,700 (78.7) 17,880 (79.5)	13,720 (61.0) 23,740 (105.6) 23,740 (105.6)	13,300 (59.2) 20,260 (90.1) 23,580 (104.9)	15,980 (71.1) 23,740 (105.6) 23,740 (105.6)
7/8 (22.2)	250 (339.0)	3-3/4 (95.3) 6-1/4 (158.8) 8 (203.2)		9,520 (42.3) 14,660 (65.2) 14,660 (65.2)	13,160 (58.5) 20,880 (92.9) 20,880 (92.9)	14,740 (65.6) 20,940 (93.1) 20,940 (93.1)	16,580 (73.8) 28,800 (128.1) 28,800 (128.1)	17,420 (77.5) 24,360 (108.4) 24,360 (108.4)	19,160 (85.2) 28,800 (128.1) 28,800 (128.1)
1 (25.4)	300 (406.7)	4-1/2 (114.3) 7-3/8 (187.3) 9-1/2 (241.3)		13,940 (62.0) 14,600 (64.9) 18,700 (83.2)	16,080 (71.5) 28,680 (127.6) 28,680 (127.6)	20,180 (89.8) 23,980 (106.7) 26,540 (118.1)	22,820 (101.5) 37,940 (168.8) 37,940 (168.8)	21,180 (94.2) 33,260 (148.0) 33,260 (148.0)	24,480 (108.9) 38,080 (169.4) 38,080 (169.4)

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.
* For Tie-Wire Wedge Anchor, TW-1400, use tension data from 1/4" diameter with 1-1/8" embedment.

PERFORMANCE TABLE

Trubolt Wedge Anchors			Ultimate Tension and Shear Values (Lbs/kN) in Lightweight Concrete*			
ANCHOR DIA In. (mm)	INSTALLATION TORQUE Ft. Lbs (Nm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	LIGHTWEIGHT CONCRETE f'c = 3000 PSI 20.7 MPa)		LOWER FLUTE OF STEEL DECK WITH LIGHTWEIGHT CONCRETE FILL f'c = 2000 PSI (13.8 MPa)	
				TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	25 (33.9)	1-1/2 (38.1) 3 (76.2)	WS-Carbon or WS-G Hot-Dipped Galvanized or WW-304 S.S. or SWW-316 S.S.	1,175 (5.2) 2,825 (12.6)	1,480 (6.6) 2,440 (10.9)	1,900 (8.5) 2,840 (12.6)	3,160 (14.1) 4,000 (17.8)
1/2 (12.7)	55 (74.6)	2-1/4 (57.2) 3 (76.2) 4 (101.6)		2,925 (13.0) 3,470 (15.4) 4,290 (19.1)	2,855 (12.7) 3,450 (15.3) 3,450 (15.3)	3,400 (15.1) 4,480 (19.9) 4,800 (21.4)	5,380 (23.9) 6,620 (29.4) 6,440 (28.6)
5/8 (15.9)	90 (122.0)	3 (76.2) 5 (127.0)		4,375 (19.5) 6,350 (28.2)	4,360 (19.4) 6,335 (28.2)	4,720 (21.0) 6,580 (29.3)	5,500 (24.5) 9,140 (40.7)
3/4 (19.1)	110 (149.2)	3-1/4 (82.6) 5-1/4 (133.4)		5,390 (24.0) 7,295 (32.5)	7,150 (31.8) 10,750 (47.8)	5,840 (26.0) 7,040 (31.3)	8,880 (39.5) --- ---

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

Forged Wire Rope Clips

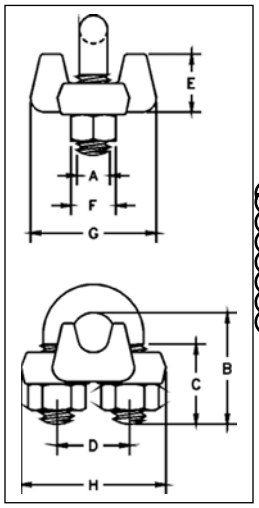
SEE APPLICATION AND WARNING INFORMATION

Para Español: www.thecrosbygroup.com *On Page 56*

G-450

- Each base has a Product Identification Code (PIC) for material traceability, the name CROSBY or CG, and a size forged into it.
- Based on the catalog breaking strength of wire rope, Crosby wire rope clips have an efficiency rating of 80% for 1/8" - 7/8" sizes, and 90% for sizes 1" through 3-1/2".
- Entire Clip-Galvanized to resist corrosive and rusting action.
- Sizes 1/8" through 2-1/2" and 3" have forged bases.
- All Clips are individually bagged or tagged with proper application instructions and warning information.
- Clip sizes up through 1-1/2" have rolled threads.
- Meets or exceeds all requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements. Importantly, these wire rope clips meet other critical performance requirements including fatigue life, impact properties and material traceability, not addressed by ASME B30.26.
- Look for the Red-U-Bolt®, your assurance of Genuine Crosby Clips.

Crosby Clips, all sizes 1/4" and larger, meet the performance requirements of Federal Specification FF-C-450 TYPE 1 CLASS 1, except for those provisions required of the contractor. For additional information, see page 444.



G-450 Crosby® Clips

Rope Size (in.)	Rope Size (mm)	G-450 Stock No.	Std. Package Qty.	Weight Per 100 (lbs.)	Dimensions (in.) A	B	C	D	E	F	G	H
1/8	3-4*	1010015	100	6	.22	.72	.44	.47	.37	.38	.81	.99
3/16*	5*	1010033	100	10	.25	.97	.56	.59	.50	.44	.94	1.18
1/4	6-7	1010051	100	19	.31	1.03	.50	.75	.66	.56	1.19	1.43
5/16	8	1010079	100	28	.38	1.38	.75	.88	.73	.69	1.31	1.66
3/8	9-10	1010097	100	48	.44	1.50	.75	1.00	.91	.75	1.63	1.94
7/16	11	1010113	50	78	.50	1.88	1.00	1.19	1.13	.88	1.91	2.28
1/2	12-13	1010131	50	80	.50	1.88	1.00	1.19	1.13	.88	1.91	2.28
9/16	14-15	1010159	50	109	.56	2.25	1.25	1.31	1.34	.94	2.06	2.50
5/8	16	1010177	50	110	.56	2.25	1.25	1.31	1.34	.94	2.06	2.50
3/4	18-20	1010195	25	142	.62	2.75	1.44	1.50	1.39	1.06	2.25	2.84
7/8	22	1010211	25	212	.75	3.12	1.62	1.75	1.58	1.25	2.44	3.16
1	24-26	1010239	10	252	.75	3.50	1.81	1.88	1.77	1.25	2.63	3.47
1-1/8	28-30	1010257	10	283	.75	3.88	2.00	2.00	1.91	1.25	2.81	3.59
1-1/4	32-34	1010275	10	438	.88	4.44	2.22	2.34	2.17	1.44	3.13	4.13
1-3/8	36	1010293	10	442	.88	4.44	2.22	2.34	2.31	1.44	3.13	4.19
1-1/2	38	1010319	10	544	.88	4.94	2.38	2.59	2.44	1.44	3.41	4.44
1-5/8	41-42	1010337	Bulk	704	1.00	5.31	2.62	2.75	2.66	1.63	3.63	4.75
1-3/4	44-46	1010355	Bulk	934	1.13	5.75	2.75	3.06	2.92	1.81	3.81	5.24
2	48-52	1010373	Bulk	1300	1.25	6.44	3.00	3.38	3.03	2.00	4.44	5.88
2-1/4	56-58	1010391	Bulk	1600	1.25	7.13	3.19	3.88	3.19	2.00	4.56	6.38
2-1/2	62-65	1010417	Bulk	1900	1.25	7.69	3.44	4.13	3.69	2.00	4.69	6.63
** 2-3/4	** 68-72	1010435	Bulk	2300	1.25	8.31	3.56	4.38	4.88	2.00	5.00	6.88
3	75-78	1010453	Bulk	3100	1.50	9.19	3.88	4.75	4.44	2.38	5.31	7.61
** 3-1/2	** 85-90	1010426	Bulk	4000	1.50	10.75	4.50	5.50	6.00	2.38	6.19	8.38

* Electro-plated U-Bolt and Nuts. ** 2-3/4" and 3-1/2" base is made of cast steel.

SS-450

- Each base has a Product Identification Code (PIC) for material traceability, the name CROSBY or "CG", and a size forged into it.
- Entire clip is made from 316 Stainless Steel to resist corrosive and rusting action.
- All components are Electro-Polished.
- All Clips are individually bagged or tagged with proper application instructions and warning information.

SS-450 Stainless Steel Wire Rope Clips

Rope Size (in.)	Rope Size (mm)	SS-450 Stock No.	Std. Package Qty.	Weight Per 100 (lbs.)	Dimensions (in.) A	B	C	D	E	F	G	H
1/8	3-4	1011250	Bulk	6	.22	.72	.44	.47	.41	.38	.81	.94
3/16	5	1011261	Bulk	10	.25	.97	.56	.59	.50	.44	.94	1.16
1/4	6-7	1011272	Bulk	20	.31	1.03	.50	.75	.66	.56	1.19	1.44
3/8	9-10	1011283	Bulk	47	.44	1.50	.75	1.00	.91	.75	1.63	1.94
1/2	12-13	1011305	Bulk	77	.50	1.88	1.00	1.19	1.13	.88	1.91	2.28
5/8	16	1011327	Bulk	106	.56	2.38	1.25	1.31	1.34	.94	2.06	2.50

Include 4 cable clips

CROSBY® CLIPS WARNINGS AND APPLICATION INSTRUCTIONS

G-450
(Red-U-Bolt®)

SS-450
(316 Stainless Steel)

⚠WARNING

- **Failure to read, understand, and follow these instructions may cause death or serious injury.**
- **Read and understand these instructions before using clips.**
- **Match the same size clip to the same size wire rope.**
- **Prepare wire rope end termination only as instructed.**
- **Do not use with plastic coated wire rope.**
- **Apply first load to test the assembly. This load should be of equal or greater weight than loads expected in use. Next, check and retighten nuts to recommended torque (See Table 1).**

Efficiency ratings for wire rope end terminations are based upon the minumum breaking force of wire rope. The efficiency rating of a properly prepared loop or thimble-eye termination for clip sizes 32 mm through 22mm is 80%, and for sizes 25.5 mm through 88.9 mm is 90%.

The number of clips shown (see Table 1) is based upon using RRL or RLL wire rope, 6 x 19 or 6 x 36 Class, FC or IWRC; IPS or XIP, XXIP. If Seale construction or similar large outer wire type construction in the 6 x 19 Class is to be used for sizes 1 inch and larger, add one additional clip. If a pulley (sheave) is used for turning back the wire rope, add one additional clip.

The number of clips shown also applies to rotation-resistant RRL wire rope, 8 x 19 Class, IPS, XIP, XXIP sizes 1-1/2 inch and smaller; and to rotation-resistant RRL wire rope, 19 x 7 Class, IPS, XIP, XXIP sizes 1-3/4 inch and smaller.

For other classes of wire rope not mentioned above, we recommend contacting Crosby Engineering to ensure the desired efficiency rating.

For elevator, personnel hoist, and scaffold applications, refer to ANSI A17.1 and ANSI A10.4. These standards do not recommend U-Bolt style wire rope clip terminations. The style wire rope termination used for any application is the obligation of the user.

For OSHA (Construction) applications, see OSHA 1926.251.

1. Refer to Table 1 in following these instructions. Turn back specified amount of rope from thimble or loop.

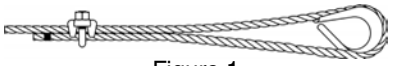


Figure 1

Apply first clip one base width from dead end of rope. Apply U-Bolt over dead end of wire rope – live end rests in saddle (Never saddle a dead horse!). Use torque wrench to tighten nuts evenly, alternate from one nut to the other until reaching the recommended torque. (See Figure 1)

2. When two clips are required, apply the second clip as near the loop or thimble as possible. Use torque wrench to tighten nuts evenly, alternating until reaching the recommended torque. When more than two clips are required, apply the second clip as near the loop or thimble as possible, turn nuts on second clip firmly, but do not tighten. (See Figure 2)

Figure 2

3. When three or more clips are required, space additional clips equally between first two – take up rope slack – use torque wrench to tighten nuts on each U-Bolt evenly, alternating from one nut to the other until reaching recommended torque. (See Figure 3)

Figure 3

4. If a pulley (sheave) is used in place of a thimble, add one additional clip. Clip spacing should be as shown. (See Figure 4)

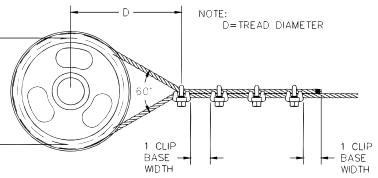


Figure 4

5. WIRE ROPE SPLICING PROCEDURES:

The preferred method of splicing two wire ropes together is to use inter-locking turnback eyes with thimbles using the recommended number of clips on each eye (See Figure 5).

Figure 5

An alternate method is to use twice the number of clips as used for a turnback termination. The rope ends are placed parallel to each other, overlapping by twice the turnback amount shown in the application instructions. The minimum number of clips should be installed on each dead end (See Figure 6). Spacing, installation torque, and other instructions still apply.

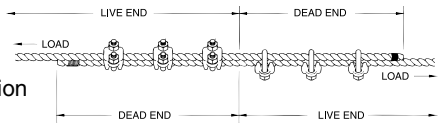


Figure 6

6. IMPORTANT

Apply first load to test the assembly. This load should be of equal or greater weight than loads expected in use. Next, check and use torque wrench to retighten nuts to recommended torque. In accordance with good rigging and maintenance practices, the wire rope end termination should be inspected periodically for wear, abuse, and general adequacy.

Table 1

Clip Size (in.)	Rope Size (mm)	Minimum No. of Clips	Amount of Rope to Turn Back in mm	*Torque in Nm
1/8	3-4	2	85	6.1
3/16	5	2	95	10.2
1/4	6-7	2	120	20.3
5/16	8	2	128	40.7
3/8	9-10	2	165	61.0
7/16	11-12	2	178	68
1/2	13	3	292	88
9/16	14-15	3	305	129
5/8	16	3	305	129
3/4	18-20	4	460	176
7/8	22	4	480	305
1	24-25	5	660	305
1-1/8	28-30	6	860	305
1-1/4	33-34	7	1120	488
1-3/8	36	7	1120	488
1-1/2	38-40	8	1370	488
1-5/8	41-42	8	1470	583
1-3/4	44-46	8	1550	800
2	48-52	8	1800	1017
2-1/4	56-58	8	1850	1017
2-1/2	62-65	9	2130	1017
2-3/4	68-72	10	2540	1017
3	75-78	10	2690	1627
3-1/2	85-90	12	3780	1627

If a pulley (sheave) is used for turning back the wire rope, add one additional clip. See Figure 4.

If a greater number of clips are used than shown in the table, the amount of turnback should be increased proportionately.

*The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

Crosby® Round Pin Shackles

Load Rated | Fatigue Rated | "QT" Quenched & Tempered | QUIC-CHECK® | MAXTOUGH®

ROUND PIN ANCHOR SHACKLES

G-213 S-213

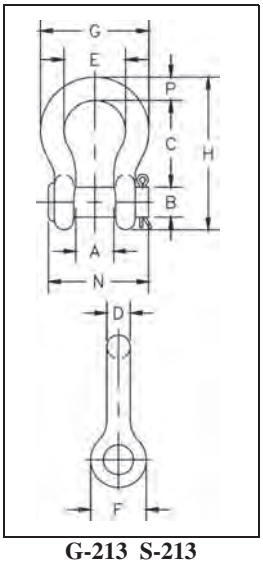
Round pin anchor shackles meet the performance requirements of Federal Specification RR-C-271D Type IVA, Grade A, Class 1, except for those provisions required of the contractor.

- Capacities 1/2 thru 35 metric tons.
- Forged - Quenched and Tempered, with alloy pins.
- Working Load Limit permanently shown on every shackle.
- Hot Dip galvanized or Self Colored.
- Fatigue rated.
- Shackles 25t and larger are **RFID EQUIPPED**.
- Shackles can be furnished proof tested with certificates to designated standards, such as ABS, DNV, Lloyds, or other certification. Charges for proof testing and certification available when requested at the time of order.
- Shackles are Quenched and Tempered and can meet DNV impact requirements of 42 joules at -20 degree C.
- Look for the Red Pin® . . . the mark of genuine Crosby quality.

ROUND PIN CHAIN SHACKLES

G-215 S-215

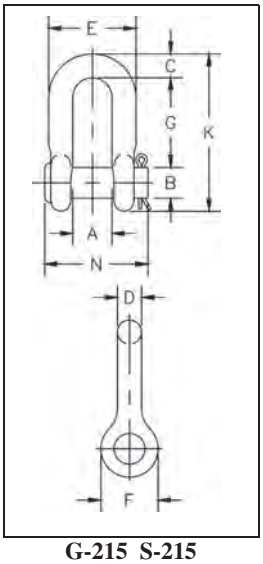
Round pin chain shackles meet the performance requirements of Federal Specification RR-C-271D Type IVB, Grade A, Class 1, except for those provisions required of the contractor.



G-213 S-213

Nominal Size (in.)	Working Load Limit (t)*	Stock No.		Weight Each (lbs.)	Dimensions (in.)										Tolerance + / -	
		G-213	S-213		A	B	C	D	E	F	G	H	N	P	C	A
1/4	1/2	1018017	1018026	.13	.47	.31	1.13	.25	.78	.61	1.28	1.84	1.34	.25	.06	.06
5/16	3/4	1018035	1018044	.18	.53	.38	1.22	.31	.84	.75	1.47	2.09	1.59	.31	.06	.06
3/8	1	1018053	1018062	.29	.66	.44	1.44	.38	1.03	.91	1.78	2.49	1.86	.38	.13	.06
7/16	1-1/2	1018071	1018080	.38	.75	.50	1.69	.44	1.16	1.06	2.03	2.91	2.13	.44	.13	.06
1/2	2	1018099	1018106	.71	.81	.63	1.88	.50	1.31	1.19	2.31	3.28	2.38	.50	.13	.06
5/8	3-1/4	1018115	1018124	1.50	1.06	.75	2.38	.63	1.69	1.50	2.94	4.19	2.91	.69	.13	.06
3/4	4-3/4	1018133	1018142	2.32	1.25	.88	2.81	.75	2.00	1.81	3.50	4.97	3.44	.81	.25	.06
7/8	6-1/2	1018151	1018160	3.49	1.44	1.00	3.31	.88	2.28	2.09	4.03	5.83	3.81	.97	.25	.06
1	8-1/2	1018179	1018188	5.00	1.69	1.13	3.75	1.00	2.69	2.38	4.69	6.56	4.53	1.06	.25	.06
1-1/8	9-1/2	1018197	1018204	6.97	1.81	1.25	4.25	1.13	2.91	2.69	5.16	7.47	5.13	1.25	.25	.06
1-1/4	12	1018213	1018222	9.75	2.03	1.38	4.69	1.29	3.25	3.00	5.75	8.25	5.50	1.38	.25	.06
1-3/8	13-1/2	1018231	1018240	13.25	2.25	1.50	5.25	1.42	3.63	3.31	6.38	9.16	6.13	1.50	.25	.13
1-1/2	17	1018259	1018268	17.25	2.38	1.63	5.75	1.54	3.88	3.63	6.88	10.00	6.50	1.62	.25	.13
1-3/4	25	1018277	1018286	29.46	2.88	2.00	7.00	1.84	5.00	4.19	8.86	12.34	7.75	2.25	.25	.13
2	35	1018295	1018302	45.75	3.25	2.25	7.75	2.08	5.75	4.81	9.97	13.68	8.75	2.40	.25	.13

* NOTE: Maximum Proof Load is 2.0 times the Working Load Limit. Minimum Ultimate Strength is 6 times the Working Load Limit.



G-215 S-215

Nominal Size (in.)	Working Load Limit (t)*	Stock No.		Weight Each (lbs.)	Dimensions (in.)									Tolerance +/-	
		G-215	S-215		A	B	C	D	E	F	G	K	N	G	A
1/4	1/2	1018810	1018829	.10	.47	.31	.25	.25	.97	.62	.91	1.59	1.34	.06	.06
5/16	3/4	1018838	1018847	.18	.53	.38	.31	.31	1.15	.75	1.07	1.91	1.63	.06	.06
3/8	1	1018856	1018865	.25	.66	.44	.38	.38	1.42	.92	1.28	2.31	1.86	.13	.06
7/16	1-1/2	1018874	1018883	.40	.75	.50	.44	.44	1.63	1.06	1.48	2.67	2.13	.13	.06
1/2	2	1018892	1018909	.50	.81	.63	.50	.50	1.81	1.18	1.66	3.03	2.38	.13	.06
5/8	3-1/4	1018918	1018927	1.21	1.06	.75	.63	.63	2.32	1.50	2.04	3.76	2.91	.13	.06
3/4	4-3/4	1018936	1018945	2.00	1.25	.88	.81	.75	2.75	1.81	2.40	4.53	3.44	.25	.06
7/8	6-1/2	1018954	1018963	3.28	1.44	1.00	.97	.88	3.20	2.10	2.86	5.33	3.81	.25	.06
1	8-1/2	1018972	1018981	4.75	1.69	1.13	1.00	1.00	3.69	2.38	3.24	5.94	4.53	.25	.06
1-1/8	9-1/2	1018990	1019007	6.30	1.81	1.25	1.25	1.13	4.07	2.68	3.61	6.78	5.13	.25	.06
1-1/4	12	1019016	1019025	9.00	2.03	1.38	1.38	1.25	4.53	3.00	3.97	7.50	5.50	.25	.13
1-3/8	13-1/2	1019034	1019043	12.00	2.25	1.50	1.50	1.38	5.01	3.31	4.43	8.28	6.13	.25	.13
1-1/2	17	1019052	1019061	16.15	2.38	1.63	1.62	1.50	5.38	3.62	4.87	9.05	6.50	.25	.13
1-3/4	25	1019070	1019089	29.96	2.88	2.00	2.12	1.75	6.38	4.19	5.82	10.97	7.75	.25	.13
2	35	1019098	1019105	43.25	3.25	2.25	2.36	2.10	7.25	5.00	6.82	12.74	8.75	.25	.13

* NOTE: Maximum Proof Load is 2.0 times the Working Load Limit. Minimum Ultimate Strength is 6 times the Working Load Limit.

Crosby® Eye Hooks

Load Rated Fatigue Rated "QT" QUENCHED & TEMPERED QUIC-CHECK® "TA" TYPE APPROVED

SEE APPLICATION AND WARNING INFORMATION

Para Español: www.thecrosbygroup.com *On Pages 140-141*

S-320 & S-320N EYE HOOKS

All Crosby 320 Eye Hoist Hooks incorporate the following features:

- The most complete line of Eye hoist hooks.
- Available in carbon steel and alloy steel.
- Designed with a 5:1 Design Factor for (Carbon Steel); 4.5:1 Design Factor for 30t - 60t (Alloy Steel).
- Eye hooks are load rated.
- Proper design, careful forging and precision controlled quenched and tempering give maximum strength without excessive weight and bulk.
- Every Crosby Eye Hook has a pre-drilled cam which can be equipped with a latch. Even years after purchase of the original hook, latch assemblies can be added. (See pages 119 - 121)
- Chemical analysis and tensile tests performed on each PIC to verify chemistry and mechanical properties.
- Type Approval and certification in accordance with ABS 2007 Steel Vessel Rules 1-1-17.7, and ABS Guide for Certification of Cranes.
- Hoist hooks incorporate two types of strategically placed markings forged into the product which address two (2) **QUIC-CHECK®** features:
  - Deformation Indicators and Angle Indicators (see following page for detailed definition).

The following additional features have been incorporated in the new Crosby S-320N Eye Hoist Hooks. (Sizes 3/4 metric ton Carbon through 22 metric ton Alloy.)

- Metric Rated at 5:1 Design Factor for (Carbon Steel); 5:1 Design Factor for 1t - 22t (Alloy Steel).
- Can be proof tested to 2 times the working Load Limit.
- Low profile hook tip.
- New integrated latch (S-4320) meets the World class standard for lifting.
  - Heavy duty stamped latch interlocks with the hook tip.
  - High cycle, long life spring.
  - When secured with proper cotter pin through the hole in the tip of hook, meets the intent of OSHA Rule 1926.1431(g) and 1926.1501(g) for personnel hoisting.
- Fatigue rated at 1-1/2 times the Working Load Limit at 20,000 cycles.

Use 1-ton rated (min.)

Working Load Limit (t)		Hook ID Code	Eye Hook Stock No.			Weight Each (kg.)	Replacement Latch Kits		
Carbon	Alloy		Carbon S-320C S-320CN S.C.	Carbon G-320CN Galv.	Alloy S-320A S-320AN S.C.		S-4320 Stock No.	PL Stock No.	SS-4055 Stock No.
.75	1.25	†D	1022200	1022208	1022375	.28	1096325	-	-
1	1.6	†F	1022211	1022219	1022386	.40	1096374	-	-
1.5	2.5	†G	1022222	1022230	1022397	.65	1096421	-	-
2	3.2	†H	1022233	1022241	1022406	.94	1096468	-	-
3.2	5.4	†I	1022244	1022249	1022419	1.95	1096515	1092000	-
5	8	†J	1022255	1022262	1022430	3.76	1096562	1092001	-
7.5	11.5	†K	1022264	1022274	1022441	6.80	1096609	1092002	-
10	16	†L	1022277	1022285	1022452	9.42	1096657	1092003	-
15	22	†N	1022288	1022296	1022465	17.9	1096704	1092004	-
20	31.5	O	1023289	-	1023546	27.2	-	1093716	1090161
25	37	P	1023305	-	1023564	47.6	-	1093717	1090189
30	45	S	1023323	-	1023582	67	-	1093718	1090189
40	60	T	1023341	-	1023608	103	-	1093719	1090205

*Eye Hooks (3/4 TC - 22TA), Proof load is 2 times Working Load Limit. Eye Hooks (20 TC - 60TA). All carbon hooks-average straightening load (ultimate load) is 5 times Working Load Limit. Alloy eye hooks 1 ton through 22 ton-average straightening load (ultimate load) is 5 times Working Load Limit. Alloy eye hooks 30 tons through 60 tons-average straightening load (ultimate load) is 4.5 times Working Load Limit.

† New 320N style hook.

Grade 80 Alloy Chain

SPECTRUM 8® ALLOY CHAIN

- Alloy Steel.
- Heat Treated.
- Finish – Black rust preventative coating.
- Permanently embossed with CG (Crosby Group) and 8 (Grade).
- Proof Tested at 2 times the Working Load Limit with certification.

Minimum chain working load for Grade 80 is 7100 lb

Grade 80 Alloy Chain recommended for overhead lifting applications.

Chain Size (in.)	Spec. 8 Drum Stock No.	Feet Per Drum	Material Size (in.)	Working Load Limit (lbs.)*	Maximum Inside Length (in.)	Maximum Inside Width (in.)	Maximum Length 100 Links (in.)	Weight Per 100 Feet (lbs.)
9/32 (1/4)	273527	500	.276	3500	.87	.42	90	72
5/16	273536	500	.343	4500	1.01	.49	100	114
3/8	273545	500	.394	7100	1.23	.58	125	148
1/2	273554	300	.512	12000	1.57	.77	164	243
5/8	273563	200	.630	18100	1.93	.90	202	351
3/4	273572	100	.787	28300	2.42	1.14	252	584
7/8	273581	100	.866	34200	2.66	1.26	277	705
1	273590	75	1.024	47700	3.28	1.54	328	1041
1-1/4	273599	66	1.260	72300	4.03	1.89	403	1478

* Proof loaded at 2 times Working Load Limit. Ultimate Load is 4 times the Working Load Limit.

Crosby provides two methods of attaching Spectrum 8® chain to Crosby fittings.

A-1337
LOK-A-LOY® Connecting Link
Refer to Page 202

S-1325
Grade 100 Coupler Lilnk
Refer to Page 211

Main
Clearance Sales
Construction Equipment & Cab Enclosures
Custom Applications
Field Covers
General Purpose Tarps
School Applications
Military Installations
Pool Covers
Repair Work
Residential Products
Tents
Tent Accessories
Total Containment, Painting & Sand Blasting
Truck Tarpaulins
Truck Accessories
About Us
Contact Us

General Purpose Tarps

Teri Tarps, protecting the construction, agricultural, recreational, and transportation industries against the weather.

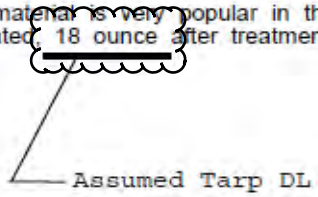
TERI GENERAL PURPOSE TARPS are rugged, water and mildew resistant canvas tarpaulins available in both regular and flame retardant materials.

TERI GENERAL PURPOSE TARPS, constructed from strong and flexible canvas, are completely dependable in any weather and for almost any purpose. They are available in many popular styles: OD, water and mildew resistant and OD Flame, water and mildew resistant, specially treated for applications requiring a flame retardant material.

Material

TERI OD: Rated 10 ounce canvas untreated; 18 ounce per sq. yd. treated. This Olive Drab canvas is the "old stand-by", proven in thousands of applications. Completely water and mildew-resistant.

TERI OD Flame: flame retardant, this material is very popular in the construction industry. 1 0 ounce canvas untreated, 18 ounce after treatment. Water and mildew resistant.



Available

10 oz. per sq. yd.

12oz. per sq. yd.

14.90 oz. per sq. yd.

Stock Sizes

15'x20'

20'x20'

20'x30'

All sizes are cut sizes before finishing. A 15' x 20' tarp will measure 1 4'4" x 1 9'6" minimum. Tarps are constructed of 6' material; allow for extra seams (2" per seam) on larger tarps.

*Special sizes available in request.

Appendix E
Standard Wire Rope

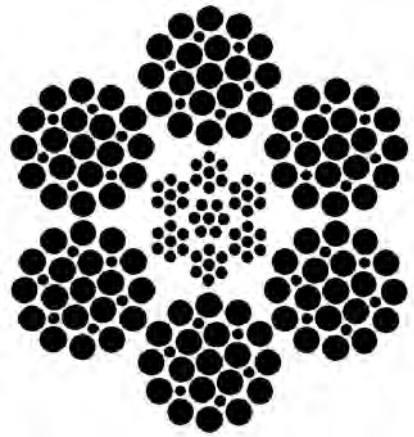
A2B ENGINEERING, LLC
CONSULTING ENGINEERS

6x19 Class Wire Rope

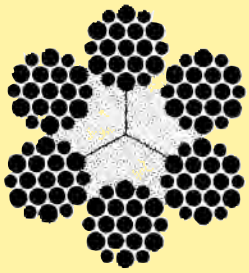
Strands: 6
Wires per strand: 19 to 26
Core: IWRC or fiber core
Standard Grade: Purple Plus
Lay: Regular or Lang
Finish: Bright or galvanized

The 6x19 Classification of wire rope is the most widely used. With its good combination of flexibility and wear resistance, rope in this class can be suited to the specific needs of diverse kinds of machinery and equipment.

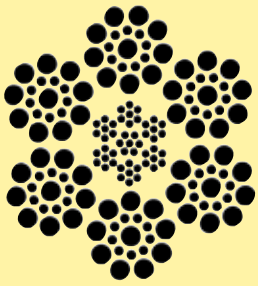
The 6x19 Seale construction, with its large outer wires, provides great ruggedness and resistance to abrasion and crushing. However, its resistance to fatigue is somewhat less than that offered by a 6x25 construction. The 6x25 possesses the best combination of flexibility and wear resistance in the 6x19 Class due to the filler wires providing support and imparting stability to the strand. The 6x26 Warrington Seale construction has a high resistance to crushing. This construction is a good choice where the end user needs the wear resistance of a 6x19 Class Rope and the flexibility midway between a 6x19 Class and 6x37 Class rope.



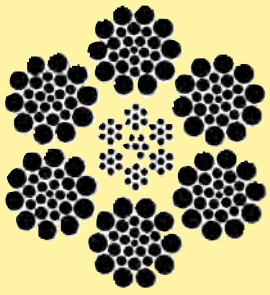
6x25 Filler Wire with IWRC



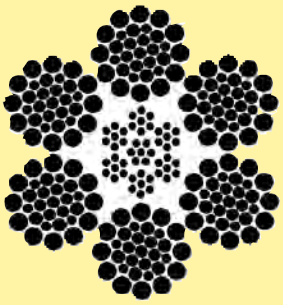
6x19 Warrington with fiber core



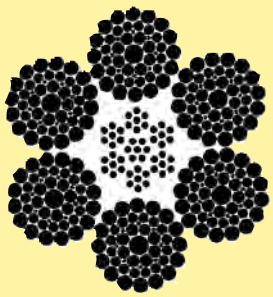
6x19 Seale with IWRC



6x26 Warrington Seale with IWRC



6x31 Warrington Seale with IWRC



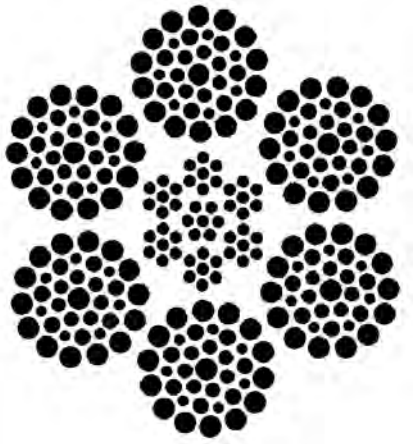
6x49 Filler Wire Seale with IWRC

6x36 Class Wire Rope

Strands: 6
Wires per strand: 27 to 49
Core: IWRC or fiber core
Standard Grade: Purple Plus
Lay: Regular or Lang
Finish: Bright or galvanized

The 6x36 Class of wire rope is characterized by the relatively large number of wires used in each strand. Ropes of this class are among the most flexible available due to the greater number of wires per strand, however their resistance to abrasion is less than ropes in the 6x19 Class.

The designation 6x36 is only nominal, as in the case with the 6x19 Class. Improvements in wire rope design, as well as changing machine designs, have resulted in the use of strands with widely varying numbers of wires and a smaller number of available constructions. Typical 6x37 Class constructions include 6x33 for diameters under 1/2", 6x36 Warrington Seale (the most common 6x37 Class construction) offered in diameters 1/2" through 1-5/8", and 6x49 Filler Wire Seale over 1-3/4" diameter.



6x36 Warrington Seale IWRC

6x19 and 6x36 Classes Technical Data

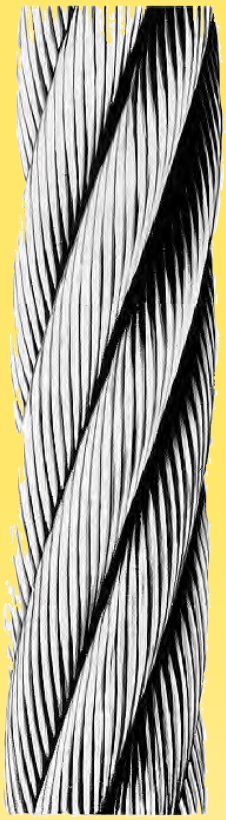
6x19 Class

6x19 Seale
6x19 Warrington
6x21 Filler Wire Type U
6x21 Seale
6x25 Filler Wire Type W
6x25 Seale
6x26 Warrington Seale

Rope Diameter		Approx. Weight (lb./ft.)		Nominal Strength, tons (bright or drawn galvanized**)		
				Royal Purple	Purple Plus	
inches	mm.	Fiber Core	IWRC	IWRC	Fiber Core	IWRC
1/4	6.5	0.11	0.12	3.74	3.01	3.40
5/16	8.0	0.16	0.18	5.80	4.69	5.27
3/8	9.5	0.24	0.26	8.30	6.71	7.55
7/16	11.0	0.32	0.35	11.2	9.10	10.2
1/2	13.0	0.42	0.46	14.6	11.8	13.3
9/16	14.5	0.53	0.58	18.5	14.9	16.8
5/8	16.0	0.66	0.72	22.7	18.4	20.6
3/4	19.5	0.95	1.04	32.4	26.2	29.4
7/8	22.0	1.29	1.41	43.8	35.4	39.8
1	26.0	1.68	1.85	56.9	46.0	51.7
1-1/8	29.0	2.13	2.34	71.5	57.9	65.0
1-1/4	32.0	2.63	2.89	87.9	71.1	79.9
1-3/8	35.0	3.18	3.49	106	85.5	96
1-1/2	38.0	3.78	4.16	125	101	114
1-5/8	42.0	4.44	4.88	146	118	132
1-3/4	45.0	5.15	5.66	169	136	153
1-7/8	48.0	5.91	6.49	192	155	174
2	52.0	6.73	7.39	217	176	198
2-1/8	54.0	7.60	8.34	243	197	221
2-1/4	58.0	8.52	9.35	272	220	247
2-3/8	60.0	9.49	10.4	301	244	274
2-1/2	64.0	10.5	11.6	332	269	302
2-3/4	70.0	12.7	14.0	397	321	361

**Galvanizing: For Class A galvanized wire rope (EIP grade only), deduct 10% from the nominal strength shown.

Technical data for the above listed constructions are the same and are detailed in the table. For further information on additional constructions and diameters, contact WW's customer service department.



6x36 Class

6x31 Warrington Seale
6x33
6x36 Warrington Seale
6x41 Warrington Seale
6x43 Filler Wire Seale
6x49 Filler Wire Seale

Appendix F
Scaffold Platform

A2B ENGINEERING, LLC
CONSULTING ENGINEERS

BETH-ALLEN
LADDER & EQUIPMENT Inc.

2124 West Broad Street Bethlehem, Pennsylvania 18018

1-800-835-4242 Email Us **610-866-4242**

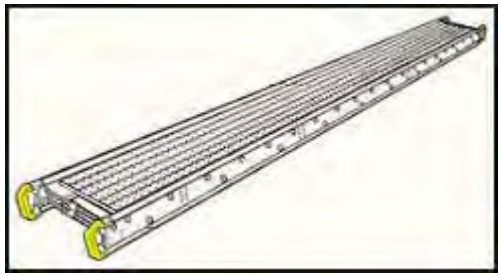
FAX: 610-866-3328

WERNER

Aluminum Staging
Task-Master® Stages

Ideal for the Jack applications, Swing stages, or catwalks

Decorator Planks * Scaffold Planks * Stage Platforms * Guard Rail Systems



- Twist-Proof® Stage Design
- Individual slip-resistant decking minimizes paint or material build up.
- Double end rung provides extra rigidity on stages 20' or longer-standard on stages with 5" or 6" rails.
- Vinyl-coated end caps serve as hand grips and protect from sharp edges and surfaces marks.

DECORATOR PLANKS **1 Person 250 lbs. Rated**

Model	Width	Side Rail Length	Side Rail Depth	Side Rail Flange	Ship Wt. lbs.
2008	12"	8'	4"	1-3/8"	25
2012	12"	12'	4"	1-3/8"	36
2016	12"	16'	4"	1-3/8"	48
2020	12"	20'	5"	1-3/8"	65
2024	12"	24'	5"	1-3/8"	78

SCAFFOLD PLANKS **2 Person - 500Lbs. Rated**

Model	Width	Side Rail Length	Side Rail Depth	Side Rail Flange	Ship Wt. lbs.
2316	12"	16'	4"	1-3/8"	48
2320	12"	20'	6"	1-3/8"	79
2324	12"	24'	6" HvyDty	1-3/8"	112
2328	12"	28'	6" HvyDty	1-3/8"	131
2330	12"	30'	6" HvyDty	1-3/8"	140
2332	12"	32'	6" HvyDty	1-3/8"	149
2408	14"	8'	4"	1-3/8"	27
2412	14"	12'	4"	1-3/8"	40
2416	14"	16'	5"	1-3/8"	58
2420	14"	20'	6"	1-3/8"	85
2424	14"	24'	6"	1-3/8"	109
2428	14"	28'	6"	2"	127
2430	14"	30'	6" HvyDty	2"	171
2432	14"	32'	6" HvyDty	2"	182

STAGE PLATFORMS **2 Persons - 500 Lbs. Rated**

Model	Width	Side Rail length	Side Rail Depth	Side Rail flange	Ship Wt. lbs.
2508	20"	8'	4"	1-3/8"	33.0
2512	20"	12'	4"	1-3/8"	48.0
2516	20"	16'	5"	1-3/8"	70.0
*2520	20"	20'	6"	1-3/8"	102.0
*2524	20"	24'	6"	1-3/8"	121.0
*2528	20"	28'	6"	2"	157.0
*2530	20"	30'	6"	2"	168.0
*2532	20"	32'	6"	2"	179.0
*2536	20"	36'	6"Hvy Dty	2"	243.0

*2539	20"	39'	6" Hvy Dty	2"	264.0

STAGE PLATFORMS **2 Persons - 500 Lbs. Rated**

2608	24"	8'	4"	1-3/8"	38.0
2612	24"	12'	4"	1-3/8"	56.0
2616	24"	16'	5"	1-3/8"	81.0
*2620	24"	20'	6"	1-3/8"	115.0
*2624	24"	24'	6"	1-3/8"	138.0
*2628	24"	28'	6"	2"	168.0
*2630	24"	30'	6"	2"	180.0
*2632	24"	32'	6"	2"	191.0
2708	28"	8'	4"	1-3/8"	41.0
2712	28"	12'	4"	1-3/8"	60.0
2716	28"	16'	5"	1-3/8"	87.0
*2720	28"	20'	6"	1-3/8"	124.0
*2724	28"	24'	6"	1-3/8"	147.0
*2728	28"	28'	6"	2"	187.0
*2732	28"	32'	6"	2"	213.0

STAGE PLATFORMS **3 Person - 750 lbs. Rated**

3112	24"	12'	4"	2"	64.0
3116	24"	16'	5"	2"	92.0
*3120	24"	20'	6"	2"	115.0
*3124	24"	24'	6" Hvy Dty	2"	145.0
*3128	24"	28'	6" Hvy Dty	2"	204.0
*3132	24"	32'	6" Hvy Dty	2"	236.0
*3136	24"	36'	6" Hvy Dty	2"	323.0
*3139	24"	39'	6" Hvy Dty	2"	365.0

STAGE PLATFORMS **3 Person - 750 lbs. Rated**

3208	28"	8'	4"	2"	48.0

Appendix G
Ventilation System

A2B ENGINEERING, LLC
CONSULTING ENGINEERS

Dust Collector/Fan Ventilation System :

The contractor shall provide mechanical exhaust ventilation for the abrasive blasting containment structures using one or more mobile dust collectors. The contractor proposes to use one (1) 45,000 cfm at 13" W.G. mobile dust collector manufactured by Advanced Recycling Sytems, Inc. The dust collector has an assumed dust exhaust capacity based on the number of ducts provided.

Using an itterative process and estimated friction loss for 20" diameter ducts from friction loss curves, use:

4 - 20 inch diameter ducts

Max. Exhaust capacity =	48000	cfm total,	or 12000	cfm per duct
Total Estimated system static pressure =	9.46	inch water gage (from fan curve)		
Friction loss per 100 ft of duct =	2.0	Inch W.G. (from friction loss curve for 20" ducts)		
Maximum number of elbows =	3	Each (46 equivalent linear feet per elbow)		
loss thru containment =	1.20	inch water gage (typical)		
loss thru fabric filters =	4.00	inch water gage (typical)		
loss thru elbows =	2.76	inch water gage (calculated)		
loss thru duct =	1.50	inch water gage (remaining)		
Maximum Length of Duct =	75.0	ft (max allowed for system)		

3 - 20 inch diameter ducts

Max. Exhaust capacity =	45000	cfm total,	or 15000	cfm per duct
Total Estimated system static pressure =	12.25	inch water gage (from fan curve)		
Friction loss per 100 ft of duct =	2.8	Inch W.G. (from friction loss curve for 20" ducts)		
Maximum number of elbows =	3	Each (46 equivalent linear feet per elbow)		
loss thru containment =	1.20	inch water gage (typical)		
loss thru fabric filters =	4.00	inch water gage (typical)		
loss thru elbows =	3.86	inch water gage (calculated)		
loss thru duct =	3.19	inch water gage (remaining)		
Maximum Length of Duct =	113.8	ft (max allowed for system)		

2 - 20 inch diameter ducts

Max. Exhaust capacity =	40000	cfm total,	or 20000	cfm per duct
Total Estimated system static pressure =	16.00	inch water gage (from fan curve)		
Friction loss per 100 ft of duct =	4.5	Inch W.G. (from friction loss curve for 20" ducts)		
Maximum number of elbows =	3	Each (46 equivalent linear feet per elbow)		
loss thru containment =	1.20	inch water gage (typical)		
loss thru fabric filters =	4.00	inch water gage (typical)		
loss thru elbows =	6.21	inch water gage (calculated)		
loss thru duct =	4.59	inch water gage (remaining)		
Maximum Length of Duct =	102.0	ft (max allowed for system)		

1 - 20 inch diameter ducts

Max. Exhaust capacity =	24000	cfm total,	or 24000	cfm per duct
Total Estimated system static pressure =	17.50	inch water gage (from fan curve)		
Friction loss per 100 ft of duct =	5.5	Inch W.G. (from friction loss curve for 20" ducts)		
Maximum number of elbows =	3	Each (46 equivalent linear feet per elbow)		
loss thru containment =	1.20	inch water gage (typical)		
loss thru fabric filters =	4.00	inch water gage (typical)		
loss thru elbows =	7.59	inch water gage (calculated)		
loss thru duct =	4.71	inch water gage (remaining)		
Maximum Length of Duct =	85.6	ft (max allowed for system)		

If the cross sectional area is exceeded in the shop drawings or required air flow is not achieved, contractor shall provide additional dust collectors and exhaust ducts or reduce the size of the active paint containment enclosure by installing internal tarpaulin walls.

Containment Design Parameters:

Provide a minimum cross-draft ventilation of 100 - 300 ft/min (Coating Structural Steel- Containment System 561.10-3)
Provide a minimum down-draft ventilation of 60 ft/min
Size the inlets to provide air flow velocity of 700 - 1,000 ft/min

Ventilation System Cross-Draft:

20" diam. Ducts, No. Required =	4	3	2	1	
Volume Q =	48,000	45,000	40,000	24,000	cfm
Max. Containment Area (V = 100 ft/min)	480.0	450.0	400.0	240.0	ft^2
Min. Containment Area (V = 300 ft/min)	160.0	150.0	133.3	80.0	ft^2
Max. Inlet Area (V = 700 ft/min)	68.6	64.3	57.1	34.3	ft^2
Min. Inlet Area (V = 1000 ft/min)	48.0	45.0	40.0	24.0	ft^2

Sample Calculation:

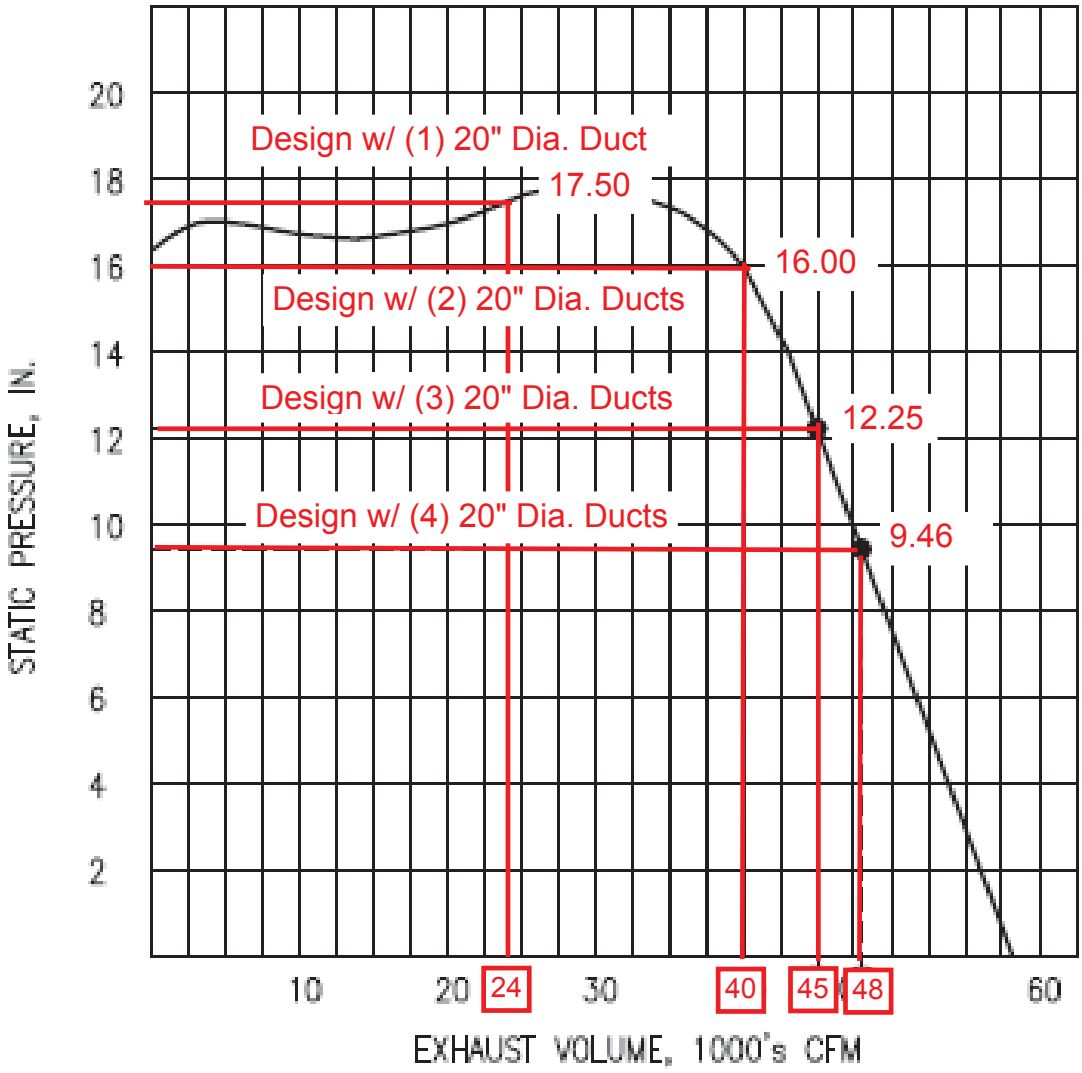
Max. Containment Area = Q/V = 48000 cfm / 100 ft/min = 480.0 ft^2

Min. Containment Area = Q/V = 48000 cfm / 300 ft/min = 160.0 ft^2

Max. Inlet Area = Q/V = 48000 cfm / 700 ft/min = 68.6 ft^2

Min. Inlet Area = Q/V = 48000 cfm / 1000 ft/min = 48.0 ft^2

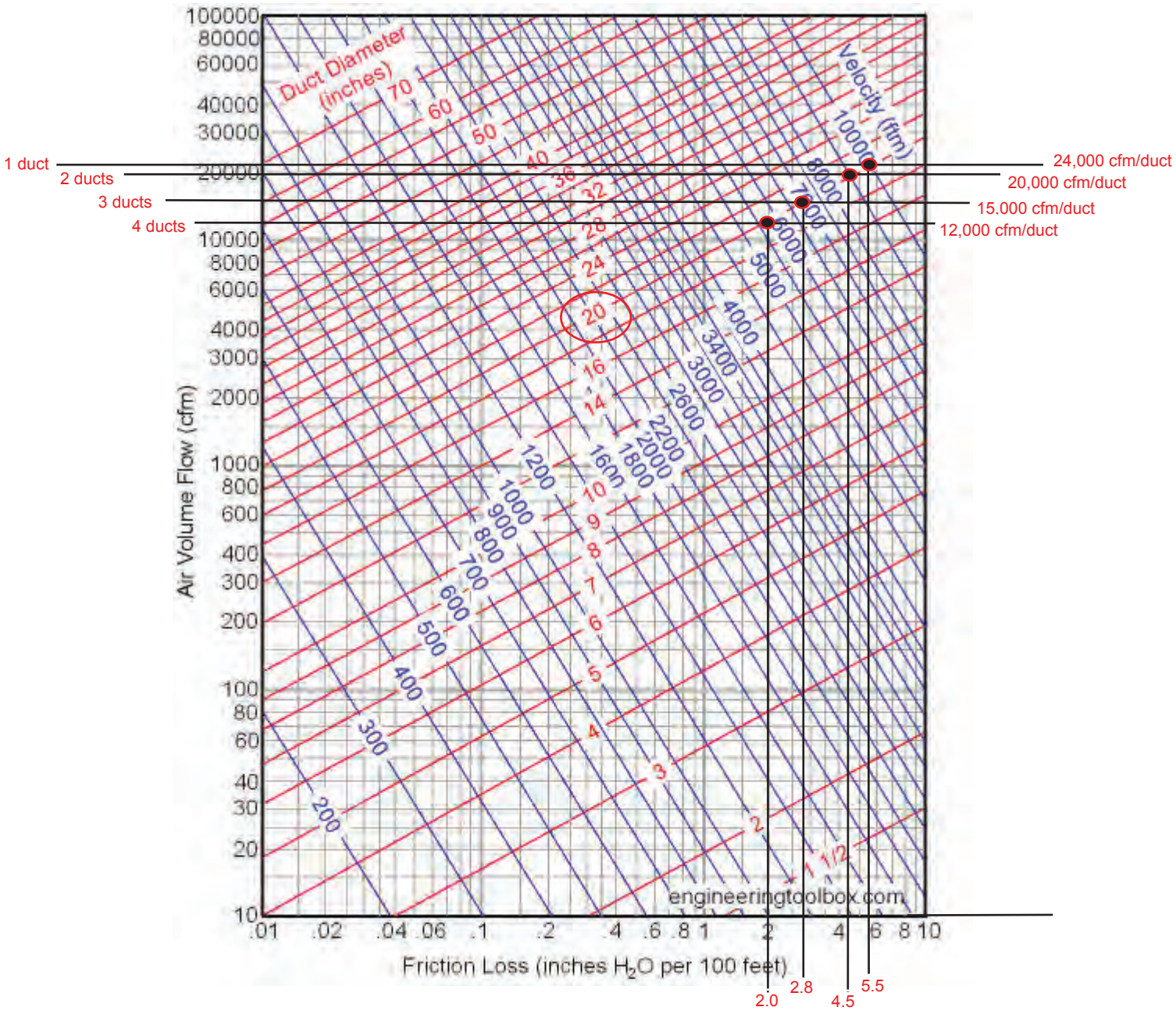
ADVANCED RECYCLE SYSTEMS, INC.
MODEL ARS-45 MOBILE DUST COLLECTOR



DUST COLLECTOR FAN CURVE

MAX. AVAILABLE EXHAUST CAPACITY W/4 DUCTS	48,000 CFM
MAX. AVAILABLE EXHAUST CAPACITY W/3 DUCTS	45,000 CFM
MAX. AVAILABLE EXHAUST CAPACITY W/2 DUCTS	40,000 CFM
MAX. AVAILABLE EXHAUST CAPACITY W/1 DUCT	24,000 CFM

Estimated Friction Loss for 20" diameter exhaust ducts



Advanced Recycling Systems, Inc.

Designers and Builders of Mobile Blasting Systems

1089 N. HUBBARD ROAD • LOWELLVILLE, OHIO 44436-9737 • Tel. (330) 534-3330 • FAX (330) 534-9249

45,000 CFM Dust Collector at 13" Wg.

- ***Hydraulic Auger***
- ***Only 28 ft. long***
- ***Long Life Filter Cartridges***

Low Drag-High Airflow Design

Advanced Recycling Systems, Inc.

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1089 N. HUBBARD ROAD • LOWELLVILLE, OHIO 44436-9737 • Tel. (330) 534-3330 • FAX (330) 534-9249

45,000 CFM Dust Collector

SPECIFICATIONS	
AIR RATE PER UNIT	45,000 CFM @ 13 Wg. 40,000 CFM @ 16 Wg.
CARTRIDGE EFFICIENCY	99.9% @ 0.5 microns
ARRANGEMENT OF ELEMENTS	Vertical
CARTRIDGE CLEANING	Ram Injection, Pulse Type
NUMBER OF CARTRIDGES	84
FILTER MEDIA AREA	12,600 sq. ft.
AIR-TO-CLOTH RATIO	3.5 TO 1 @ 45,000 CFM 3.1 TO 1 @ 40,000 CFM
DUCTING CONNECTIONS	4 @ 20" Dia.
FAN	Class IV Non-overloading Type "C" Spark Resistant
DRIVE	Banded V-Belt with clutch
TYPE OF ENGINE	165 H.P. Diesel
FUEL TANK	90 Gallon
AUGER DRIVE	Hydraulic
TRAILER	28'L x 8"W x 12'3"H
BRAKES	Electric
OPTIONS:	Dual Rear Inlets